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SCHOOL OF EDUCATION

Dissertation

ALTERNATIVE STRATEGIES IN THE DELIVERY OF INJURY PREVENTION HEALTH EDUCATION

by

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B.S.N., Duke University, 1971

M.A.T., Alaska Pacific University, 1992

Submitted in partial fulfillment of the

requirements for the degree of

Doctor of Education

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1996

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Embarking on a dissertation must have many similarities to a novice sky diver's first jump. There is a need for rigorous training and preparation. An expert with many jumps to his credit must check the parachute to make sure it will be ready to unfold flawlessly when needed. Just before the flight the novice undoubtedly receives encouragement that he is ready and will indeed conquer his fears to land whole and hearty in the target zone. At the right moment, the jump master in the plane's hold may have to push the beginner out the cargo door into the freedom of the skies. Last but not least, a ground crew must be there to act as both safety net and cheering squad.

As I write these acknowledgment from the safety of the target zone, I am moved by my recognition of the scope and breadth of this learning experience as well as by my need to personally acknowledge the people who trained, encouraged, pushed, cheered, and provided the air time to make this dissertation possible.

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ALTERNATIVE STRATEGIES IN THE DELIVERY OF

INJURY PREVENTION HEALTH EDUCATION

(Order No.)

KATHERINE ANN SLOAN

Boston University, School of Education, 1996

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ABSTRACT

Injury is one of the leading causes of death, yet the use of protective devices such as helmets is not widespread. This study was designed to determine if health education strategies are effective in increasing the use of helmets by riders of off-road vehicles in rural Alaska, and to describe characteristics of both helmet users and nonusers.

A quasi-experimental design employing three sets of villages provided a comparison between two treatments and a control. In consideration of barriers, the most predictive element of the Health Belief Model, two tactics reduced the barriers to owning a helmet: local sale and lowering the price. In the first group of treatment villages, helmets were made available. The second group of treatment villages received helmets plus exposure to modeling, a training technique drawn from Bandura's Theory of Self-Efficacy.

Observation of helmet use by off-road vehicle riders occurred before and during the experiment. Sales of helmets were also analyzed. Curbside interviews elicited information on: (a) perceptions of normative beliefs about helmet use (Theory of Reasoned Action), (b) social learning in response to off-road injuries, and (c) helmet-wearing habits. Qualitative interviews followed the study, using Health Aides and the role models as key informants.

Study results indicated that geographic and economic access increased the sale and use of helmets. Also, the modeling treatment increased the use of helmets. Males, adults, and non-Natives wore helmets more often than their counterparts. Group activities most often set the stage for helmet wearing, and villages which had experienced an off-road vehicle tragedy

were more open to adopting helmets. The use of off-road vehicles was so pervasive within the area that the region could be described as having a culture of off-road vehicles.

In summary, this research supported modeling and the reduction of barriers as effective means to increase helmet wearing by riders of off-road vehicles in rural Alaska.

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CHAPTER ONE

THE PROBLEM

Background of the Problem

The 20th century is an age of medical miracles. Epidemics, which once decimated whole populations, have been tamed by "baby shots." Transplanting a heart is almost routine. Even severe trauma, once a sure killer, has responded to surgery within the first "golden hour." One might assume the public's trust and support for the health care system would know no bounds, and personal feelings about health would be marked by optimism and a sense of control. Yet just the opposite seems to be true; mounting tension pervades health care worldwide (Sullivan, 1992; Tabor, 1988). Confidence in a long and healthy life has been replaced by a sense of risk, a foreboding that illness can strike at any time (Brownell, 1991).

Political debate in the 1992 presidential campaign focused on some of the causes of this tension and fear, particularly the more than 35 million Americans who are uninsured, and the expanding budget which now consumes more than 13% of the Gross National Product (GNP), (Clinton, 1992). The candidate with the most ambitious plan for reform won the election, and attempted to lead the nation into a new health care era. The failure of this major legislative effort exemplifies the multiple crosscurrents affecting medicine today.

Other causes reflect society itself. This is the age of the consumer, who demands options and control. In the past 30 years, every once sacred institution, including health care, has been challenged. Gone are the days of compliance "because the doctor said so." Self-help medical books are found by the hundreds in every bookstore. Health education is available through every medium, on nearly every subject imaginable. Patients have become "clients," who expect to negotiate their treatment plans, and bring unprecedented *personal*

knowledge to the exchange (Peters, 1987).

Change in the health care system is so far reaching and fundamental that core institutions, including the hospital and the private practice of medicine, may not exist in the 21st century (K. Johnson, personal communication, September 12,1993). Instead of relying on institutional help, consumers will keep themselves healthy, drawing what they need from the marketplace (Dunham et al., 1986; Illich, 1976; Naisbitt, 1982). Choice accompanied by multiple outpatient service options will dominate the treatment of illness. Once a pawn in the complex web of hospital, physician, and third-party payer relationships, the consumer will instead be in charge of both wellness and illness decisions.

Driving both the high cost of health care and the health education revolution are fundamental changes in morbidity and mortality patterns. Until this century and the advent of immunizations and antibiotics, infectious disease was the leading killer (Wilcocks, 1965). Its elimination has relied on medical breakthroughs. Lifestyle-related illnesses such as diabetes, cancer, heart disease, and injury have become the leading causes of death in an increasingly elderly population (Bezold, 1989). The First World's affluence made possible this age of medical miracles. Ironically, it has also led to its citizens' ill health through sedentary yet stress-filled routines, high-caloric, high-fat diets, and high-risk behavior (Uutela & Tuomilehto, 1992).

Improvements in health for people with lifestyle-related diseases will come not primarily from new medical miracles, but from changes in health-promoting behaviors (Bezold, 1989; Dubos, 1959; Uutela & Tuomilehto, 1992). The tension felt in health care today is nowhere more evident than here—on the continuum with, at one end, educated consumers demanding more collaborative relationships with their physicians, and, on the other end, physicians (and even in some cases insurers and the legal system) demanding more knowledge and health-promoting behavior from those in high-risk groups.

This author's health care practice has been primarily in emergency nursing in Alaska.

Because of Alaska's young population and hazardous environment, many preventable injury cases have come to her attention over the years. Health education, leading to safer lifestyles, could have prevented hundreds of senseless deaths. Specific topics of interest to this researcher are health education, particularly in the areas of injury prevention and rural Alaska.

Rationale and Significance of the Problem

The primary purpose of this study was to identify health education strategies which are effective in increasing the use of protective devices which can prevent injury. The specific protective device studied was the helmet worn by off-road vehicle (including All-Terrain Vehicles [ATVs] and snowmachines) riders in rural Alaska.

Injuries from off-road vehicle crashes constitute a significant health problem for rural Alaskans, with nearly a third of the adult respondents in a recent survey reporting personal harm from an ATV crash at some previous date. Although more than two-thirds believed a helmet could prevent injury, only 7% reported wearing one the last time they rode (Sloan, 1992). The effectiveness of helmets in reducing ATV injuries and deaths was demonstrated by Rodgers (1990), who analyzed data from fatal and non-fatal ATV crashes. He concluded helmets could reduce the risk of death by 42% and the risk of non-fatal head injury by 64%.

Although significant efforts are being made by the U.S. Public Health Service to improve the health of rural Alaskans by reducing injuries, no focused study has been conducted comparing the effectiveness of alternative health education models (R. Perkins, personal communication, December 9, 1991). Because the decision to wear a helmet must be made each and every time an off-road vehicle is used, health education is an essential component of the total prevention strategy for these types of injuries. Development of a successful model program can provide focus and direction for future health education in this area.

The literature contains numerous reports of health education programs taking place around the world during the past 20 years. Although some efforts have been guided by health behavior or social psychology theories (Eisen, Zellman, & McAlister, 1992; Kelly & St. Lawrence, 1990; Parcel et al., 1989), there are few accounts of programs based in adult learning theory (Tones, 1986; Wallerstein & Bernstein, 1988). The majority of health education programs described in the literature do not appear to be guided by either psychological or learning theories, nor are there health education theories unique to that discipline (Hochbaum, Sorenson, & Lorig, 1992; Timmreck, Cole, James, & Butterworth, 1987). There has been relatively little research in health education which combines health behavior or social psychology models with adult learning theory. Instead, research has been dominated by epidemiologists and other health professionals who have preferred quantitative methods and observable data (Robottom & Colquhoun, 1992).

Qualitative research in health promotion has been rarely attempted or reported. Milio (1990) advocated a combination of qualitative research methods, including interviews, participant observation, and content analyses, as well as the collection of "harder data," to deepen understanding and create useful principles which could in turn be tested by research. She also recommended that the researcher collaborate with participants, while maintaining appropriate scientific controls, so that the findings would ultimately be useful and credible to the potential users.

Therefore, a health education study based in adult learning and social psychology theories which uses qualitative research techniques could contribute to the knowledge of strategies effective in increasing the use of protective devices.

Statement of the Problem

The 20th century began as an age of medical miracles: antibiotics, immunizations,

great advances in diagnostic and surgical technology, a pharmacopoeia of new drugs. The people of the "First World" looked forward to long lives, free of disease and any worry about health. In many ways medicine has delivered on its promise.

In the late 20th century, the biotechnology miracle machine seems to have run out of steam (Bezold, 1989; Dubos, 1959). Lifestyle-related maladies, such as injury, cancer, heart disease, and diabetes now lead the list as causes of mortality (U.S. Department of Health and Human Services [DHHS], 1990). On these, the quick, easy fixes of surgery and drugs have, at best, only a limited impact.

Yet the opportunity for a long and healthy life still exists. The challenge each of us faces is changing our own behavior to achieve that potential. Since the dawn of history both eastern and western philosophers have pointed to the link between mind, body, and spirit and its impact on physical health. However, the current "wellness" movement in the United States is relatively young, dating from a series of 29 lectures on health and wellness delivered by Dr. Dunn in a Unitarian Church in the early 1960's (Ardell, 1985).

Over the past 30 years, health promotion and education programs have grown into a "confused jungle . . . of practices and approaches with no theoretical foundation" (Timmreck et al., 1987, p. 25). Although theories of psychology and learning have much to offer health education, "few (practitioners) ever deliberately use theories in their work" (Hochbaum et al., 1992, p. 295).

The jungle analogy can be taken one step further in looking at the prolific growth of health promotion and education efforts. Scholarly databases contain thousands of citations on the subject, and consumer literature is filled with prescriptions for staying young, losing weight, "toning up," quitting smoking, reducing cholesterol, and more.

What emerges is a matter of great contrast. Undeniably health is of great value to everyone, but acting in ways that promote individual health is a great challenge. Societal values which stress the importance of personal freedom and responsibility for health at the same

time argue against changes in laws and the environment which would improve health (Uutela & Tuomilehto, 1992). Theories of learning and psychology are available to guide scholarly research on health education, but they are seldom used. Although spending on health care now exceeds 13% of the GNP, health promotion and education strategies, which are much less costly than acute care, are not used systematically or continuously through the lifespan (Clinton, 1992). Injury is one of the leading causes of death, yet the use of protective devices such as seat belts, flotation devices, helmets, etc. is not widespread.

The question remains: what health education strategies are effective in increasing the use of protective devices which can prevent injury?

Major Research Questions

The purpose of this study was to determine if health education strategies are effective in increasing the use of protective devices which can prevent injury. Specific questions included:

1. What theories of health behavior motivation and persuasion are predominant and most closely address the use of protective devices?

2. What learning theories are most applicable to health education practices for training in injury prevention?

3. Do people who are learning about their own health prefer one teaching strategy over another?

4. What teaching strategy is most effective in increasing the use of protective devices?

Definition of Terms

Wellness

> An integrated method of functioning which is oriented toward maximizing the potential of which the individual is capable. It requires that the individual maintain a continuum of balance and purposeful direction within the environment where he is functioning. (Dunn, 1961, p. 4-5)

This definition is taken from Dunn, whose philosophy of wellness is considered the cornerstone for the wellness revolution of the past 30 years.

Self-care

> The practice of activities that individuals personally initiate and perform in their own behalf in maintaining life, health, and well-being. (Orem, 1971, p. 2)

Although this model was developed to define a nursing approach to patients receiving treatment, it has broader applications to the arena of health promotion. Not limited to the maintenance of health in the face of disease, it also addresses the prevention of disease in the presence of normal health, or wellness.

Health Promotion

> . . . health care directed toward high-level wellness through processes that encourage alteration of personal habits or the environment in which people live. It occurs after health stability is present and assumes disease prevention and health maintenance as pre-requisites or by-products. (Brubaker, 1983, p. 12)

This definition was arrived at through a linguistic analysis of health *promotion*, wellness, health maintenance, and disease prevention literature. Although these terms are

often used interchangeably, Brubaker (1983) found it important to separate the concepts. She argued health promotion implies an improvement of health from a steady state, whereas disease prevention merely protects against disease without offering greater well-being.

She also regarded the term "health education" as both too narrow and too broad. It is too limiting because it only implies an individualized approach directed at cognitive processes, and too broad because it covers the spectrum of both sick and healthy people.

Health Education

An aspect of health promotion involving a learning situation in which the goal is to change knowledge and behavior with the aim of improving health status.

Tones (1986) described three types of health education:

Preventive approach

> Its focus is the individual; its goal is to *persuade* the individual to adopt a particular lifestyle. (p. 7)

Self-empowerment approach

> . . . is based on the philosophical view that education is primarily concerned with rationality and freedom of choice . . . the primary goal of health education is to facilitate decision making . . . . (p. 7)

Radical approach

> . . . argues that health education should be addressing the fundamental social issues underlying disadvantage and ill health . . . by modifying people's beliefs in their capacity to influence their destiny and by providing them with the skills to do so. (p. 8)

Tones (1986) broadened the scope of health education, within the general framework

of health promotion, by identifying its role in changing personal knowledge and behavior, enhancing personal decision-making ability, and mobilizing the individual for community action.

Habit

> . . . stable response patterns that are learned through multiple repetitions until they become nearly or completely automatic responses to certain classes of stimuli. (Baldwin, 1988, p. 38)

Habits may be learned consciously or developed without any particular awareness. They may become so perfected that the behavior is performed without conscious guidance, leading to the term "second nature."

CHAPTER TWO

REVIEW OF RELATED LITERATURE

History of Theories of Health

It's supposed to be a professional secret,
But I'll tell you anyway.
We doctors do nothing.
We only help and encourage the doctor within.

Albert Schweitzer

Where does the physician's healing role start and stop—and the priest's or patient's begin? Can scientific medicine alone cure the body, or is there an alchemy of body, mind, and spirit that transforms the doctor's chemistry and surgery into health? Is man king of all he surveys, or does environment rule the person? Will a healthy lifestyle always follow from the knowledge of what promotes wellness, or does persuasion play a role even when an individual's best interests are crystal clear?

Since the beginning of recorded time, both society and the medical profession have attempted to answer these questions, with varying results. Each era has solved the health care equation differently, assigning varying degrees of importance to the influences of mind, spirit, lifestyle, and the environment. Treatment of disease and promotion of health have obeyed these guiding principles, with the paradigm continuing to change down to our own century.

The Ancient Hebrews

History recognizes the ancient Hebrews as the first tribe to worship one God, and as the originators of much of what is known today as western culture and religion. Perhaps less widely acknowledged are the sanitation, hygiene, and health innovations prescribed by the

Bible. Together, the Books of Leviticus, Numbers, and Deuteronomy formed the world's first hygienic code. Thousands of years later many of these precepts still cannot be improved upon (Wain, 1970).

Taking the view that illness was the expression of God's divine wrath against man's transgressions, the Bible offered relief through prayers, fasting, and heeding God's word. Until that time, evil spirits and demons were commonly seen as the source of health problems. Although individuals were accountable to God in the life hereafter for following His moral laws, Moses wielded the full force of the Almighty's sanctions on earth when the health of the community was threatened (Wain, 1970). Execution was the penalty for spreading venereal disease contracted from the "daughters of Moab . . . thus the plague was stayed from the people of Israel" (Numbers 25:8, Revised Standard Version).

Although Hebraic innovations such as dietary laws, separation of the sick, sanitation, and cleanliness were revolutionary for the age, perhaps their greatest innovation was the method used to apply these precepts. For the first time public health practices were implemented community wide for the betterment of the entire population, the link between personal behavior and health was recognized, and the environment came to be known as a source of illness.

God was the source of wisdom on ways to stay healthy, but He also was the cause of man's ill health when His moral laws were not followed. Modern public health laws, as well as western civilization's concepts of the link between personal behavior, the environment, a virtuous life, and health can all be traced to what might be appropriately termed the first public health revolution, led by Moses and the Children of Israel thousands of years ago.

Ancient Greece

The foundations of western medicine were laid in Greece. Dating from about 500 B.C., the "Cult of Asclepius" was the first recorded medical movement. Originally *described by*

Homer as a priest-physician, Asclepius' stature grew until he emerged in 525 B.C. as the Greek God of Medicine. Depicted as a heroic bearded figure, he carried a staff entwined by a single serpent, the symbol of healing. To this day the caduceus, first attributed to Asclepius, remains the international symbol of medicine (Wain, 1970).

According to legend, Asclepius also had two lovely daughters who aided him in healing. Hygeia, the goddess of health, is remembered in the word hygiene. Panacea, the source of an "all-healing" power, also lingers in the concept of a panacea, a "cure-all" drug (Wain, 1970).

Following a primarily religious intent, Asclepieian priest-physicians erected temples of healing amidst idyllic natural settings. A staff of priests and musicians, as well as sacred serpents and other animals, treated Greek patients with diet, rest, exercise, massage, baths, and heliotherapy. With a clear focus on healing the body through the spirit, sick and healthy alike flocked to these centers (Wain, 1970).

Despite the public's support for the cult of Asclepius, Greek medicine moved decisively away from magic and religion toward a rational naturalistic approach to healing. Physician-priests were displaced by physician-philosophers, who later divorced themselves again from philosophers to form a separate physician class (Wain, 1970).

Hippocrates, born in about 460 B. C., was the greatest of Greek physicians and is revered as the founder of modern medicine. Studying first at the Asclepieian of Cos, Hippocrates later traveled widely, all the time practicing his profession, observing, and collecting medical ideas. His recording of these observations, the *Corpus Hippocraticum*, was the source of his fame and influence, not only in his own time but down through the millennia to our own era (Wain, 1970). Drawing a line between religion and health, Hippocrates reported gods do not cause illness. Instead diseases are "natural," and respond to treatments still in use today: diet, drugs, and surgery (Temkin, 1977). Hippocrates is said to have preferred conservative treatments such as dietary and lifestyle changes, saving surgical intervention as a last resort.

Other sources from the same era corroborate this changing view of illness's source. Plato spoke of the physician as "a ruler of bodies," and Democritus wrote, "Medicine heals diseases of the body, wisdom frees the soul from passions" (cited in Temkin, 1977, p. 44). At the close of the Golden Era of Greece, the professions had clearly staked their territories: physicians in charge of the body which becomes sick from natural causes, and philosophers and priests in charge of the soul and the gods (Temkin).

Early Christianity

Early Christians appear to have returned to a more religious interpretation of the relationship between the body, the soul, and health. In the fifth chapter of John, Christ is reported to have met a man whom he cured from an old sickness, and to have spoken to him saying: "See, you are well! Sin no more, that nothing worse befall you" (John 5:14).

Later Christians carried forward this perception of sin as the origin of disease by requiring (at the 4th Lateran Council in 1215) that physicians hear confession. Not only was disease felt to be caused by sin, and confession to be a possible immediate cure, but ill health might also be in some way a blessing, a demonstration of God's glory. Not obedient to Church teaching, physicians of the Middle Ages continued to focus on healing the body, not the soul (Temkin, 1977).

The Roman Era

As Greek civilization declined, Rome rose through military conquest to a position of uncontested world power. Needing to keep its military machine in fighting trim and practical to the core, the Romans imported the far superior Greek medicine via the hire of Greek physicians. Foremost among these transplants was Claudius Galen, who came to be known as the greatest of Roman physicians.

Thoroughly trained in science, Galen first sharpened his skills treating gladiators.

Considered the father of experimental physiology, Galen wrote prolifically, producing more than 500 treatises on a wide variety of subjects. Also interested in pharmacology, Galen compounded many prescriptions, one of which is still used today: cold cream. Like Hippocrates before him, Galen employed a scientific approach to medicine, divorcing it from religion and superstition. Through his writings, he continued to influence medicine for more than 1,500 years (Wain, 1970).

The Middle Ages

With the fall of Rome, most medical knowledge and writings were lost. Medicine ceased to be a science. Physicians did not practice, and the profession itself disappeared. Schools of medicine closed, not to re-open for 400 years (Wain, 1970).

Solerno, Italy is credited with starting the first medical school following the fall of Rome, somewhere around 900 A. D. Unfortunately, the events which led to this educational breakthrough have been lost in the mists of time. Fragmentary Latin translations of Hippocrates's work were used as building blocks, with Arabic and Jewish treatments incorporated later.

As Solerno's reputation grew, patients flocked to it from all over Europe. The Crusades brought a constant flow of famous patients, most notable of whom was Robert, Duke of Normandy, the son of William the Conqueror, and heir apparent to the throne of England (Wain, 1970).

Concerned for his health, the physicians of Solerno wrote for Robert what might be considered the first persuasive "wellness" book. Known as the *Regimen Sanitatis Salernitum*, it contained 362 verses with specific healthy living tips, such as, "A King that cannot rule him his diet, Will hardly rule his Realm in piece and quiet" and, "Drink not much wine sup light and soon arise" (cited in Wain, 1970, p. 45).

Presented in easy jingles and rhymes, which were accessible to the common people,

the *Regimen* swept across Europe, becoming the most popular and widely read volume next to the Bible. Originally copied by hand, Gutenburg selected it as one of the first books he printed in the 1500s. Over the centuries it was translated into all major European languages, and physicians continued to add thousands of verses (Wain, 1970).

With the invention of the printing press, popular health books and almanacs flooded medieval Europe. Following the *Regimen's* style, they contained many practical suggestions for a healthy life and, at the close of the Middle Ages, led to the first "wellness craze." Contrary to popular opinion, the health education movement is hardly a 20th century phenomenon. Instead, its roots can be traced back more than 400 years to a Solernan physician who, steeped in the Hippocratic tradition, recognized the connection between persuasion, lifestyle, and health (Wain, 1970).

The Renaissance

The Renaissance opened medicine's eyes even more fully to the learning of antiquity and changed the criteria for true medical knowledge. Called the "Luther of the physicians," Paracelsus advocated gaining information from the real world, not from books (Temkin, 1977). Human anatomy was studied scientifically for the first time, through the dissection of cadavers (Wain, 1970). Many errors, perpetuated for 1,500 years in Galen's writings (which were based on pig dissections) were corrected. Medical knowledge became accessible even to the lay public, through the graphic anatomical pictures of such artists as Michaelangelo, da Vinci, and Vesalius.

Applying these new findings to surgery, Pare made dramatic improvements in vascular techniques, and achieved several remarkable "saves" through his insistence on cleanliness and non-interference with the body's natural healing processes. However, upon being congratulated on one of these miraculous cures, Pare, contrary to the Hippocratic tradition, is reported to have said, "I dressed him and God healed him" (cited in Wain, *1970, p. 82*).

Cartesian philosophy overthrew the notion of a natural soul in the liver which regulated appetite, and a vital soul in the heart which accounted for emotions such as anger and wrath. As a result, the rational soul was the only soul remaining, eliminating the possibility of psychological causes for either physical or mental disease. Taking this one step further, Descartes compared the human body to the mechanical robots in the royal garden of Louis XIII, and saw medicine as the prime beneficiary of the new science (Bloomfield & Kory, 1978). The era ended with a paradigm which viewed the division between body, soul, and mind, as complete and denied the existence of a relationship between lifestyle and health.

The Enlightenment and the Industrial Revolution

The bright vision of a world where scientific medicine cured the body, without concern for the negative influences of behavior, held great appeal. It was almost the antithesis of early Christianity's belief that sin led to illness. But there were discordant voices, pointing to facts which did not conveniently fit into this picture.

In the early 1700s Cheyne, also known as the Corpulent Physician of Bath, undertook a personal weight reduction program using a vegetarian diet. In his book on the subject he proclaimed, "It is easier to preserve than recover Health, to prevent than to cure Diseases" (1979, p. xxi). His writings went through many reprints in his own time and were quoted by Franklin in Poor Richard's Almanac, itself a widely read American classic.

The effects of alcohol on health were also recognized. Writing on the subject in his Inquiry into the Effects of Ardent Spirits upon the Humon Body and Mind, Rush proclaimed drunkenness as a disease and chronicled the miserable existence of those who chose this path (cited in Temkin, 1977).

The relationship between hygiene, disease, and the environment was also systematically described for the first time. In 1839, epidemics had become so rampant in the urban areas of England that a Royal Commission was formed to examine *the problem. Its*

report documented the correlation between illness and the factory workers' housing, which was greatly overcrowded and without even basic sanitary facilities. Because of this investigation, the connection between disease, poverty, and sanitation was established. Perhaps even more important was the recognition that physical and social environments directly impact health. The Royal Commission's findings led to changes in housing regulations and health care measures which were so far-reaching that they came to be termed the "great public health revolution" (Wilcocks, 1965).

In the second half of the 19th century Holmes extended this concept further by greatly expanding the physician's role. He placed his faith in the prevention and treatment of disease through wholesome physical, mental, and social conditions, rather than scientific miracles. Improving individual health also meant improving the environment through social and political action (Temkin, 1977). Holmes advocated a leadership role for physicians in this emerging field.

On this side of the Atlantic the "great public health revolution" also emphasized environmental improvements, but added health education as a key strategy. Teaching by example, Addams, founder of Chicago's Hull House Settlement, swept the slum streets to demonstrate the importance of good housekeeping in an industrial city. In New York City, Wald, nurse and founder of the Henry Street Settlement, focused on preventing the ghetto's horrifying illnesses, using health education as her major tool. Her efforts resulted in the hiring of the city's first public health nurses in 1902 (Fee & Greene, 1989).

Just six years later, Baker, working in the public health department, recognized New York's phenomenal infant mortality rate as a problem susceptible to health education. With the aid of public health nurses, she was able to significantly improve newborn survival by educating parents on basic principles of diet, sanitation, and activity (Fee & Greene, 1989).

The 20th Century

All the medical progress made over the ages pales in comparison to the discoveries of our own era, the 20th century. From antibiotics to cures for cancer, from immunizations to Computerized Axial Tomography (CAT) exams, from laser surgery to intensive care units, the list of medical wonders goes on and on. Temkin (1977) has proclaimed this the age of "curative confidence." Infectious diseases, common just a hundred years ago, have been almost vanquished (Milio, 1976; Wilcocks, 1965), and life expectancy has increased greatly (Bezold, 1989). Some experts believe the normal human lifespan may be 85 to 100 years old (Fries & Crapo, 1980).

Yet this is not an era of trust or content with our health care system; in fact there is mounting tension worldwide (Sullivan, 1992; Tabor, 1988). Personal feelings of confidence about a long and healthy life have been replaced by a constant sense of risk, a foreboding that illness can strike at any time (Brownell, 1991).

Chronic, lifestyle-related diseases have taken the place of infectious disease as the leading causes of death. Lifestyle decisions now account for as much as 50% of the mortality from the United States' top ten causes of death (Hamburg, Elliot, & Parron, 1982).

Just as medical science appeared to enter the age of "curative confidence," relying solely on technology and drugs to vanquish disease, the pendulum began to swing away from such a narrow solution, toward a more integrated view of body, mind, and spirit. Although this argument has gone on since the beginning of recorded time, the change of mortality patterns in the 20th century has crystallized the debate.

The Wellness Movement

Many names have been given to this new philosophy of health, including "holistic," "wellness," and "high level wellness," to name just a few. Smuts, writing in 1926 in Holism and Evolution, is credited with introducing the concept of "holism" as an antidote to his era's

excessive scientific analysis. Looking at the whole instead of the pieces, he viewed organisms and systems as being both greater than and fundamentally different from the sum of their parts (cited in Gordon, 1980).

More than 35 years ago Dubos (1959) accurately predicted what health care would look like in the latter half of the century. His aptly titled book, Mirage of Health, foresaw no more "magic bullets" to cure cancer or eliminate heart disease for the peoples of the First World. Instead, he believed mankind must recognize the need to adapt and change to an ever-changing environment.

The concept of wellness entered the public arena in the early 1960s with the introduction of a relatively short book, High Level Wellness, by Dunn (1961). The book contained transcripts of 29 lectures delivered in a Unitarian Church in the Washington , D.C. area. Although not an instant best-seller, it slowly captured the imagination of many people around the country, leading eventually to the "wellness craze" (Ardell, 1985). Stating his philosophy simply, yet with great depth and insight, Dunn insisted on the importance of seeing "the individual as a total personality . . . as a continuum of body and mind and spirit, which is functioning within an ever-changing environment and flow of events" (p. 10). Speaking with the authority of a physician, Dunn stressed the importance of prevention, "Patching up is no longer sufficient" (p. 7).

Although a visit today to a bookstore reveals hundreds of "wellness" titles on the shelf, three authors, coming from very different perspectives, yet saying much the same thing, are important to mention. Better known as winner of the Nobel Peace Prize and architect of the Indian national liberation movement, Gandhi also developed a philosophy of health. Published posthumously in 1965, his book, The Health Guide, scorned the organized medical profession and called for "healers of souls rather than of bodies" (p. 7). He found:

> The relation between the body and the mind (to be) so intimate that, if either of them got out of order, the whole system would suffer. Only that man can be said

to be really healthy, who has a sound mind in a sound body (p. 16).

The connection between personal autonomy and health was Illich's theme in Medical Nemesis (1976). Expressing his profound opposition to the modern medical establishment, Illich claimed the healing professions were in fact a major threat to health. He described the institutionalization of health as an appropriation of the people's cultural competence in dealing with these issues. Calling for a reduction in professional intervention, Illich asserted the level of public health would directly correspond to people's ability to manage their own illnesses, suffering, and death autonomously.

Crossing more directly into the domain of popular literature, Mind as Healer, Mind as Slayer became a national bestseller in the 1970's. Citing the impact of the modern environment on health, Pelletier (1977) reported stress-related psychological and physiological disorders were the number one social and health problems of the decade. Drawing from Illich, he asserted that health care was a matter of personal responsibility, and the individual must learn to recognize both applications and limitations. Like Dubos, Pelletier found that "advances in the material sciences and technology have failed to bring the panacea they promised. Creating an effective holistic approach to health care is central . . . to an improved quality of life" (p. 302).

Further refining the definition of "holistic," Gordon (1980) moved the changing paradigm from the fields of philosophy and popular culture back toward the medical arena. Thinking through the implications of the "wellness craze," he identified 17 principles of holistic medicine, the first of which states "Holistic medicine addresses itself to the physical, mental, and spiritual aspects of those who come for care" (p. 16). Succeeding principles stress individual responsibility and autonomy, focusing on "education and self-care rather than treatment and dependence" (p. 19).

Four Models of Health

Attempting to give greater clarity and definition to the changing paradigm, Smith (1981), a nurse, synthesized the ideas of many philosophers to create four models of health. Drawing from the works of Aristotle, Plato, and Maslow, her eudaemonistic model extended the concept of health to general well-being and self-realization. On a continuum, exuberant well-being fell at one end, whereas illness, its opposite, was seen as a state which potentially prevented self-actualization.

Smith's (1981) adaptive model found its origins in the work of Dubos. Health was defined as the condition in which an organism engaged in effective interaction (adaptation) with its physical and social environment.

The role-performance model was based on the common-sense criterion that adequate role fulfillment was itself a measure of health. Its origins can be traced to the field of medical sociology. Smith (1981) criticized this design both for its failure to address major functions previously identified and for inconsistencies: A person might be physically ill but still able to fulfill key obligations.

Finally, Smith (1981) defined traditional health care, which concentrates on the elimination of pain and other symptoms, as the clinical model. She found this concept also wanting due to its lack of a description for optimum functioning.

Critical Social Theory

The wellness movement has emphasized decision making and responsibility, empowering the individual as captain of his ship, master of his fate. However, this singular emphasis has not been universally supported. Critical social theory considers personal actions within the context of larger environmental forces, including social, economic, and political conditions (Butterfield, 1990; Stevens & Hall, 1992).

Pointing beyond man, critical theory redirects the burden of responsibility to society.

Changes in society's health are best understood "by studying the historical development of unsafe physical surroundings, oppressive social arrangements, economic inequities, and political disenfranchisement" (Stevens & Hall, 1992, p. 4).

Society is the basic structure for changes proposed by critical social theorists (Stevens & Hall, 1992). Criticism of health-damaging environments begins the process of liberation, which leads both individuals and groups toward a greater understanding of their own positions and the outside interests served. Social action follows. Coming from within the community itself, change is based on shared interests, knowledge, and goals, as well as the acceptance of possible risks. The power of the community is mobilized through the liberation process, creating the social conditions necessary for health.

Critical social theory has had special relevance for liberation movements, including those struggling against colonization, racism, the exploitation of women, and poverty. Freire and Illich have employed its precepts in the field of education. Application in health care is also widespread. For instance, grass-roots organizations which are sustained by community support include the United Way, volunteer Emergency Medical Services squads (providing more than 90% of scene responses in Alaska), Mothers Against Drunk Drivers (MADD), and the National SAFE KIDs Campaign, to name just a few.

A Framework for Prevention

Echoing critical social theory, Milio (1976) offered a framework for integrating concepts from a variety of disciplines into six principles for evaluating and planning prevention strategies.

1. The availability of health-sustaining resources, either in excess or scarcity, affects the health status of populations. Resources were categorized as either seminal (e.g., food), or synergistic (e.g., health services, education). For instance, scarcity in the Third World has led to starvation and epidemics, whereas the First World's abundance has produced conditions

such as obesity, alcoholism, injury-related deaths, and pollution.

2. Whole populations develop habitual patterns of behavior based on the limited choices available in the environment. These habits are caused by the: (a) options available (actual or perceived), and (b) beliefs and expectations developed over time through experience, education, and socialization. Health education has the opportunity to influence these habitual behavior patterns.

3. Policy decisions by government and business define the options available to individuals. For example, federal policies on tobacco products include taxation, agricultural subsidies, advertising constraints, and import-export restrictions. These affect, in sometimes conflicting ways, the consumption of cigarettes, which in turn impacts morbidity and mortality from lung and heart disease.

4. Individuals make choices based on both their personal and societal resources. Included in the personal resource category are knowledge, beliefs, family and peer influence, available money and time, access, and the urgency of other priorities. Societal resources include such factors as the availability of health care and related human services, alternatives, and the potential penalties or rewards for a particular decision.

5. Broad changes in the health behavior of a population are the result of many individual choices. For this to happen, health-promoting options must be both more available and more attractive than health-damaging options.

6. Health education will have little impact on changing behavior unless health-promoting options are readily available. For this reason, health education's traditional focus on information and motivation must be combined with expanded choices for healthy living.

Education strategies suggested by this framework emphasize increased access, especially to options controlled or directed by government and business. Therefore, health-related behavior change becomes possible only through the combined availability of both enhanced choices and health education.

Theories of Autonomy

Health care providers began to share power with patients for the first time in the 20th century. However, political systems, and the philosophies which inspire them, have been advancing in this direction for several hundred years. The perspectives of two leading theorists, both strong advocates for the rights of the individual, are important to consider because the concept of individual autonomy is central to the wellness movement.

Kant (trans. 1976) argued in The Metaphysic of Morals that every rational being is a self-determining agent, capable of making "universal law" (p. 94). He believed people should never be treated as a means toward an objective, but instead as an end in themselves. Seeing individual autonomy as a necessary condition for morality, he also linked this construct to respect for the individual.

Mill (1989), a Utilitarian philosopher, argued that the sole end for which mankind is justified, individually or collectively, in interfering with the liberty of any other, is self-protection. "Over himself, over his own body and mind, the individual is sovereign" (p. 13). However, Mill saw some justification for invading an individual's liberty to prevent a crime or an accident, when there was a certainty of injury. Often quoted by groups wishing to escape public health statutes, the latter reference indicates a more complete reading of Mill is in order.

Summary

The nature of the relationship between body, mind, spirit, environment, lifestyle, and health is a question which has been debated since the beginning of recorded time. Corollary issues are the role of the physician-healer in repairing and fostering health, the role of the patient in promoting his or her own well-being, and the link between knowledge and healthy lifestyle choices.

Ancient civilizations, including both the Hebrews and the Greeks, recognized the interplay between these factors. Concentrating on environmental and lifestyle influences, the

Hebrews created the world's first hygienic code, giving it the force of divine revelation and earthly sanctions. The Greeks also linked health with religion through the mythical deity, Asclepius, God of Medicine. In temples devoted to his worship, physician-priests treated the body through the spirit with therapies such as diet, rest, exercise, massage, baths, and heliotherapy.

The Hippocratic tradition, rejecting the cult of Asclepius, directed the physician's attention to the body alone, deferring care of the mind and soul to philosophers and priests. The physical realm was seen as the sole source of disease, and also the only system requiring therapy to effect a cure. Handed down through the millennia, the Hippocratic tradition has been reinforced by the medical science revolution of the last 250 years which has promoted solely technology and pharmacology as the basis for the total treatment plan.

Arguments from several sources have countered this position, playing a role in changing the 20th century health care paradigm from clinical to holistic health. In the Middle Ages Christians believed God's hand played an important part in creating ill health, either as a punishment for sins or as an avenue through suffering to redemption. The public health movement of the 1700s and 1800s brought recognition that the environment, and societal and political decisions, can impact lifestyle, which in turn directly influences health.

Beginning in the early part of the 20th century, philosophers and scientists alike began to call for a more holistic view of the interrelationships between the environment, the body, mind, and spirit, and their combined effect on health. Changes in the causes of morbidity and mortality have led to an increasingly elderly population beset by chronic diseases related to lifestyle decisions. "Patients," who have been treated in a paternalistic fashion by health care providers through the centuries, have become articulate, educated "consumers" who demand both information and control of the medical decisions affecting their lives. Theories of health and the role of the physician have changed in recognition of the focus on "high-level wellness," a concept which emphasizes lifestyle modification through education.

Although not dismissing the importance of personal responsibility, some 20th century thinkers have focused their attention on the environment's influence. Seeing every decision within the context of social, economic, and political forces, critical social theorists have identified health-damaging systems as the primary source of illness. Seen in this light, health promotion becomes a political process. Their emphasis on community liberation through knowledge remains consistent with the wellness movement's vision of individuals empowered through health education.

Regardless of theoretical orientation, health activists agree that the 20th century presents both unparalleled opportunities for wellness, and equally challenging barriers to its achievement. Although some groups emphasize changing the environment and others focus on lifestyle, most agree the days of medical miracles which will dramatically extend the length and quality of life are over. For centuries the medical professions have appeared to control health, directing both public policy and individual therapy. Now the pendulum is swinging, moving power back to autonomous individuals. The question remains, what strategies are effective in persuading each of us to make the right decisions and take the right steps to promote our own health?

Theories of Health Behavior

Planners make canals,
Archers shoot arrows,
Craftsmen fashion woodwork
The wise man molds himself.

Buddha

The 20th century is an age of opportunity. From the trivial to the sublime, from buying ice cream to selecting a mate, unheard-of options are open at every turn. The decision to stay healthy is perhaps the most important choice of all. In this age of technological miracles, life has been extended as never before. However, even medicine has its limits. Wise lifestyle

decisions, not "magic bullets," are the answer to preventing many chronic diseases, now the leading causes of death.

As modern medicine has become more widely available in the past 40 years, questions have arisen about why the full array of services is seldom used. An inconsistency appears to exist between what is obviously "good" for an individual, and the choices made. The result of such behavior is apparent in the statistics, which report that 50% of the morbidity from the ten leading causes of death can be attributed to lifestyle choices (Hamburg, Elliot, & Parron, 1982). Drawing from the fields of medicine, psychology, social psychology, and sociology, various theories have been advanced to explain this apparently illogical behavior.

Health Belief Model

As the oldest theory of health behavior, the Health Belief Model (HBM) is also the one most widely reported in the literature. Originally developed by public health physicians and social psychologists, the model was created in response to low utilization of free disease screening services (Rosenstock, 1974).

Variables were drawn from the social psychology theories of Lewin (Rosenstock, 1966). Faced with alternatives, an individual will choose the route with probable success, even though the reward is less valuable. Lewin theorized that most behavior depends on two factors: (a) how much the individual values the outcome, and (b) how probable the individual feels the outcome will be (Rosenstock, 1960).

The Health Belief Model assumes that decisions are made based on the individual's subjective reality rather than the objective environment (Rosenstock, 1974). Cues to action, alerting an individual to feelings, are necessary to activate the process. Conscious decisions are therefore seen as fundamental to health behavior (Maiman & Becker, 1974). The likelihood that a person will take action relative to a health condition is determined by the individual's perceptions of: (a) susceptibility to the health condition, (b) the *severity of the*

consequences of contracting the condition, (c) the benefits of medical actions which may reduce either susceptibility or the severity of the disease, and (d) the barriers to taking action.

Numerous articles and dissertations have been produced in the past 40 years based on the Health Belief Model. In 1984, an analysis of 29 HBM studies found barriers to taking action as the most significant dimension of the model. Susceptibility and benefits were also consistently predictive. Severity, however, achieved significance in only about 50% of the studies (Janz & Becker, 1984).

Commenting on the implications of the research, the authors reported that: (a) some behaviors, such as seat-belt use or helmet wearing, are based in habit rather than a conscious decision, (b) many health-related behaviors, such as dieting, are undertaken for non-health-related reasons, and (c) economic or environmental forces (such as lack of local retail availability or the price of an ATV helmet) may prevent an individual from engaging in a preferred course of action. They also reiterated the importance of "cues to action," and the underlying assumption that health is a highly valued goal. When these conditions are not met, the Health Belief Model is unlikely to be relevant.

Reflecting on the outpouring of survey research, Janz and Becker (1984) deplored the scarcity of experimental designs. Focusing on the ultimate purpose of the model—behavior change—they emphasized the importance of testing various health interventions aimed at changing individual perceptions identified by the Health Belief Model.

Because the Health Belief Model itself does not propose strategies for health-related behavior change, Becker and Maiman (1980) offered the suggestions below for interventions based on their comprehensive review of the literature. They recommended using these techniques in combination with a focus on the four HBM dimensions.

1. Improve knowledge through discussion, re-inforcement, and written information.
2. Whenever possible, make the proposed change simple, easy, and inexpensive.
3. Find out how clients have handled similar situations in the past, and what they

believe about it. As feasible, work to alter perceptions which interfere with the behavior clients have to change.

4. Improve the client's satisfaction with the health care situation, especially the provider-client relationship.

5. Continue to monitor compliance.

6. Increase the awareness of staff of the influential role they play.

7. Use contracts and incentives.

8. Maintain provider continuity.

9. Involve the social support network.

10. Involve all members of the health care team by assigning them specific roles directed toward promoting the behavior change.

Over the years there have been several modifications to the original theory, including measurement of sick role behavior (Becker, Drachman, & Kirscht, 1974), the addition of the concepts of self-efficacy (Rosenstock, Strecher, & Becker, 1988) and general health motivation (Maiman, Becker, Kirscht, Haefner, & Drachman, 1977), and the development of the Injury Belief Model (Peterson, Farmer, & Kashani, 1990), to name just a few. Although researchers continue to favor surveys, other theories, such as the Health Locus of Control, are now commonly tested in combination with the Health Belief Model. Despite the lack of experimental data, the Health Belief Model remains a valuable predictor and important tool for understanding health-related behaviors.

The Epidemiological Model for Health Action

Coming from a public health background, Suchman (1966, 1967) adapted the classic epidemiological model of host, environment, and agent. Expressing frustration with the controversies raging in sociology and psychology over the motivation for health behaviors, Suchman suggested public health scientists would best be served by a "*back to basics*"

approach.

His model identified three main factors in evaluating an individual's attitudes and behavior. Tendencies of the host, such as recognition of the seriousness of the problem, acceptance of personal vulnerability, motivation and ability to act, and knowledge of the desired action represent personal readiness factors. Environmental influences, or social control factors, exert pressure through interpersonal contact and societal norms. And last, situational factors, or attributes of the agent, may include the potential for pleasure, required effort, experience, and attractiveness, to name just a few.

Using these criteria, the epidemiological model sought to change behavior in order to: (a) decrease the exposure and susceptibility of the host, (b) increase supportive forces in the social environment which could help the individual both avoid unhealthy acts and take advantage of health-promoting measures, and (c) decrease the impact of the illness or injury.

In this author's experience, the epidemiological model is the most commonly used construct in public health today. Although Suchman (1966, 1967) is not widely quoted, the frustration he shared, as well as the back to basics approach he espoused, appears to be widespread, and continues to contribute to the separation between many public health practices and the application of psychological theories.

The Health Services Utilization Model

Coming from a systems and health care planning perspective, Anderson and Newman (1973) created a model to assist in the evaluation of health care utilization. Incorporating the ideas of Suchman and Rosenstock, it identifies variables related to the availability and accessibility of health care, and key factors which affect an individual's use of services by type, purpose, and unit of analysis. These include: (a) societal determinants—both technology and community norms, (b) health systems services—resources and organization, and (c) individual determinants—predisposing factors, enabling factors, and health status (multiple elements for

each of these major categories).

Anderson and Newman (1973) separated discretionary use of health care from non-discretionary, and suggested the more optional the behavior, the more significant the predisposing and enabling components were in explaining personal decisions. This model provides useful constructs for development and analysis of governmental health care plans. However, the identified individual determinants contain 28 itemized points, making testing difficult. Not widely referenced, the model is of interest because of its systems perspective.

Theory of Reasoned Action

Also known as the theory of behavioral intention, Ajzen and Fishbein's model, or simply Fishbein's model (Ajzen & Fishbein, 1973; Ajzen & Madden, 1986), the Theory of Reasoned Action is one of the most widely used and most frequently cited constructs in the literature, perhaps in part because of its elegant simplicity, especially compared to other models. The theory assumes that the immediate and sole determinant of behavior is the intention to perform it. Factors which affect intention are the individual's attitude toward performing the behavior, and the influence of significant others.

Attitudes toward behavior, called behavioral beliefs, are impacted by perceptions of the consequences of carrying them out. Normative beliefs, the second element influencing intention, are determined by perceived expectations of important groups or individuals.

Actions are taken because the individual believes such behavior will lead to consequences more beneficial than harmful and/or because of the perception that significant others favor adoption of that behavior. The theory is most appropriate for predicting single or first-time events when intention is closely connected in time to behavior (Charng, Piliavin, & Callero, 1988).

In 1986 a third component was added: perceived behavioral control. This concept takes into account the continuum of control an individual perceives over *his or her actions*.

With this change, the model came to be known as the Theory of Planned Behavior.

Like the Health Belief Model, the Theory of Reasoned Action is best able to predict consciously controlled, non-repetitive actions. Acknowledging that some health behaviors might not be accounted for by their theory, Fishbein and Ajzen (1975) wrote,

> Although a person may intend to do one thing, by 'force of habit' he may do something else . . . many well-learned skills are performed almost automatically without much conscious effort. (p. 371)

The relationship of habit to both intention and behavior therefore becomes an important consideration in evaluating the usefulness of this theory, especially since many injury prevention activities are habits formed in earliest childhood, such as the use of seat belts or an ATV helmet.

A seven-month study of blood donors leant support to Ajzen and Fishbein's concern regarding the model's application to habitual behavior. Adding measures for identity, social relations, and past behavior to the Fishbein-Ajzen model, Charng et al. (1988) found that habit and behavioral intention operate independently of one another. Behavioral intention was affected by attitude, social norms and relations, and role identity. Habit did not influence intentions. After five episodes, habit (past donations) emerged as a significant predictor of behavior (future donations), as well as intention. The authors concluded that once a habit is formed, the continuation of that behavior is not entirely the result of conscious processes. In other words, habit directly impacts behavior and may even override intentions.

Based on a study of voting, Granberg and Holmberg (1990) suggested additions to the model. They found that prior behavior and self-identity affected future behavior, both directly and indirectly, through intention. Although they discovered that party affiliation (self-identity) was a stronger predictor of voting tendency than intention, they postulated the strength of the variables might differ in other contexts.

In summary, the Theory of Reasoned Action continues to enjoy wide use and extensive reporting. Intention has repeatedly been shown to be a strong predictor of behavior, especially when the action is non-repetitive and closely linked in time. However, the theory is of less value in measuring consistent behavior (habit) over longer periods of time, and several researchers have proposed modifications to account for prior actions, role identity, and social relations. Charng et al. (1988) have postulated that habit and intent operate independently, implying habitual behavior may continue despite motivation to the contrary, and that stated purposes may not take into account the individual's habitual preferences.

As seen with the Health Belief Model, research using this theory continues to consist almost exclusively of surveys, with few, if any, experimental designs reported. No specific strategies are suggested by this construct, and a researcher would be challenged to further develop an experimental method for testing it in the health education arena.

The Health Promotion Model

In developing this design, Pender (1975) drew variables from a variety of sources: the Health Belief Model, Rotter's Social Learning Theory, including its modification for health, the Health Locus of Control, and Bandura's Social Cognitive Theory of Self-Efficacy. Synthesizing these, she identified two stages of preventive health behavior: decision-making, and action.

She further divided decision-making into three main determinants: personal, interpersonal, and situational. Personal factors included the importance of health and perceptions of vulnerability, the value of early detection, the efficacy of action, and the perceived level of internal versus external control. Examples of interpersonal determinants are the concern of significant others, family patterns of utilization, friends' expectations, and information from professionals. Cultural acceptance of health behaviors, societal group norms and pressures, and information from nonpersonal sources are all situational determinants.

Once an individual has decided to engage in preventive behavior, a cue to action is

needed. This can be internal or external. Personal experience with recent illness (within the previous year) may also act as a cue, even in areas unrelated to the original disease. The individual's readiness determines the intensity of the cue required. Barriers to action, such as price, inconvenience, and pain may also come into play here.

In 1986 Pender and Pender expanded the initial model with the development of the "Health-Promoting Lifestyle Profile", a 100-item self-report tool, and began using it in conjunction with the Multidimensional Health Locus of Control Scales and Laffrey's Health Conception Scale (based on Smith's 1981 philosophical inquiry). Cited most often in the nursing literature, Pender's model provides a sophisticated approach to understanding health behaviors. However, its research application may be limited due to its complexity.

Health Locus of Control

Originally developed by Wallston, Wallston, and DeVellis (1978), the Health Locus of Control is based on Rotter's Social Learning Theory, using its construct of locus of control, internal versus external. The model was created in response to the emerging holistic health movement's emphasis on patient responsibility. It was hoped the new formulation would increase the predictability of Locus of Control (LOC) in health-related situations. The authors theorized that people with an "internal" LOC orientation believed and acted as if their health outcomes were contingent upon their own actions.

The Health Locus of Control model proposed that people engage in health-related behaviors when: (a) they value health (HV), and (b) they believe their actions will lead to health (HLC). The second concept is usually measured along three dimensions: (a) belief in self-control over health, (b) belief in provider control over health, and (c) belief in chance health outcomes. Overarching the theoretical development has been the hypothesis that people with a high internal locus of control will, given the opportunity, seek out more health information and be more active in their own health care than people with an external locus of health. Given this

concept it follows that "high internals" will in the long run be healthier than "externals" (Wallston, Maides, & Wallston, 1976).

Several instruments have been developed to measure the Multidimensional Health Locus of Control. Forms A and B, created by Wallston et al. (1978) employ a Likert scale to evaluate three dimensions: the degree to which individuals believe health outcomes are under the control of self (IHLC), chance (CHLC), or powerful others (PHLC). A third tool, developed by Lau and Ware (1981), has been criticized for both poor construct validity and reliability across populations (Marshall, Collins, & Crooks, 1990).

Despite numerous publications by two dedicated teams of researchers, the Health Locus of Control has not been without its problems and detractors. In 1992 Wallston, one of the theory's original authors, reported that his own studies, as well as those of several other researchers, had demonstrated only a 10% variance in the behavioral measure. Based on these disappointing findings, he proposed theory modifications, substituting "perceived control" or "health competence" for "locus of control."

Other researchers have conjectured that the Health Locus of Control is foundering due to its lack of ability to evaluate situation-specific expectations, and its failure to keep pace with recent theoretical developments (Strickland, 1989). Although current tools measure multiple dimensions of external control over health (e.g. control by powerful others versus chance), internal locus of control continues to be conceived of as undifferentiated. Marshall (1991) proposed four distinct modifications to the internal control concept: self-mastery, illness prevention, illness management, and self-blame.

Antonovsky (1992) suggested the addition of a fourth scale, benevolent powerful (BP) others. Focusing on the impact of health care providers and the social network, this variable attempts to account for the patient's belief in caregivers, significant friends, and family members. Antonovsky has conceptualized this in two tiers: BP beliefs which place the patient in a permanent dependent role, and those which allow room for growth, responsibility, and

choice.

Reviewing a decade of research, Oberle (1991) reported that the Health Locus of Control had been found to be only a weak predictor of health behaviors. Its value diminishes even further in comparison to other constructs such as the Health Belief Model, or when demographic factors such as education, are considered. Oberle also found that the value of the Locus of Control concept was questionable in familiar contexts. Although it is important in new or ambiguous situations (Rotter, 1975), experience (habit) is more likely to guide repetitive behavior. Another concern is the importance of both reinforcement and the situation to behavior (Rotter), and the lack of consideration for these factors in the research (Oberle).

Not entirely pessimistic about the potential significance of the Health Locus of Control, Oberle (1991) ended her review with a recommendation for continued study. However, echoing comments about research based on the Health Belief Model and the Theory of Reasoned Action, she decried the plethora of survey data, calling instead for "not more of the same . . . (but for) experimental and quasi-experimental studies, in which teaching programmes are tailored to locus of control and the outcomes evaluated" (p. 805). An understanding of the long-term effects of health education on both behavior and individual control orientation is essential for the Health Locus of Control to have meaning in the clinical setting.

In summary, although the Health Locus of Control received widespread attention when it was first presented in the late 1970s through its intuitive appeal to the holistic health movement, it has come under increasing attack based on lackluster research results. Criticisms of the Health Locus of Control have centered on: (a) failure to consider two important aspects of Rotter's original Social Learning Theory, specifically the value of reinforcement and the psychological situation, (b) unidimensionality of the internal locus of control concept, (c) reliability and validity of at least one measurement tool, (d) inability to measure situation-specific expectations, (e) inappropriateness to familiar situations where

habit more than conscious decisions may guide behavior, and (f) lack of consideration for the impact of benevolent powerful others—both health care providers and the social network. The Health Locus of Control theory now seems to be at a crossroads. It must either be adapted in a way which improves its theoretical performance and clinical application, or be relegated to the historical sidelines as a theory which had its day, but failed to survive the rigorous scrutiny of the scientific community.

Hardiness

The universe is change
Our life is what our thoughts make it.

Marcus Aurelius

Drawing from the work of existential philosophers, Kobasa (1979) created the concept of hardiness to portray a personality type which stays healthy despite high levels of stress. Existentialists have searched for ways to describe individual success in an environment which is forever changing and, as a result, constantly stressful. For them, life's ultimate goal has become the continual pursuit of personal meaning through decision making and action (Bigbee, 1985). Self-reflection and self-discipline have therefore been recognized as essential to meeting life's challenges. Within the context of a strenuous life, striving, hard work, and competence have all acquired positive connotations (Lambert & Lambert, 1987).

Kobasa (1979) identified control, commitment, and challenge as the three dimensions of hardiness which buffer the response to stress. Those who feel in control, who are committed to various activities, and who view change as a challenge were postulated to stay healthier than individuals whose responses fell at the opposite end of each spectrum. Control, which was viewed as multidimensional, included (a) decisional control over various courses of action, (b) cognitive control over incorporation of stressful events into an ongoing life plan, and (c) coping skills, as demonstrated through a high standard of personal achievement.

A tool to measure hardy personalities was developed primarily through the

combination of existing standardized instruments (Kobasa, 1979). Field tests conducted by Kobasa and her co-authors have focused on predominantly male populations whose workplaces were considered to be high-stress: attorneys, telephone company executives, and army officers (Lambert & Lambert, 1987).

Kobasa (1979, 1982) reported that all three dimensions were supported as conceptualized. Subsequent studies by other researchers have expanded to look at the health status of rural adults (Lee, 1991), burnout in critical care nurses (Topf, 1989), and rheumatoid arthritis patients (Okun, Zautra, & Robinson, 1988), to name just a few. These studies have yielded mixed results.

As with other theories, hardiness is not without its critics. Based on a comprehensive analysis of hardiness research some authors (Funk, 1992; Hull, Van Treuren, & Virnelli, 1987) have challenged the very concept, claiming it is not a theory at all, but rather an unscientific combination of component parts. Condemning the instrument's development as "convenient, simple and familiar" (p. 343), and the published research reports as containing statistical and procedural errors, Funk denounced hardiness, declaring it to be without "compelling scientific reason" (p. 344).

In summary, although hardiness offers an attractive vision of the attributes necessary to survive and even flourish in our stress-filled age, it appears to be in the infancy of its development. Among the criticisms have been: (a) lack of operationalized terms, (b) invalid, unreliable instruments and, (c) research results encumbered by methodological and analytical errors. Some authors have optimistically suggested its application to health education (Lindsey & Hills, 1992; Okun et al., 1988), but experimental designs are not found in the literature. As with other health behavior theories, the connection between academic research and clinical application has yet to be established.

The Interaction Model of Client Behavior

Coming from a nursing and holistic health care perspective, Cox (1982) proposed a complex, multistage model with 16 major elements and multiple feedback loops. Writing in defense of her theory, Cox asserted that it integrated key elements from a variety of disciplines rather than limiting itself to just one or two, such as psychological or sociological perspectives. She also claimed it moved the focus of the health care interaction away from disease and a passive role for the patient toward health promotion and an interactive, independent "client" relationship. Finally, she believed her model provided a means for evaluating the health professional's effect on client health behavior.

Cox (1982) identified three major components of the interaction model:

1. Client Singularity—background variables, intrinsic motivation, cognitive appraisal, and affective response;

2. Client-Professional Interaction—affective support, health information, decisional control, and professional/technical competencies;

3. Health Outcome—utilization of health care services, clinical health status indicators, severity of health care problem, adherence to the recommended care regimen, and satisfaction.

Writing in a later research article in defense of the complexity of her model, Cox (1986) acknowledged its "sobering wealth of information" (p. 55). However, she continued to support her strategy of identifying an array of factors which accurately reflect the multifaceted reality of health care behavior.

Denial

Although denial has not been developed into a theoretical model, it is nevertheless a potent factor and common theme in health care. Forchuk and Westwell (1987) synthesized several important theories to provide a framework for understanding denial.

Dorpat (1983) described denial as a cognitive arrest process, reducing it to four phases: (a) preconscious appraisal of the danger or trauma, (b) painful effects in which defensive action is initiated, (c) cognitive arrest in which painful information is actively excluded from conscious awareness, and (d) screen behavior in which an individual actively develops a "cover story" via fantasy, ideas, affects, or overt behaviors.

Lazarus and Folkman (1984) described denial as an emotion-based strategy for coping with stress. It may be employed when circumstances are beyond a person's control, and relating to the world primarily through feelings becomes appropriate. However, it should not prevent adaptive behavior.

Denial can also be viewed within a framework of cognitive dissonance (Festinger, 1957). Cognition is defined as a belief or opinion about the environment. Dissonance occurs when there are inconsistencies or conflicts among an individual's ideas. It can be reduced by rejection or alteration of inconsistent concepts—in other words—by denial.

Freudian psychologists have traditionally viewed denial as maladaptive, but more recent theorists, including Kübler-Ross, Lazarus, and Folkman, have seen it as normal and even potentially beneficial in some instances (cited in Forchuk & Westwell, 1987). Denial remains a complex and difficult issue for all health care professionals. But recognition of the psychological processes, as well as acceptance of its potential benefits, is an important beginning toward removing the barriers denial may place in the way of health.

Health Habits

Nothing is stronger than habit.

Ovid

Habit is . . . the enormous flywheel of society,
its most precious conservative agent.
It alone is what keeps us all within the bounds of ordinance.

William James

Over the past 40 years scholarly theories of health behavior have focused on conscious decision making. The Health Belief Model, Theory of Reasoned Action, and Health Locus of Control—the three most frequently cited constructs—are all acknowledged to experience limitations in predicting habitual behavior. Focusing instead on conscious decisions for single events, these theories have not accounted for habit, or its effects on health.

Reports in the literature about health habits, or even habit in general, are scarce. Unfortunately, many articles which claim to focus on health habits turn out instead to be survey reports on attitudes, as measured by one of the three most widely used scales.

Reinforcing these impressions, several authors have commented on the scarcity of research and lack of current scholarly attention to habit (Baldwin, 1988; Cohen, Brownell, & Felix, 1990; Stephens & Marlatt, 1987). Instead, theorists cited are of a historical nature: James, from 1893; Dewey, from 1922; and, Mead, from 1932. Seeking to explain this intellectual aversion to the study of habit by sociologists, Camic (1986) suggested the field has attempted to sever its ties with the previously dominant discipline of psychology by dumping theorists, as well as community affiliation. This break from the past occurred around 1918 (Baldwin).

Though dated by current standards, the theories and observations of James, Dewey, Mead and others are nevertheless important to consider. Stephens and Marlatt (1987) quoted James who found that "in habitual action, mere sensation is a sufficient guide, and the upper regions of brain and mind are set comparatively free . . . a strictly voluntary act has to be guided by idea, perception, and volition" (p. 85). James described habit as a chain, which is initiated by a cue and continues until the last event is completed. Not limited to motor skills, habit can also control information processing and many routine daily activities, such as social interactions.

According to Dewey, habits are formed when behavior is reinforced in such a way as to satisfy innate needs or acquired desires. Stephens and Marlatt (1987) quoted Dewey as

describing habits as an "intimate and fundamental part of ourselves (more) than are vague, general, conscious choices" (p. 92). Learned gradually, through repetition of the same stimulus, habits ultimately produce behavior which is relatively effortless.

Baldwin (1988) reported that Mead believed habits could be formed either through a conscious decision-making process, or without any particular level of attention. He found that they served an essential function, creating an "economy of our conduct" (p. 41). Like James, he also viewed habits as chains of events strung together, even believing they extended to social interactions, and going so far as to picture the "structure of society in these social habits" (p. 43).

The formation of health habits across age groups is another subject which has received scant attention (Cohen et al., 1990). Because changing adult behavior is difficult (Brownell, Marlatt, Lichtenstein, & Wilson, 1986), some health education efforts have been directed instead toward creating beneficial habits in children. Through a survey of approximately 4,000 children, grades three through twelve, and an analysis of the National Health Interview Survey of 1985, Cohen et al. reported that the health habit trends of junior high students were consistent with those seen in senior high school. Both groups also had habits consistent with those of adults. However, in most categories elementary school students reported the healthiest lifestyles. Based on the findings, Cohen et al. recommended health education interventions just prior to junior high school.

In summary, the impact of habit on health is indisputable, yet poorly understood. Theories of health behavior developed in the past 40 years have acknowledged limitations in predicting the extent of their influence. The wellness movement, which promotes the autonomy of the individual, has failed to fully account for its effects, which may be formed without conscious awareness.

Strategies for changing behaviors identified as health habits, especially in the area of injury prevention, are poorly defined or non-existent. Therefore, no experimental testing has

occurred. Further theoretical development appears essential to lay the groundwork for changing habitual, unhealthy behaviors.

Summary

Beginning 40 years ago with the development of the Health Belief Model, theorists have investigated the discrepancy between the availability of health-promoting options and the public's full use of these services. The fields of psychology and social psychology have both contributed to the extensive research and writing in this area.

Still the most frequently cited theory, the Health Belief Model postulates that factors influencing the use of health care services are primarily perceptual, rather than objective. These include the individual's sense of personal susceptibility and vulnerability to the condition, belief in the benefits of treatment, and an assessment that barriers such as cost are not insurmountable.

The Theory of Reasoned Action, also widely reported, assumes that the immediate and sole determinant of behavior is the intention to perform it. Factors impacting the intention to act are the individual's attitude toward performing the behavior and the influence of social forces.

A third theory, the Health Locus of Control, derived from Rotter's Social Learning Theory, has not proved to be predictive, and its originators have proposed modifications.

Other theories have drawn heavily from these three by adding factors or proposing new combinations among them. Although providing a valuable perspective of the many influencers of health behaviors, they have not been widely applied.

Over the past four decades researchers have focused on conscious decision making. The three major theories have all been acknowledged to experience limitations in predicting habitual behavior. Unfortunately, they do not account for habit, nor its effects on health.

Theorists who have written about the place of habit in the normal course of human

events are historical in nature: James, Dewey, and Mead. Both Mead and James described habit as a chain, which is initiated by a cue and continues until the last event in the sequence is completed. Dewey believed habits were formed gradually, and Mead viewed habits as arising from either a conscious decision-making process or from a non-conscious situation.

The last four decades of investigation into health behaviors have opened the door to an understanding of this complex area. Two theories, the Health Belief Model and the Theory of Reasoned Action, have proved to be predictive of conscious, one-time decisions. However, they do not account for habit. Because many behaviors associated with injury prevention are controlled by habit—such as driving a car or riding an ATV—their appropriateness to this area is uncertain. The question remains, What strategies are effective in persuading each of us to make the right decisions and take the right steps to promote health?

Theories of Adult Learning and Motivation

All that is comes from the mind;
It is based on the mind, it is fashioned by the mind.

The Pali Canon

Recognizing that mind and behavior influence health, the literature review turns next to theories of adult learning and motivation. As health education has grown to become its own unique discipline, some researchers have incorporated learning theories into their work. Chief among these is behaviorism, as represented by the widespread use of "behavioral objectives."

Also, Freire's model of experiential learning has been applied to alcohol and drug prevention. Nevertheless, despite reports in the literature of theory-based studies, most health educators do not ground their programs in adult learning models. However, theories of motivation are gaining some recognition, and those most commonly cited are discussed.

Theories of Adult Learning

Behaviorism

Three assumptions are central to behaviorism (Merriam & Caffarella, 1991):

1. The focus is behavior, not thought. Learning is manifested by a change in behavior.

2. The environment shapes behavior and determines what is learned, not the individual learner.

3. Reinforcement and contiguity (how close two events must be in time for a bond to be formed between them) are both central principles in explaining the learning process.

Skinner is the most widely known proponent of behaviorism. Other leading theorists include Thorndike and Pavlov (Merriam & Caffarella, 1991).

Thorndike's major contribution was connectionism, or the stimulus-response theory of learning (cited in Hergenhahn, 1988). He developed three laws to describe his findings. The Law of Effect stated that learners form and remember responses which lead to satisfaction. The Law of Exercise said that repeating meaningful connections results in significant learning. The Law of Readiness declared that learning was enhanced if the organism was ready for the connection; lack of readiness led to inhibited learning.

Pavlov (cited in Merriam & Caffarella, 1991) expanded on Thorndike's work by adding the concepts of reinforcement, conditioned stimulus, and extinction to the stimulus-response connection.

Skinner (1984) is best known for operant conditioning which focused on reinforcement of desired behavior and ignoring undesirable actions. He theorized that if behavior is reinforced or rewarded, it is more likely to occur again under similar situations. If not reinforced, the behavior will not occur as frequently, and may eventually disappear altogether. Skinner emphasized environmental control of behavior, instead of forces internal to the individual. His theories have strongly influenced the field of adult education, especially in

vocational and skills training. Learning strategies based on behaviorism include behavioral objectives, systematic design of instruction, competency-based education, and computer-assisted instruction (Merriam & Caffarella, 1991).

Cognitive Learning

The first salvo fired against the behaviorist orientation came in 1929 from a Gestalt psychologist, Bode (cited in Merriam & Caffarella, 1991). Gestalt psychologists viewed human behavior as a whole rather than as individual parts and favored looking for patterns rather than for analyzing isolated events. Bode criticized the behaviorists as being too concerned with individual events instead of with the entirety, too focused on overt behavior to explain learning, and too limited to details.

Gestalt psychologists including Wertheimer, Kohler, Koffka, and later Lewin, went on to develop learning theories which became as widespread and important as behaviorism (cited in Hergenhahn, 1988; Kidd, 1978). Their key premises were:

1. Learning involves a cognitive process, not just stimulus-response, in which experiences are reorganized to find a solution that may come suddenly as an insight.
2. The locus of control is with the individual learner, not the environment.

Cognitive learning theory developed from the foundations laid by Gestalt psychologists. Leaders in the field included Piaget, Ausubel, Gagne and Briggs, and Smith. Although Piaget (1950) worked entirely with children, his theories have also been applied extensively to adults. Piaget identified four main factors of cognitive development:

1. Maturation of the body, especially the nervous system and mental functions
2. The role of experience as the person reacts to successive environments
3. Social transmission including language and education
4. Self-regulation.

Ausubel (cited in Kidd, 1978) suggested learning is valuable only when it can be

related to existing concepts. Meaningful learning is therefore distinguished from rote learning. Bruner emphasized learning through discovery (cited in Kidd). He believed that information is rearranged and transformed by the learner to allow extension beyond the course content into new insights. For Bruner, "education is experience reorganized" (p. 180). Learning is its own reward, more a process than a product. The energy or motivation for learning comes from curiosity, a desire for competence, a sense of commitment to society, and the goal of emulating a model.

Gagne and Briggs defined eight types of learning, each with a corresponding mode of instruction (cited in Merriam & Caffarella, 1991). These include signal learning, stimulus-response, motor training, verbal association, discrimination, concept structures, rule memorization, and problem solving. Smith (1982, 1987) applied these to adult education with the "learning how to learn" concept. This means the student has developed skills which enable effective knowledge acquisition in a variety of situations.

The Humanists

Humanists view learning from the perspective of the human potential for growth. Maslow, Rogers, Knowles, Lindeman, and Tough are important theorists. Their fundamental assumptions include (Merriam & Caffarella, 1991):

1. Human beings control their own destiny. Behavior is not determined by the environment or the subconscious.
2. People are inherently good and will strive for a better world.
3. People possess an unlimited potential for growth and development.
4. Perceptions are centered in experience.
5. Adults are self-directed learners.

Considered the founder of humanistic psychology, Maslow (1970) is best known for his description of human motivation as a hierarchy of needs. He depicted self-actualization, the

ultimate goal of learning, at the top of the pyramid. Conversely, physiological needs such as hunger and thirst, followed by safety needs, security and protection, were found at the pyramid's base. Maslow theorized that the drives represented by each level must be met prior to advancement to the next. Moving up the hierarchy, subsequent steps contained belonging and love, then self-esteem. Maslow believed it was the educator's role to help the learner bring about self-actualization.

Rogers (1983) also focused on the contribution of learning toward personal growth and development. He identified several attributes of education which promote growth: (a) personal involvement, (b) self-initiation, (c) pervasiveness of learning which results in a difference in behavior, attitudes, or even personality, (d) learner evaluation of the process, and (e) the transfer of meaning into total experience.

Knowles (1975, 1980) is perhaps the best known humanistic educator. "Andragogy," a term he coined to describe his philosophy of adult learning, redefines the traditional teacher-student pedagogical relationship. Often criticized, Knowles has nevertheless captured the imagination of his contemporaries (Merriam & Caffarella, 1991). Andragogy is based on four assumptions which states that as a person matures:

1. His self-concept moves from dependent to self-directing.
2. Experience becomes a resource for learning.
3. Readiness to learn is oriented to developmental tasks and social roles.
4. The orientation of learning is immediate and problem centered.

Lindeman (1989) authored a seminal work, The Meaning of Adult Education, and is credited by Brookfield (1984) with introducing the concept of andragogy prior to Knowles. Key elements of his philosophy were an emphasis on collaborative, informal exchanges between learners and teachers, the social mission of adult education, which was to put meaning into the whole world, and the value of experience as a resource for learning. Lindeman believed "Education is (not) preparation for life. Education *is* life" (p. 129).

Tough (cited in Langenbach, 1988) is best known for developing an operational definition of self-directed learning. He also identified seven benefits which can be derived from the activity: (a) satisfying curiosity, (b) enjoyment from the content, (c) pleasure from practicing the skill, (d) the activity of learning itself, (e)) successful acquisition of new knowledge or behaviors, (f) completing unfinished education, and (g) other aspects, such as social, which are unrelated to the content.

Experiential Learning Theorists

Termed the "critical paradigm" of facilitation by Brookfield (1989), this group of educators has focused on the role experience plays in making learning meaningful (Wilson & Burket, 1989). Key theorists are Dewey, Kolb, Mezirow, Freire, Houle, and Illich. Concepts central to experiential learning include:

1. The learner's real world is the starting place for learning.
2. Learning involves direct interaction with an experience.
3. Learning has to provide contradiction, or some element of mystery or doubt, to invite a learning response.
4. Learning is not significant until it has undergone a conscious critical analysis which forces the learner to incorporate it into his or her behavior.

Dewey (1938) was the founder of progressive education, a movement which focused on learning through experience. Believing meaningful learning had to be connected to both the individual's past and future, he identified continuity as one of two essential conditions. His second principle, interaction, placed the individual in his or her social milieu, defining experience as the result of the transaction between the individual and the event. Dewey saw the educator as responsible for arranging the conditions of the learning situation in a manner which encouraged growth and development.

Kolb (1984) reported that learning was the result of an individual's response to

experience. During this process, knowledge is created by transforming events into concepts. He also believed in a broad connection between the situation and change, finding there were both personal and social consequences. As ideas become integrated, new levels of consciousness develop. This in turn leads to personal liberation and self-direction. Openness to experience is crucial, and the educator must structure a supportive climate which keeps learning alive.

Mezirow (1981) is best known for his theme of a disorienting dilemma as the initiator of learning. Creating three categories of education: technical, interactional, and emancipatory, he focused on the latter which he believed created critical self-awareness. As a result, the learner gained an understanding of personal, social, and environmental forces, and their effect upon behavior. Through this insight, the individual's world view could be reconstituted to form a broader, more integrated, and more inclusive description of reality. Mezirow criticized educators for attempting emancipatory learning by using a task analysis approach, instead of helping the learner identify real problems within their social context.

Freire (1973,1986) is famous for his work in literacy education for the disenfranchised poor of Brazil. His theories combine learning with a call for social action. Describing a "culture of silence," Freire believed that personal lethargy and ignorance were the outcomes of economic, social, political, and educational oppression. He saw individual growth as being dependent on both consciousness of cultural barriers to perception and on actions taken to overcome them. Coining the term "praxis" to describe this combination of action and reflection, Freire found the strategy to be central to liberation. In the educational setting, the concept is implemented through "dialoguing." Students pose problems and are then asked to review and reconstruct their perceptions by examining their reactions. Through this process, learners scrutinize underlying assumptions which guide their conscious behavior.

Based on interviews with adult learners, Houle (1961) developed three classifications of students: goal-oriented, activity-oriented, and learning-oriented. He questioned the nature of

the adult learner, choosing to answer by asking learners to describe themselves. Houle acknowledged two biases: lifelong learning, and a focus on adults who are extraordinarily active in educational programs. His typology describes meanings the learners associated with education. Inherent in this concept is the recognition of different motivations for learning. Educators benefit from understanding that the significance of education comes from the learners themselves, not from the instructor.

Illich (1984), sometimes referred to as a radical educator, called for the "deschooling of society." He claimed that despite more and more schooling, the world was not better. Arguing for complete reorganization of the educational system, Illich envisioned "learning webs" which could provide services such as reference materials, skill exchanges, and peer-matching. His opinion of formal learning institutions challenged assumptions thousands of years old. However, his faith in the learner was just the opposite. He believed that:

> Most people learn most of the time when they do whatever they enjoy; most people give purpose and give meaning to whatever they come in contact with; and most people are capable of intimate intercourse with others unless they are stupefied by inhuman work or turned off by schooling. (p. 96-97)

Theories of Motivation

Hierarchy of Needs

Widely referenced in both the educational and psychological literature, Maslow's theory of motivation (1970) bears repeating because of its importance to both fields.

Depicted as a triangle, needs are described from the most basic (for survival) to the most sophisticated or advanced:

1. Physiological needs, such as hunger and thirst
2. Safety needs, such as security and protection

3. Belonging and love
4. Self-esteem
5. Self-actualization—the desire to become all that one is capable of becoming.

Maslow viewed self-actualization as the goal of learning, one which educators should strive to bring about. At this level, motivation to learn becomes intrinsic. Educators use Maslow's theory not only to move students toward the goal of self-actualization, but also as a means of recognizing other motivational factors which must be addressed first.

Locus of Control

One of the most frequently employed individual differences measures, locus of control comes from Rotter's Theory of Social Learning (1982) which states that a person's decision to engage in certain behaviors is based on:

1. The person's expectancy that the behaviors will lead to a particular outcome
2. The value of the outcome to the person.

People with a high internal locus of control believe they are in charge of their own destiny, "captains of their own fate." Typically they have a high motivation to learn. Conversely, people with an external locus of control believe fate, luck, and other people are in control. They are less likely to be motivated to learn.

Relevance

Many learning theorists have contributed to this construct, which in simple terms means learners are motivated to participate in education if they view the content as directly applicable to their own lives.

Knowles (1980), a humanist, associated an adult's readiness to learn with the developmental tasks of his or her social role. C. R. Rogers (1983) maintained that the need, focus, and consequence of learning arises from the experience of the individual.

Tough (1978) reported that the most common motivation for a learning project is some anticipated use or application of the knowledge and skill. Both Dewey (1938) and Lindeman (1989) placed an emphasis on using life experiences as the resource for learning.

Experiential learning theorist Mezirow (1981) believed learning began with a transforming experience, which, under critical analysis, emancipated the learner. Freire (1986) rejected standard curricula and insisted that literacy programs be developed from within the community, based on the words and concepts used in that locality. Illich (1971) emphasized learning from the world and returning the autonomy of the educational process to the learner and tutor.

Although there are various approaches to this concept, the underlying themes are: (a) education is based in experience, (b) it must be relevant to the learner, and (c) it must transcend the formal learning situation to allow the learner to integrate concepts which, coming full circle, transform or liberate awareness and future experiences.

Attribution Theory

Although a number of theorists have contributed to the body of knowledge collectively described as attribution theory, there is general agreement than an attribution is a conclusion about why a particular event happened (den Boer, Kok, Hosper, Gerards, & Strecher, 1991). People derive attributions from experiences and apply them to the potential consequences of future events. Weiner (1979) stated that negative, unexpected, or important events result in the search for a cause which explains the outcome.

Den Boer et al. (1991) cited Heider and Kelley's descriptions of the three dimensions of attributions: (a) locus of causality, (b) stability, and (c) controllability. Previous outcomes impact all three factors. Locus of causality describes the assignment of cause to internal or external factors. Stability refers to the potential for causes to be either alterable or immutable. Controllability portrays the individual's power over the outcome. Attributions have both a

cognitive and emotional component.

Weiner (1979) reported that expectations of success are based on perceptions of the stability of the causes for success or failure. For instance, when success is attributed to a stable cause, there will be a greater expectation of future success than when it is attributed to an unstable cause such as luck. Lowered expectations of success cause a poorer adaptive response to the situation. Less energy and effort will be invested, leading to a poor result. Den Boer et al. (1991) compared this concept to Bandura's theory of self-efficacy which assumes that a low sense of self-confidence precipitates task avoidance. Both theories also are estimates of the likelihood that a certain outcome or goal will be attained and are based on a cognitive appraisal of experiences. Kok, de Vries, Mudde, and Strecher (1991) believe that self-efficacy and expectancy of success are identical concepts.

The affective component encompasses the relationship between both perceptions of locus and controllability and between emotions and behavior. A basic assumption is that different attributions lead to different emotions. For instance, the attribution of lack of effort to failure can lead to guilt, whereas the attribution of lack of ability can lead to shame.

A second basic assumption is that there are two kinds of emotions: motivating and debilitating. Motivating emotions lead to better task performance, whereas debilitating emotions have the opposite effect. As with self-efficacy, the perception of the attribution is more important than the "facts."

Summary

The 20th century has been a fertile period for the development of theories of adult learning and motivation. These concepts have been characterized by great diversity. Behaviorists have focused on the impact of the environment on behavior, shifting attention away from thought and the learner's internal processes. Responding to this school, cognitivists have emphasized the importance of the learner, not the environment, and that

thinking, or cognitive processes, reorganizes experience into solutions.

Humanists have extended the focus on the learner by creating a philosophy of unlimited potential for growth and development. Believing people are inherently good and should control their own destiny, humanists have stressed the theme of adults as self-directed learners. Experiential learning theorists have viewed the real world as the starting place for learning. With experience seen as both the basis and reason for learning, some have challenged the core of the educational institution. Like the humanists, they have found that true educational reform is required to return initiative, accountability, and autonomy to the learner.

Motivational theories provide an understanding of why learners engage in the educational process. Cited as both an educational and motivational philosopher, Maslow (1970) created the Hierarchy of Needs Model. Using the structure of a triangle, he described both the goal of learning, self-actualization, and basic needs which must be overcome before progress can be made toward higher levels.

Conceptualizing a dichotomy between internal and external, Rotter (1982) postulated that learners with a high internal locus of control believe they are in charge of their own destiny, and will have a high motivation to learn. Conversely, learners with an external locus of control think fate, luck, and other people are in charge. They are less likely to be motivated to acquire new knowledge or behaviors.

Many learning theorists contributed to the concept of relevance, which in simple terms means learners are motivated to participate in education if they view the content as directly applicable to their own lives. Experiential learning theorists Mezirow (1981), Freire (1986), and Illich (1971) believed that relevant learning begins with experience, is based in the community, and should be controlled by the learner.

Attribution theory describes the tendency to search for a cause for experiences, especially those which are negative, unexpected, or important (Weiner, 1979). Attributions assigned to experiences are applied when similar experiences are encountered again. The

cognitive component of attribution theory predicts that when past failures are attributed to a stable cause (one which recurs), efforts to deal with the same situation in the future will be characterized by reduced energy, thus perpetuating the cycle of failure. Conversely, past success attributed to a stable cause breeds future success. The affective component describes emotions which arise from attributions as either motivating or debilitating.

As is apparent from the diversity of both education and motivation theories, there is no single unifying paradigm. Rather, the literature is filled with competing claims and reports. Understanding the broad spectrum provides the basis for selection of relevant constructs upon which to develop and integrate specific training plans.

Theories of Community Development

A community is like a ship;
everyone ought to be prepared to take the helm.

Henrik Ibsen

The Social Action Model

When President Kennedy created the Peace Corps in the 1960s, he hoped it would eliminate the fundamental causes of war: poverty, disease, illiteracy, and malnutrition. At the time, the Peace Corps was portrayed as an innovation, but its origins were actually historic, based on models first employed in the impoverished South of the late 1800s.

America was a rural society in that era; the bedrock of the economy was the family farm. It may not be surprising therefore to trace the roots of community development strategies to this agrarian setting. The organization established back then to foster social change was the agricultural cooperative extension service, commonly called "The Extension," or even more simply "The Co-op." Its twin goals were improvement of farm productivity and rural life in the broadest sense (Dixon, 1989; Sanders, 1958).

Although Dixon (1989) traced the Extension and its philosophy of community development to the "carpet bagger" era in the post Civil War South, the service wasn't formalized until 1914 when Congress passed the Smith-Lever Act (Langenbach, 1988). Since then it has grown to include four major programs: (a) agriculture and natural resources, (b) home economics, (c) 4-H youth services, and (d) community resource development. The term "cooperative" refers to shared funding from all levels of government. Land grant universities administer it.

Drawing from Loomis's rural sociology studies (1960), the Extension first publicized its program design in 1966, calling it the Social Action Model (Beal, Blount, Powers, & Johnson). Encompassing a multiplicity of factors, this design is a comprehensive description of the change process, taking into account key actors and social systems, and describing a step-by-step plan for social transformation.

Looking first at the people involved, Beal et al. (1966) described roles for the change agent, who acts as a catalyst, and powerful community figures. The change agent is responsible for identifying key leaders based on the scope of the project and the type of action contemplated. Broader, community-wide problems may require the participation of more influential residents, although these are not necessarily elected officials. On the other hand, individuals with expertise in a special area may be appropriate for more narrowly defined issues. Social systems were described as either the target or the context of change. Elements of the system which impact the program are:

1. Ends or objectives
2. The means which will be used
3. Norms, both acceptable and unacceptable
4. Status-role expected from the incumbent (This term was coined by Loomis (1960) to place equal emphasis on both the position's structure and function.)
5. Rank of individuals
6. Power, through either authority or influence

7. Sanctions normally used to maintain conformity (either punishment or reward)
8. Beliefs about the order of things
9. Sentiments about the phenomena.

Although the Social Action Model contains thirty-four separate stages, with an evaluation step between each one, there are just four fundamental concepts:

1. Functions are complex and interrelated.
2. A flow diagram can display action from beginning to end.
3. There are separate phases.
4. Each activity can be observed and analyzed.

The process begins by identifying the elements, system boundaries, and subsystems. Questions answered about the subsystem by the end of this stage are: (a) its relative status, (b) influential groups, (c) goals and activities, and (d) key leaders.

At least two people from either inside or outside the system must come together and decide to pursue social action before it truly begins. An agreement about the definition of the problem, the goals, and subsequent steps is essential.

Next, past history is analyzed, including information about previous: (a) conflicts between key actors, (b) communication patterns, (c) cooperative efforts, and (d) successes or failures on similar projects. An estimation of both the potential impact on individuals and groups occurs at this time as well. A description of the social systems follows, emphasizing the "target systems" which will be affected. Also, key players, who may later be contacted for either help or opinions, are identified.

At this point, the core membership is expanded, still retaining the change agents. Now called the "initiating set," the new group must be committed to meeting with key community leaders in order to legitimize the social action program. Although the majority within a target system must sanction any proposed change, influential leaders can enhance *its initial* reception. Gaining their support involves both a candid explanation of potential problems, as

well as a description of benefits. Also, all must clearly understand their roles.

After gaining credibility and support, the circle expands again. Now called the "diffusion set," members must devote time and effort toward disseminating information about the project. This stage is complete when a communication plan is in place, and a group of people are ready and able to implement it.

The next phase is considered the most time-intensive, as well as the riskiest. At this point, members of the target system, as well as other social systems, are invited to join in planning for the change. Ownership of the problem and commitment to its solution must be transferred from the project team to members of the target system. The process can move forward only after its members openly acknowledge their support.

Goals, which have been previously unstated, become specific in the next stage, along with the commitment to their achievement. To be successful, they must be explicit, understandable, and widely publicized. After agreement, the group must decide on the method for their accomplishment.

Following these steps, the work plan can be formalized. It should contain descriptions of: (a) goals, (b) methods, (c) an organizational structure, including lines of authority and delineation of responsibility, (d) training requirements, and (e) timing of events. Implementation follows. Resources are mobilized, and the action steps in the work plan are executed. The last step is an evaluation.

In summary, the Social Action Model is flexible and can be used to address a wide variety of problems in diverse settings. By including key leaders and an ever-expanding group from the target system, it works for change from within. Constant evaluation between steps ensures the process is self-correcting, and the goals and work plan are truly appropriate. The chances for long-term, lasting change are therefore increased.

Critics of this model have pointed to its potential for excessive conformity with entrenched institutions, which may themselves be flawed. In the same vein, collaboration with

established leaders may doom the project if their status or prerogatives are threatened (Langenbach, 1988). Therefore, the model has limitations in attempting to address fundamental issues, such as were advocated by the Civil Rights Movement of the 1960s or the anti-Vietnam protest a decade later. Also, societies without a strong tradition of democracy and free speech may be challenged by the community input required for success.

However, when the change contemplated fits within the framework of general social values, the Social Action Model has an impressive track record. Health-related changes often impact a wide cross-section of the community and require support from many sectors such as law enforcement, community groups, retail outlets, the school system, and health care providers. This structure provides a vehicle, via ever-expanding circles of participation, to draw in groups, gaining their support before the work plan is implemented. Although application of this specific method may not be acknowledged, its use is the norm for health-related changes requiring community participation. Numerous examples are available including the Alaskan Emergency Medical Services System, the SAFE KIDs Program, and the WHO Safe Cities Programme.

The Community Self-Empowerment Model

Placing an emphasis on the social and political responsibilities of the health care professions, McMurray (1991) described a model for community change specific to medicine. Viewing self-reliance in health care decisions on a continuum, she found most cities to be totally dependent on outside sources, with very few achieving full self-determination. She believed these health-related issues should be handled at the local level:

1. Protection of the natural environment
2. Safe communities
3. Families
4. Equal access to health care

5. Aging

6. Overcoming epidemics

7. Addressing the needs of vulnerable groups including minorities, indigenous people, women, single parents, children, the poor, the homeless, migrants, and the ill.

In localities which lack self-determination, McMurray (1991) believed health care professionals must become proponents of systemic change. Putting them on the front line of the political process, she recommended a wide range of advocacy activities including:

1. Awareness of community issues
2. Monitoring and evaluation of programs
3. Participating in consumer groups
4. Working with the media and writing letters to the editor
5. Lobbying
6. Organizing coalitions
7. Participating in policy making
8. Joining political action groups
9. Supporting elected officials, and even running for office.

Diagramming her concepts, McMurray (1991) visualized a "diffusion of power" flowing down from the medical professionals to the community, which in turn becomes self-empowered. The end result is "health for all people."

In summary, this design places responsibility for public health improvements squarely on the shoulders of the health care professional. It assumes a commitment of time, energy, and expertise which may be unrealistic. In contrast to the Social Action Model, which depicts power residing within the target system, this scheme views it flowing in the opposite direction: down to society from the healing professions. McMurray (1991) appears to assume that when not used to its fullest potential, authority has been abdicated, requiring its return via enlightened intervention.

Even though it emphasizes "community self-empowerment," this model's paternalistic viewpoint appears to run counter to the wellness movement's precepts of personal and community autonomy. Likewise, it may also be philosophically at odds with the Social Action Model. Although perhaps idealistic, McMurray (1991) nevertheless presented an often-overlooked professional obligation: the responsibility for improving the health of society.

The Nature of Community Development

In a classic 1958 article, Sanders, a sociologist, offered an analysis of four types or methods of community development. Finding there was little disagreement about the history of the movement, he reported there was likewise no theoretical consensus about its nature.

Sanders's (1958) typology divided community development by function into a: (a) process, (b) method, (c) program, and (d) movement. As a process, community development is defined by progression from one stage to the next. On a continuum, activities include an expansion of those involved in decision making, an increase in cooperation and participation, and a trend toward the use of internal, as opposed to external, resources. People are the focus, and theories of social change are applicable.

Viewed as a method, community development concentrates on achieving goals. Unrelated efforts which promote change may also contribute to its success: education, regulatory requirements, and incentives. Although the steps described above are still employed, the emphasis is on achieving a tangible result. Theories of social control, including motivation and socialization, and an analysis of political systems, group pressure, and public opinion are all relevant.

As a program, community development focuses on following procedures and completing an action plan. With the underlying assumption that success comes from checking items off the list, the program itself, not its beneficiaries, is the focal point. Theories of social organization provide direction as clear roles and values are essential.

In contrast to the previous styles, which have been emotionally neutral, community development as a movement takes on the force of a crusade. Devotees are fervently committed to its success, whereas detractors may be equally obligated to its failure. Goals are more diffuse, philosophical, and long range, with permanent institutional structures arising to support the cause. Political sociology is a relevant field.

Sanders (1958) offered two final ways to analyze community development: geographical focus, with emphasis on the decision-making locus, and the types of functionaries. He identified three geographical areas: (a) community, (b) regional or district, and (c) national. As suggested by the name, development at the local level originates in one city, where it is both financially supported and led by residents. Outside consultants may be catalysts.

At the regional level, issues affecting a number of cities are targeted for change. Specialists may be available to come to individual sites from time to time. Two problems must be overcome for this model to succeed: (a) regional strategy must be tied to the expressed needs of local residents, and (b) local leaders must carry on after outside experts depart.

When programs are implemented at the national level, local communities are seldom directly involved in the planning, but must participate in actual implementation. Resource allocation is determined nationally, as are general program guidelines. Challenges experienced at the regional level apply also to the national scene.

Although Sanders (1958) believed theoretical insights from the social sciences were applicable, he recognized communications theory as providing the most important contributions to understanding geographical issues. Given the complexity of the situation, and the differential in knowledge and orientation between specialist and lay leader, face-to-face communication was essential. The concepts of diffusion of information were basic to the innovation process. Maintaining the flow of ideas up and down the hierarchy was also essential.

Sanders' s (1958) final analysis was a typology of functionaries in community development: (a) local lay leaders, (b) resident professionals, (c) outside professional organizers, and (d) multipurpose community development workers. All four types have attributes which both contribute to and challenge their success.

Lay leaders, who are unpaid volunteers, can readily gain community support, but may lack expertise, adequate time, and energy. Resident professionals are paid employees with special training relevant to the task. Typically, they are recruited from outside the area, and, as a result, may be an unknown entity to locals. The organizations for which they work are locally run by a board of directors, often maintaining a narrow focus which places them in competition with other groups for scarce resources.

In stark contrast to the locally managed personnel described above, outside professional organizers can be characterized as "barn stormers." Sent in for a limited time by national groups, their goals are unrelated to local needs. Relationships are only superficial, and the advice they give may be inappropriate for the region.

Multipurpose community development workers also come from outside the area, but their efforts are directed toward the needs of residents. Arriving either by invitation or government direction, their purpose and status may at first be unclear. Some establish their own residence and base of operations. As opposed to resident professionals, they are not experts, except in the area of community development itself. Their main goal is grooming local leaders to take their place and continue the programs.

In summary, Sanders's overview offers a rich perspective on a varied topic. Although the term "community development" is freely used, and its application widespread, definitions are often glossed over or assumed. As Sanders so aptly pointed out, the term means many things to many people. His typology provides a valuable method for categorizing styles, geographic areas, and personnel. The thoughtful addition of commentary on relevant theory provides direction for further review.

The Lay Helping Conceptual Model

Citing many of the same reasons which gave rise to the wellness movement, such as changing disease patterns, the widespread availability of health education materials, and the emphasis on personal autonomy, Eng and Young (1992) have developed a model to describe the role of the lay health advisor (LHA).

As prevention has gained importance, the medical community has recognized the need to reach people in new ways. Interest has centered on existing systems, such as the church, work place, civic group, or neighborhood (Gottlieb, 1985; Hatch & Lovelace, 1980; Israel, 1985). These locations have several advantages. Groups already in place can be readily mobilized for new activities. Also, some researchers believe family and friends may positively influence those at risk through peer pressure and group norms (Gottlieb, 1985; McLeroy, Bibeau, Steckler, & Glanz, 1988).

Eng and Young (1992) viewed the lay health advisor as a linking agent between traditional medicine and the community. Implicit in this concept is an acceptance of health care as an open system, extending beyond the door of the clinic or hospital. For many providers, such an inclusive view is a paradigmatic shift.

Lay health advisors complement the work of health professionals by providing four basic types of social support:

1. Emotional—listening, demonstrating concern
2. Instrumental—offering concrete help such as time, money, and personal effort
3. Informational—providing referrals, suggestions, advice
4. Appraisal—giving feedback and affirmation.

The support provided by lay health advisors affects behavior on three levels: (a) individual, (b) social network, and (c) community. At the individual level, the lay health advisor can influence health decisions by: (a) emphasizing risks associated with behavior, *(b) pointing*

to changing social norms, and (c) helping the individual evaluate his or her own ability to change. Eng and Young (1992) diagrammed these steps as: perceived risks and benefits —> behavioral intent —> health-seeking behaviors —> sustained health behaviors —> health outcomes.

Individual behavior is also indirectly affected by the lay health advisors' impact on both the social network and the community. As stated earlier, enhanced social support may beneficially alter high-risk health behaviors. Promoting contacts with formal health care providers can engender multiple changes including: (a) increased availability of information and services, (b) improved access via more "user-friendly" scheduling, location, etc., (c) direct outreach from agencies which previously played only a passive role, and (d) cross-agency referral and resource sharing, which may have a synergistic effect on community norms.

System dynamics impacted by the lay health advisor were outlined by Eng and Young (1992) as follows: increased social control —> increased community participation —> increased community competence —> organizational development outcome. These changes are cross-linked to individual health outcomes.

Summarizing the interventions available, Eng and Young (1992) developed a second model, which they called the Planning Model for a Lay Health Advisor Program. Its three strategies are to:

1. Strengthen ties to existing networks. Individual health behaviors are the target.

2. Improve the coordination and delivery of services. The goal is enhancing the social network's collaboration and help.

3. Promote synergistic problem-solving between agencies and support new grass-roots efforts to address unmet needs. Community transformation is the goal.

In summary, both the Lay Helping and Program Planning Models provide valuable tools for conceptualizing the many steps required to convert the traditional, *closed health care* system into an open systems model. The wellness movement has placed the autonomous

human being at the center of change—in contrast, these plans position the individual within a social context. As such, they may provide a bridge between wellness theorists, who see each man as an island, and critical social theorists, who view him as a pawn of the environment.

Published in early 1992, these structures present a relatively new and perhaps controversial approach to both individual health behavior change and the metamorphosis of modern medicine. Also, the authors acknowledge their reliance on empirical evidence regarding a fundamental assumption, the value of social support. Although lay health advisors may have a rich historical pedigree, their existence is just gaining legitimacy, and the concept is newly operationalized.

Injury prevention specialists who design programs for rural Alaska should consider these strategies. Isolated villages, visited by a licensed health care provider once a month or even less frequently, might benefit from a linking agent who could support change. Their initial recruitment would be a key start-up strategy, and their ongoing involvement would be essential for long-term success.

Ethical Implications of Community Development

Far from being value neutral, community development is one of the most ethically complex and challenging areas in which a health educator can work (Minkler, 1978). A naive observer might see the teacher outside the decision-making process, simply providing technical expertise upon request. However, as McMurray (1991) pointed out, few if any communities are completely self-reliant, and, by implication, able to negotiate for health services from a position of knowledge and strength. At the very best, many cities are moving slowly and uncertainly in that direction, still requiring a catalyst or outside change agent to initiate the process.

Minkler (1978) identified five ethical standards, as well as their associated pitfalls. The first principle calls for "starting where the people are" (p. 200). Not unlike Star Trek's Prime

Directive, which was violated by the Enterprise's well-meaning crew almost every episode, this may be much more difficult than it sounds. Normally working under the direction of an agency or board, health educators may be charged with accomplishing a particular mission. Regional goals may be secondary. Experience suggests this dilemma can be overcome by first responding to local concerns, then allowing a gradual return to the agency's agenda.

The historic focus on helping the poor poses another ethical dilemma. By focusing on those most in need, such programs may unwittingly overlook more fundamental changes which should be undertaken by those in power. Although indirect, a transformation in the values of the "advantaged" may have longer-term implications for an improvement in the status quo. Also, the emphasis on the poor implies that group should sustain all social change, an expectation which may be both unfair and unrealistic (Minkler, 1978).

Anchorage, Alaska's approach to the growing public inebriate population offers a case in point. Millions of dollars are spent each year to house, feed, detoxify, and rehabilitate this group. Yet the Alcohol Beverage Control Board continues to protect the liquor licenses of vendors caught selling to minors and others who, operating in low-income areas, stock cheap "Ripple" type products specifically targeted to the buying habits of public inebriates and teenagers. Those in power retain their profits undiminished, but society hopes for substantial improvement from underage drinkers and the homeless. The problem's continued growth speaks to this strategy's lack of realism.

A third dilemma involves promoting change by choice, not coercion (Minkler, 1978). Acknowledging the autonomy of the individual, voluntary action is held as the only ethical approach. However, this idealism comes under intense pressure when individuals willfully act against their own best interests, even impinging on the rights of others.

California's motorcycle helmet law provides a classic example. Lacking a regulation, voluntary compliance produced a 60% helmet use rate. With a vocal coalition of bikers' clubs adamantly opposed to helmets, the rate was not going to improve further. Asserting the right

to ride unhelmeted, wind in their hair, bikers chose to disregard the possible consequences of a crash. However, they were not the only ones affected by this decision. It was discovered that following an injury, publicly funded programs (e.g., Medicaid and Social Security) were picking up a disproportionate percentage of the costs. After a historic confrontation in California's capitol building, the motorcycle helmet law was passed. Compliance is now virtually 100%, with mortality statistics improving. In this case, California's legislature recognized the public's welfare was more important than the issue of personal liberty. (L. McLoughlin, personal communication, November 13, 1992).

In support of public health initiatives, Minkler (1978) emphasized principles of non-violent intervention.

> Health educators are justified in supporting such methods whenever communities have failed through other means to achieve health objectives of major significance, and when the health educator and the community see the use of nonviolent, coercive strategies as preventing harm and enabling changes which may not otherwise occur. (p. 205)

Unintended or unexpected effects pose the fourth ethical dilemma. Changing one part of a system can affect others in unpredictable or even uncontrollable ways. For instance, as was seen recently in Sitka, Alaska, tougher pollution laws, designed to preserve the environment, can have the unintended effect of increasing costs, leading to unprofitable operations, with the ultimate outcome being plant closure and lost jobs. Although no one can be expected to foresee all consequences, Minkler (1978) cautioned that clients should be warned of potential problems, and the community should be involved in an informed assessment of risks and benefits.

Finally, Minkler (1978) advised against an excessive focus on the person when more fundamental social change is required. For instance, individuals are now expected to

remember to purchase an ATV helmet when they buy a machine. For some, this is a personal freedom issue. However, a recent study found that fewer than 40% of Alaskan rural ATV riders owned a helmet (Sloan, 1992). When asked about this discrepancy, many cited both the helmet's cost and the lack of retail access. Since a new ATV is in the $4,000 to $5,000 range, logic dictated that the $200 price of a helmet would not alter the buying decision. Also, availability is assured at the time of sale. In this situation the health educator must question whether time and effort would be best spent changing the marketing strategy, or providing an educational program on helmets.

In summary, health educators are often presented with situations which call for both ethical and professional decisions. People do not always act in their own best interests. When the health and welfare of many are affected, society may have an overriding obligation to act, reducing personal liberty for the greater good. The health educator is often on the cusp of these decisions. A clear understanding of personal values and potential ethical dilemmas is essential to acting in the community's best interests.

Summary

Theories of community development and related ethical considerations are important to health educators because so much of the "real work" of the profession occurs in this context. Especially in the field of injury prevention, the community, whether it be local, regional, or national, will continue to be the stage for the struggle for "better health for all."

However, a review of the theories of community development offers a potentially confusing array of approaches and philosophies. As Sanders (1958) pointed out, the term means many things to many people. Taking four cuts at the concept, he identified activities which were a: (a) process, (b) method, (c) program, and (d) movement. The models also vary according to the geographic locus of decision making, and the type of functionary involved.

The most often cited theory of community development, the *Social Action Model*, arose

from somewhat obscure origins in the agrarian reform movement of the late 1800s. Although its action steps are clear, detailed, and generalizable to a wide variety of settings, many health educators appear to use it only intuitively, lacking a complete understanding of its concepts.

The Lay Helping Conceptual Model, newly proposed in 1992, attempts to link traditional health care to the community via "lay health advisors." Modern medicine is clearly in transformation, with both providers and the public seeing prevention and wellness as the future. This design attempts to bring that vision one step closer to reality. As such, it deserves to be tested and refined.

Ethical considerations are at the heart of many heated debates, both between health educators, and within society at large. The examples cited were drawn from this writer's personal knowledge. Others could undoubtedly provide similar scenarios. Recognition of these moral dilemmas and values clarification appears to be fundamental to significant progress toward a healthier society.

In conclusion, although theories of community development are in some ways less clearly formulated than might be desirable, they can offer structure for programs, as well as insights into both assets and potential problems. The Lay Helping Conceptual Model may have particular application in rural Alaska due to its geographic isolation and cultural diversity.

Theories of Health Education

Health is the greatest of human blessings.

Hippocrates

The State of Theory Development in Health Education

Calling health education a "theoretical jungle," Timmreck et al. (1987) are just a few of many authors to decry its lack of theoretical foundations. Although many professionals

appear to confidently report advances in their disciplines through science, these authors related instead:

> Writing and research about theoretical and academic aspects of health education and health promotion are still in the adolescent state . . . . The result is a confused jungle of health education and health promotion practices and approaches with no theoretical foundation . . . . In the current somewhat blind direction, many professionals continue to come through with different distracting directions, solutions, and processes, trying to identify the same elephant. (p. 25)

Issuing a call to arms, they challenged their colleagues to develop a sound theoretical foundation upon which research can occur, and other aspects of the profession may develop. They characterized the current situation as just the opposite, with eclectic content areas randomly drawn from six to ten fields. In turn, research loosely applies these theories under the umbrella of health education. Graphically depicting their appraisal as a pyramid upheld by columns, they placed health education and promotion at its top with eight disciplines supporting them: sociology, anthropology, psychology, biomedical sciences, education, management, counseling, and marketing.

Other authors also advocate greater use of theory. Hochbaum et al. (1992) found that,

> . . . although social and behavioral science theories are claimed to be able to contribute greatly to the effectiveness of health education programs, most practitioners in the profession seem to doubt this, and very few ever deliberately use theories in their work. (p. 295)

They went on to describe the purpose of theory, including its use in research, and the differences between theory-based and non-theory-based studies. Although recognizing the

rapid advances made through the infusion of empirically based knowledge from other disciplines, they nevertheless bemoaned the neglect of theory by non-academicians. They found that, in circular fashion, this has fostered continuing reliance on other fields.

Commenting on the uses of theory, Burdine and McLeroy (1992) also reported, "The division between theory and practice in the field of health education represents a significant opportunity and challenge to the discipline . . ." (p. 331). Rather than simply calling for more application of theory, they gave specific recommendations for its development. These include: (a) process theories—that cut across multiple levels of intervention (the individual, their immediate social group, institutions, the community, and the government), and (b) intervention theories—that include many types of strategies, and identify the combinations most effective in specific contexts. They also agreed on several underlying principles which should be integrated into every program: (a) freedom of choice, (b) voluntary behavior change, (c) broad-based participation in program development, implementation and evaluation, and (d) informed consent.

Entitling their article "What's the Use of Theory?", Van Ryn and Heaney (1992) wrote yet another exhortation to the health education community. Their aim was to expose "common misperceptions of the nature and usefulness of theory" (p. 315). Looking at the roots of the problem, they found two primary causes. First, they believed there was a misunderstanding that the abstraction in theory makes its use impractical. Just the opposite is true. Instead, its generalizability makes it useful in a wide variety of settings, populations, and problems. Second, they reported that theories may appear to be unproven and therefore useless because they are at first educated guesses. However, later rigorous testing validates them. Citing the advantages of coherence, effectiveness, and consistent evaluation, the authors invited their colleagues to experience the same satisfaction they have had working with theory-based interventions.

An Ecological Model for Health Promotion

In order to provide structure to this review of the literature, the ecological model of health promotion, developed by McLeroy et al. (1988) was used. In developing this, they have in turn drawn from the works of Brofenbrenner, as well as from Belsky and Steuart.

Brofenbrenner's ecological design of human development (1977) viewed behavior as being both affected by, and affecting, many levels of influence. Brofenbrenner categorized the environmental influences into four levels: micro-, meso-, exo-, and macrosystem. The microsystem includes face-to-face contacts in settings such as home, work, or informal social groups. The mesosystem focuses on interrelations in locations such as work, family, school, peer group, or church. The exosystem refers to forces within society which impact the individual, such as unemployment. The macrosystem encompasses underlying cultural and social beliefs, and values. Examples include culturally prescribed dietary habits and beliefs about alcohol. The ecological perspective implies there is interaction between the environment and the individual, with influence flowing in both directions.

Adapting this scheme, McLeroy et al. (1988) developed a conceptual framework for categorizing the range of strategies currently used in health promotion. Behavior is the focus, and it is viewed as being determined by:

1. Intrapersonal factors—individual characteristics such as knowledge, attitudes, behavior, self-concept, and skills

2. Interpersonal processes and primary groups—formal and informal social networks and support systems—the family, work group, and friends

3. Institutional factors—social institutions with organizational characteristics

4. Community factors—relationships between organizations, institutions, and informal networks within defined boundaries

5. Public policy—local, state, and national laws, and policies.

The following subsections will review the processes operating at each level and how they affect health related behaviors, along with examples from the literature.

Intrapersonal Factors

Health education strategies in this area focus on changing the individual (McLeroy et al., 1988). Theories borrowed from psychology and social psychology, as well as health behavior concepts themselves, all come into play. Common interventions include educational programs, mass media, support groups, organizational incentives, and peer counseling (when the focus is on changing the individual, not the culture). Knowledge, attitudes, skills, and intentions to comply are all targets for change.

The literature is filled with reports on such programs—one database alone contains more than 1,000 citations. Just a few have been selected as examples.

Rimer et al. (1992) conducted an experimental educational design in randomized groups of women over 65. The goal was to increase the use of mammography services. Women in the experimental group were interviewed as a baseline. Both control and experimental groups were then exposed to promotional materials and offered a discount coupon for mammography. At three months women in the treatment condition were interviewed again, using messages based on the Health Belief Model and Social Learning Theory. Rimer et al. found women in the experimental group were significantly more likely to obtain mammograms. They concluded mammography use can be increased through a combination of health education interventions, and by reduction of the barriers to access.

Ostwald, Weiss-Farnan, and Monson (1990) conducted an education experiment using two treatment groups and one control. One experimental group was teacher-directed, and the second was learner-paced. Subjects were elderly women with a mean age of 71. The training focused on cardiovascular risk factors. Results indicated subjects in both experimental groups were more likely to reduce stress levels, salt consumption, and systolic

blood pressure, and there was no difference between the two. Participants in the instructor-directed group reported more satisfaction with the learning methods.

Franzini, Sideman, Dexter, and Elder (1990) used behavioral techniques to teach assertiveness to a group of 79 university students. The intervention was designed to reduce the risk of contracting Acquired Immune Deficiency Syndrome (AIDS) by promoting "safer-sex" behaviors. They employed a variety of methods: modeling, role-playing, verbal reinforcements, and health education. Their findings demonstrated an improvement in the participant's ability to be assertive, with even brief interventions yielding beneficial results. In vivo behavior was not measured.

Singleton, Neale, Hess, and Dupuis (1987) conducted a cardiovascular screening program for 223 volunteers. The health educator shared results with the subjects who were then asked to sign a "contract" to make behavior or life-style changes. Contractors were more successful in making changes than non-contractors. The authors cited Social Learning Theory as the basis for the contingency contracting technique.

Lorig and Gonzalez (1992) described their modification of an existing arthritis education program which was based on Bandura's Self-Efficacy Theory. Three characteristics of the theory were found to be relevant to health education: (a) it was belief- and behavior-specific, (b) it had already been shown to be highly predictive of future health behaviors, and (c) specific methods were described including skills mastery, modeling, reinterpretation of physiological symptoms, and persuasion.

The researchers constructed a tool to measure self-efficacy, including scales for management of pain, physical function, and symptoms such as fatigue and depression. Their hypotheses were supported: (a) self-efficacy predicted future health status, and (b) changes in self-efficacy were associated with health-related changes. A second set of studies attempted to determine if improved self-efficacy led to enhanced health, and if health education grounded in the self-efficacy theory created greater health improvement. Again, both hypotheses were

supported, upholding the original belief that Bandura's Self-Efficacy Theory provides a powerful tool for improving health.

Interpersonal Processes

Relationships with family, friends, neighbors, and work associates significantly influence health-related behavior (McLeroy et al., 1988). Programs which employ interpersonal strategies typically attempt to change the individual through groups, rather than attempting to change more fundamental social norms. Following are reports from the literature on this type of health education program.

Kelly and St. Lawrence (1990) conducted a 12-session group intervention aimed at reducing the risk of AIDS in gay men through development of interpersonal skills. Two booster sessions were held within 16 months following the initial program series. The authors reported that the experimental group decreased at-risk behavior significantly. They concluded intervention can produce rapid and clinically meaningful changes in high-risk behavior patterns.

Ho et al. (1987) developed a health promotion delivery system using peer leadership and social networking. Subjects were volunteers from an elderly population. Those who qualified as leaders recruited a second generation. Success was measured by an improvement in nutrition knowledge of 52.3%.

Klitzner, Gruenewald, and Bamberger (1990) reported on the impact of a parent-led alcohol and drug abuse prevention program. Studying already formed parent-led groups, the authors conducted telephone interviews to assess the extent to which this type of activity was decreasing drug use and improving family relations and parental control. The findings suggested parent-led groups had a positive impact on both family relations and parental control, as measured by the amount of talking and time spent together, and by the degree of strictness. Drug use could not be accurately assessed.

Mayer, Beach, Carter, Hillman, and Kellogg (1991) evaluated the effectiveness of co-worker-delivered breast self-examination reminders. Subjects were randomly assigned to

control or contract groups. Participants in the contract condition were buddied with a peer, whom they prompted at least monthly for six months. Mailed prompts were sent to everyone. The authors found both groups increased breast self-examination equally, with no difference in the magnitude of change between the two conditions.

Institutional Factors

Organizational settings have a powerful influence on 20th century man (McLeroy et al., 1988). Estimates indicate people spend up to half their lives within the walls of institutions, beginning in infancy with day care, extending into schools and the workplace, and ending in old age with senior centers or nursing homes.

This experience can impact health either positively or negatively. For instance, workplace hazards, such as toxic chemicals, or stress, can have a negative effect.

Some functions inherent to an organization can promote health. For example, as transmitters of social values, institutions can effectively alter perceptions. Health promotion activities are frequently held at places such as worksites and churches because access to such a large group saves time and money. Also, in such a setting both internal social norms and structured incentives or rule changes can support sustained behavior change long after the initial activities are over.

Health promotion programs in this setting impact not only the individual, but the organization as well. For instance, system-wide changes might involve linking related departments such as engineering, safety, employee health, personnel, and employee committees. New individual behaviors can be promoted by new personnel policies. Even more fundamentally, education efforts can be directed toward corporate culture, transforming its health-related values.

Continued operation beyond the first blush of enthusiasm and "soft" funding is an important milestone for long-term program viability. Start-up costs may come from outside

sources, making implementation relatively painless for the corporate bottom-line. However, to survive, the program must become part of the organization's operations, a process known as institutionalization. Important considerations during this transition phase are consistency with the mission, perception of the cost to benefit ratio, development of a coalition of support, the creation of a structural niche, and measurements of the program's effectiveness.

In conclusion, organizations are in many ways ideal locations for health promotion. Both the individual and the system can embark in new directions, and corporate cultures which emphasize health can significantly impact wellness in and out of the workplace. Here are some examples from the literature of such efforts.

Wallerstein and Bernstein (1988) adapted Freire's educational theory of empowerment to the setting of alcohol and substance abuse prevention. The lead agency for the program was the University of New Mexico School of Medicine. Youth were drawn from minority high-risk communities and brought to the University Hospital Emergency Center for four educational visits. Freire's three-stage methodology of listening, dialogue, and action was employed. The authors found the process impacted affective, cognitive, behavioral, and social factors positively, and recommended the method be used in other health promotion strategies. Outcomes were varied: (a) enhanced personal growth and social support, (b) new directions in community organizing, and (c) policy and environmental changes.

Kaman, Licciardone, and Hoffman (1991) reported administration of the Healthier People Health Risk Appraisal at a voluntary health screening to 239 employees. They found significant differences between projected and actual risk factor profiles, leading them to conclude risk factor prevalence among smaller groups may not be accurately predicted from aggregate statistical data.

Bertera (1990) used the PRECEDE framework to develop a comprehensive health education program for the employees of the DuPont Company. A pilot program at one of the company's 110 locations reported a 47.5% decline in absenteeism over six years as

compared to company-wide reductions of just 12.5%. Intervention strategies at the pilot site targeted both the individual and the system through health risk assessment profiles, group- and self-directed lifestyle education, incentives and awards, and new policies, such as a restriction on smoking.

Parcel et al. (1989) described implementation of Bandura's Self-Efficacy Theory and Roger's Diffusion Theory in "Smart Choices," a tobacco prevention program in the schools. Their article focused on theory application; evaluation of program effectiveness is pending.

Community Factors

McLeroy et al. (1988) identified three distinct definitions for the concept of community: (a) mediating structures, (b) relationships among organizations and groups within a defined area, and (c) power structures.

Mediating structures include family, informal social networks, churches, voluntary associations, and neighborhoods. These are important influencers of the larger communities' norms and values, the individuals' attitudes and beliefs, and other health-related behaviors. Without their support, health-related change is difficult to achieve.

Units such as local voluntary agencies, governmental health providers, and schools are all examples of organizations and groups which form relationships within a defined area. Because health care is typically delivered by a combination of service agencies, these associations are crucial. Health promotion programs often rely on disparate groups working together in coalitions or loose coordination.

Governmental and political systems both represent important power structures. Successful program implementation may depend on effectively working with these entities to secure funding, pass legislation, and achieve active engagement of the bureaucracy.

Defining communities as more than groups of people living in geographic proximity allows a broader view of the factors which affect the success of health promotion programs.

Also, a focus on relationships provides an understanding of cultural differences, improving the fit of programs for ethnic and special interest groups. Likewise, recognition of both similarities and differences can enhance long-term coordination. Finally, effective politicking is an activity to be sought after, not discredited, by groups wishing to move the community toward health promotion. As in previous sections, here are examples from the literature of such programs.

Eng, Hatch, and Callan (1985) identified the black church as a Southern organization which could institutionalize a health promotion program. Professionals attempted to incorporate health activities into the church's ongoing events by turning over much of the decision making to congregation members, and by creating "Lay Health Advisors" to guide the process. However, the authors were disappointed to find continued reliance on outside professional support, leading them to conclude institutionalization was unsuccessful. Although the setting of the church reduces barriers to access, its use does not appear to have so far resulted in long-term institution-based behavior change.

Hersey, Klibanoff, Lam, and Taylor (1984) reported on the impact of California's innovative "Friends Can Be Good Medicine" public education campaign, whose goal was the promotion of health through enhanced social support. The effectiveness of the campaign was assessed using pre-, post-, and long-term follow-up interviews with a subject group of 340 adults in the Fresno media market. Comparisons between individuals exposed to the campaign and those who were not demonstrated a measurable increase in knowledge, attitudes, behavioral intentions, and support-enhancing actions. Follow-up interviews one year later revealed the gains were sustained. The campaign was most effective when several means of communication were used. Fresno City received the most intensive combination of community activities and media communications. As predicted, the greatest improvements occurred there, with support-enhancing behavior increasing from 42% to 59%. Smaller gains were achieved in areas which relied primarily on community implementation, and no strides were made where exposure to the campaign was limited to mass media.

Black and Hultsman (1990) used the Purdue Stepped Approach Model (PM) to alter cardiovascular risk factors in a community. This design calls for area-wide interventions followed by clinical interventions. Program components included a media campaign, toll-free referral number, and individual medical management. The authors cited a number of benefits: the ability to target a large number of people, cost-effectiveness, the focus on a participant's response to treatment, and the likelihood of lasting change. Individual differences were handled by emphasizing self-management and enhanced knowledge.

Orenstein, Nelson, Speers, Brownstein, and Ramsey (1992) reported on four evaluations of the Planned Approach to Community Health (PATCH) programs. PATCH evolved from the World Health Organization's (WHO) "Health for All" philosophy. In the United States, the Center for Disease Control (CDC) has been charged with implementing the PATCH model, a goal which it has attempted to achieve by strengthening state and local health departments' capacity to plan, implement, and evaluate community-based health promotion activities (Kreuter, 1992). The CDC's primary tactic has been to create mechanisms which increase community health education, with a secondary emphasis on technical support to community health educators. A number of problems with program implementation have surfaced including both lack of focus and funding, unrealistically short timelines, insufficient training for health educators, and disintegration of the communication network once funding priorities changed. Although the CDC has developed responses to some of these criticisms, lack of funding and competition for dollars remain unresolved issues. Kreuter (1992) called for public health leaders and elected officials to work together to increase PATCH resources.

DiGuiseppi, Rivara, Koepsell, and Polissar (1989) staged a successful community-wide bicycle safety program in Seattle which targeted helmet use. They employed a variety of strategies: media messages, modeling by local sports figures, and decreased cost of helmets via coupons. Program success was measured by street corner observation of helmet use in both Seattle and the control city of Portland, Oregon.

Winder (1985) described an intervention designed to eliminate spraying of herbicides and pesticides along rights-of-way within Leverett, Massachusetts. With the help of his graduate class, residents publicized the problem, launched a letter-writing campaign to local officials, and organized a number of local groups into the "Pesticide Forum." Their negotiations with the local utility resulted in a mutually acceptable compromise: (a) the posting of informal notices of "intent to spray," (b) the use of alternate methods of vegetation control, and (c) the designation of wetlands and buffer zones which could be cut only by hand.

Monahan and Scheirer (1988) analyzed the diffusion of information between a state dental health program and local schools. Basing their findings on Rogers' Diffusion Theory, they discovered state dental offices played a key linking role between federal government agencies, which produce information and program standards, and individual schools, which are responsible for implementation. Contrary to previous reports in the literature, they discovered sources external to the operational level exerted a strong influence on ultimate adoption. They believed their results confirmed the importance of an ecological approach to the diffusion of health promotion programs, employing multiple levels of influence to effect change. This perspective also implied that funding for agencies which act as linking agents directly impacts program implementation. The proportion of schools engaging in the dental hygiene program varied considerably between states, with the linking agent model explaining 59% of the variances.

Lalonde, Hooyman, and Blumhagen (1988) described a follow-up evaluation to the Wallingford Wellness Project (WWP). Implemented two years prior to this study, the WWP was a three-year community-based demonstration project. Health promotion education was targeted to elderly persons living outside nursing homes. Four main curriculum components were covered in a 21-week course: physical fitness, stress management, nutrition, and environmental awareness and action. Group process and integrated material were assumed to be essential characteristics of the program. Follow-up six months later demonstrated

sustained gains in the four main content areas. Other benefits included an increase in health information, and a decreased risk for heart attack and stroke.

Evaluation at three years identified sustained improvements in lifestyle habits and health information. However, several gains reported at the six-month follow-up were not continued: positive program effects on mental health, responsibility for health, appropriate use of health services, risk of heart attack and stroke, and overall health status. The authors concluded that, although immediate and short-term benefits were realized, long-term benefits were not. They recommended continued intermittent health education to sustain the original outcome.

Public Policy

Strictly speaking, public policy is not an educational activity, However, it has important implications for health education because of its relationship to funding, its role in setting health priorities, and the cultural implications of health laws (McLeroy et al., 1988). The use of regulations to protect the community is a trademark of public health. Perhaps the most famous example comes from London in 1848 when, to prevent the spread of a water-borne illness, cholera, Dr. Snow removed the handle from the town pump (Wilcocks, 1965).

There are many examples of modern-day public health regulations—the highly visible 55-mile-per-hour speed limit, prohibition of smoking in public buildings, and restrictions on the sale of alcohol and tobacco to minors—to name just a few. Public health laws can also act as behavioral incentives or barriers. For instance, increasing the cost of alcohol and tobacco have both been demonstrated to decrease use. Reducing the number of alcohol retail outlets can make liquor less available, ultimately reducing consumption. Gun control laws are also an important, albeit a controversial, public health strategy.

It can be argued that some public health regulations carry such a light fine and are enforced so loosely, that they are in essence just another means of education. For instance,

Alaska's seat belt law is a secondary offense. This means that officers check for their use only when a vehicle is stopped for another reason. Both the Alaska State Troopers and the Anchorage Police Department are encouraging their officers to enforce the law more strictly because it has become apparent they are giving it a low priority. Alaska's Child Occupant Restraint Law has experienced a similar fate.

In the broadest sense health education may play a role in informing the public about policy issues and encouraging participation in the process. McLeroy et al. (1988) believed professionals should become personally involved in the spectrum of policy development as leaders, implementers, and evaluators.

Summary

Health education today is both more and less than could be hoped for. Propelled by the wellness movement, programs have proliferated. Well-intentioned educators have in many cases been guided more by instinct and experience than theory.

Conceptualizing the health promotion movement according to the target of influence—intrapersonal, interpersonal, institutional, community, and public policy factors—aids in organizing the wealth of information available in the literature. As theory becomes more integrated with practice, health educators will be better able to measure results and duplicate successful programs. Models now reported in the literature can serve as effective guides in this endeavor.

Theories of Injury Control

Down by the salley gardens my love and I did meet;
She bid me take love easy, as the leaves grow on the tree;
But I, being young and foolish, with her would not agree;
She bid me take life easy, as the grass grows on the weirs;
But I was young and foolish, and now am full of tears.

W.B. Yeats

Injury: A Worldwide Public Health Problem

The International Perspective

At the turn of the century Henry Ford made the automobile synonymous with industrialdevelopment. Since that time motorized means of transport, in a wide variety of forms—from car to airplane to snowmachine—have gradually replaced their naturally-powered predecessors—the horse, ship, and dog team. Modern man has gained speed and convenience. But there has been a price to pay: an epidemic of injuries, primarily caused by motor vehicles.

Worldwide, injury has been recognized as a public health problem of the first magnitude. In 1977, the World Health Organization (WHO) adopted a multifaceted goals document entitled "Health for All by the Year 2000," based on the finding that globally health was unsatisfactory. WHO included injuries, among many other conditions, as a targeted area of focus. According to WHO's international data, unintentional injuries were the leading cause of death for children over age five, adolescents, and young adults. Besides mortality rates, other subjects of concern included the high rate of Years of Potential Life Lost (because injuries strike the young), disabilities caused by head trauma, and the economic impact. Motor vehicles were found to be the most common cause of injury, with males more at risk than females, and the underprivileged more vulnerable than higher socio-economic groups (World Health Organization [WHO], 1993).

Individual countries have also identified injury as a public health problem. In a recent study of New Zealand's health statistics, Langley and McLoughlin (1989) found that injury was the fourth leading cause of death, accounting for 32% of Years of Potential Life Lost (YPLL). Motor vehicle crashes caused 37% of the fatalities. The most common reason for an injury-related hospital admission was concussion, and together, skull fractures and intracranial injuries accounted for 21% of all injury-related hospitalizations. Despite these figures, Langley and McLoughlin (1989) lamented that "relative to other causes of mortality and morbidity the amount of attention (injuries) receive by public health professionals and the scientific community is minuscule" (p. 243).

An unintended consequence of economic development has been the rise of injuries caused by motor vehicles. (Health data gathering systems also mature as countries develop their economic systems. Escalating injury death rates may be in part an artifact of better reporting.) As one of the emerging economic powerhouses of the Far East, Taiwan provides an excellent example of this phenomenon. For more than two decades, since 1967, injury has been the third leading cause of death in that island nation. Considering YPLL, it is the leading cause of mortality. Taiwan also has a higher population-based injury mortality rate than the U.S.: 68.79 deaths per 100,000 per year as compared to the U.S. rate of 61.3 per 100,000 per year (Graitcer, 1992; Wu et al., 1991). More than half of all injury fatalities are caused by motor vehicle collisions, with motorcycles being the predominant mode of transportation.

Many other developing countries report statistics with alarming implications. In Egypt and Indonesia, injuries are the leading reason for admission to a hospital. Fatal injuries from motor vehicle events result in more YPLL in Thailand, Malaysia, and Singapore than deaths from malaria and tuberculosis combined. Population-based death rates from motor vehicle crashes in Botswana, Cameroon, and the Republic of South Africa are equal to or greater than U.S. rates. However, when the number of vehicles is used as the unit of analysis, *rather than* population, fatality rates for developing countries are 10 to 20 times the U.S. rate, with

Ethiopia and Nigeria reporting figures 50 times higher than the U.S. (Graitcer, 1992).

In conclusion, statistics reported from around the world document injury as a global public health problem. All countries report motor vehicle crashes as the most common cause of injury, and both New Zealand and WHO statistics reflect a heightened concern in the area of head injuries. Industrialized nations entered this era decades ago. Developing countries are experiencing a growing epidemic of injuries for which their national health systems are unprepared.

The United States Perspective

Documentation of the extent of the injury problem has been a major governmental objective in the United States over the past ten years. Before that, data were reported in the aggregate, separated only into unintentional (with motor vehicle broken out), homicide, and suicide injury rates. Trends over time, from 1950 to the most recently reported year, 1991, demonstrate a steady decline in the national unintentional injury mortality rate per 100,000 population. These numbers reflect the effectiveness of existing efforts, point to the potential for future improvements, and act as a guide for policy decisions (see Figure 1).

Note. From Healthy people 2000: National health promotion and disease prevention objectives by the U. S. Department of Health and Human Services, Public Health Service, 1990, Washington, DC: U.S. Government Printing Office.

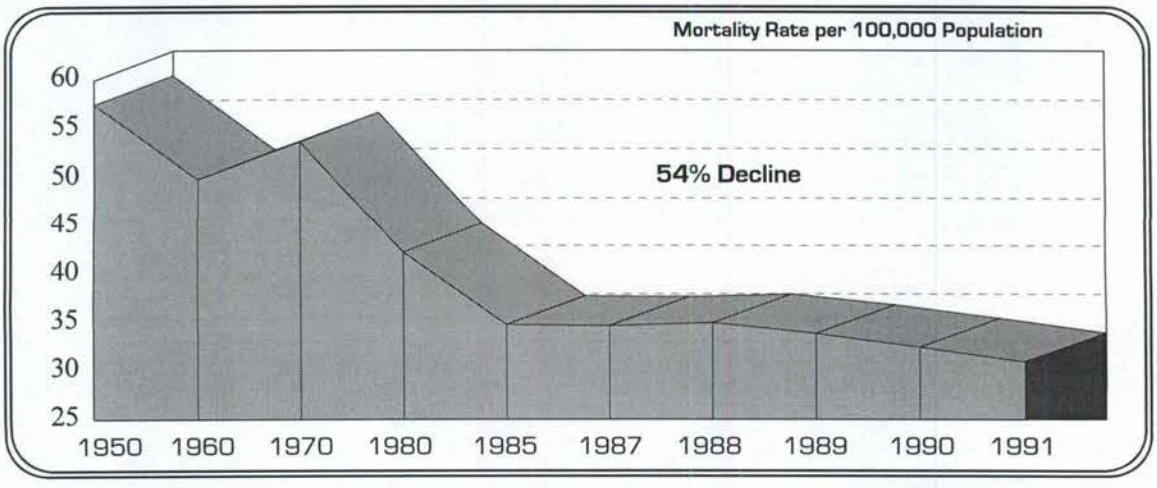


Figure 1. **Unintentional injury fatalities in the United States, 1950 - 1991.**

Mortality from motor vehicle crashes has not declined as significantly as the rate for all other unintentional injuries (minus MVA). In 1960, motor vehicle deaths represented 45% of the total unintentional injury mortality. By 1970, that figure had increased to 51%, and, by 1980 it had jumped to 58%, where it has stayed for over a decade (see Figure 2). In 1990, the fatality rate for firearm-related deaths surpassed unintentional injury mortality minus MVA rates for the first time although it remained below that for motor-vehicle-related fatalities.

Note. From Health, United States, 1993 by the U. S. Department of Health and Human Services, Public Health Service, 1994, Washington, DC: U.S. Government Printing Office

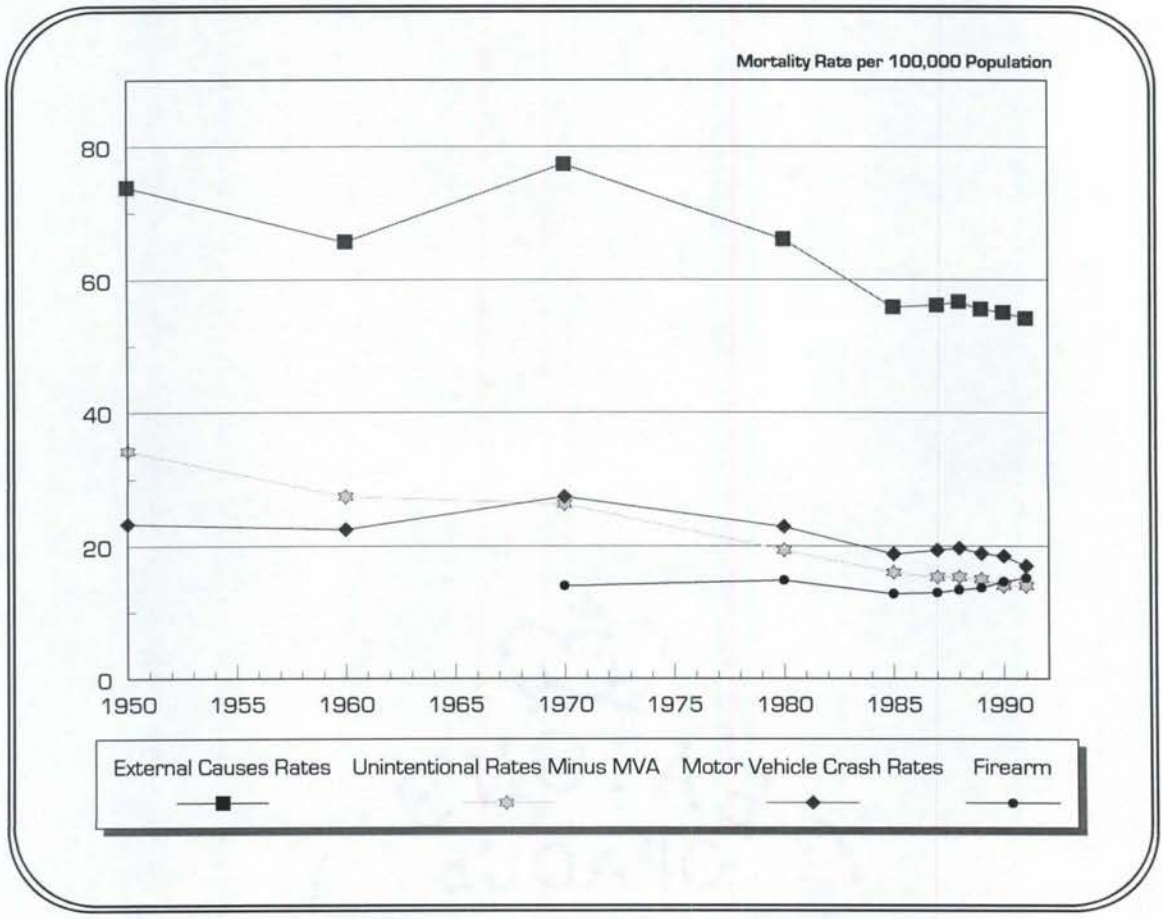


Figure 2. Comparison of total external cause rates, unintentional injury rates minus MVA rates, motor-vehicle-related death rates, and firearm-related fatality rates in the United States, 1950-1991.

In 1991, injury fell from its rank as fourth leading cause of death, a *status held for a*

decade, to fifth, behind heart disease, cancer, cerebrovascular accident (CVA), and chronic obstructive pulmonary disease (COPD). Within that statistic (between 1980 and 1991), unintentional injury rates fell 28% as a percentage of all external causes, but intentional rates (suicide and homicide) rose 22% . Also, the rates for intentional injuries remained static, whereas unintentional injuries declined both as a percentage of all external causes and based on the rate per 100,000 population.

However, because injuries strike the young disproportionately, Years of Potential Life Lost, a second picture of the problem, must also be considered (see Figure 3). In 1991, intentional and unintentional injury combined were responsible for 50% of the YPLL, with the next cause, cancer, being a distant second at 26%. This figure graphically portrays the impact of injuries on the young population, as compared to the effects of chronic diseases on middle-aged and elderly groups.

Note. From Health, United States, 1993 by the U. S. Department of Health and Human Services, Public Health Service, 1994, Washington, DC: U.S. Government Printing Office

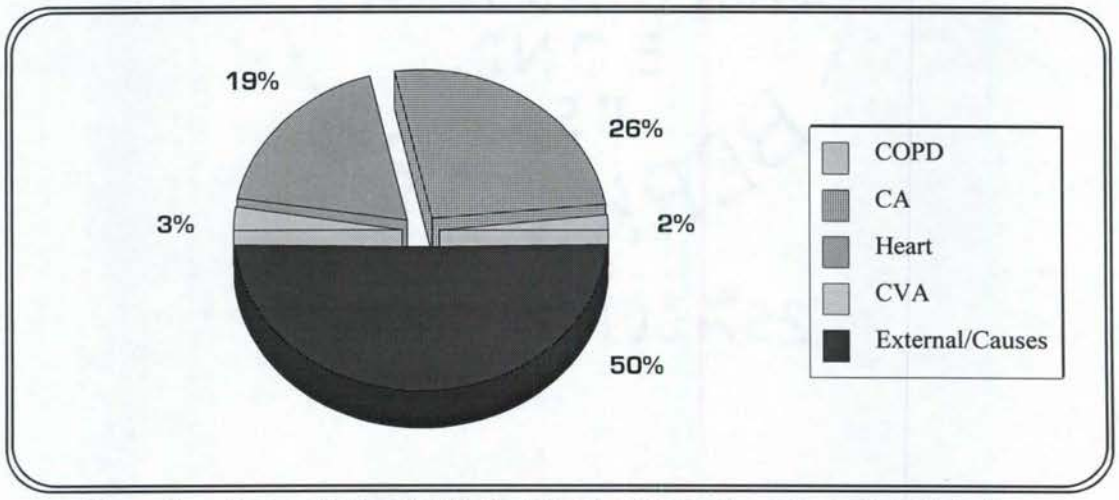


Figure 3. Years of Potential Life Lost for the five leading causes of death in the United States, 1991.

Although decades-long studies are available in only a few categories, focused research has identified key statistics which can guide policy makers and act as a baseline for measuring the effectiveness of future efforts. In 1989, the National Committee for *Injury Prevention* and

Control reported motor vehicles were the leading cause of injury death, and they were the most common cause of all deaths in the 1- through 34-year-old age group. (Motor vehicle codes report injuries to occupants of autos, trucks, and buses, to pedestrians struck by a motor vehicle, to motorcycle drivers and passengers, to bicyclists, and to drivers and passengers of off-road vehicles including all-terrain vehicles, snowmachines, mopeds, and mini-bikes. Data from the Fatal Accident Reporting System (FARS) are limited to crashes on public roads, whereas the Alaska Bureau of Vital Statistics and the Alaska Trauma Registry report both on-road and off-road events.) Almost as significant, motor vehicle crashes were responsible for the majority of cases of quadriplegia and paraplegia. In 1985, motor vehicle injuries alone produced $61.7 billion in lifetime costs to society (Rice & MacKenzie, 1989).

Long regarded as a "death-cycle" by emergency medicine practitioners, motorcycles are 20 times more deadly per mile driven than automobiles, as confirmed by recent reports. Also, in 1985, one in ten motor vehicle fatalities occurred on a motorcycle, resulting in an annual lifetime cost to society of two billion dollars (Runge, 1993).

As one of the most significant consequences of motor vehicle crashes, head and spinal cord injuries are gaining increased notice. Runge (1993) found that "head and spinal cord injuries warrant special attention and discussion . . . because of the profound long-term impact of these injuries on society" (p.244). Nationally, injuries to the head and spine combined are responsible for 13% of all trauma-related hospitalizations. In children, ages 0 to 14, this figure rises to 29% (Rice & MacKenzie, 1989). Head injuries also have a profound impact on long-term quality of life, with one study finding that only 72% of severely injured patients were able to return to the work force, whereas 95% functioned productively before (Morris, Sanchez, & Bass, 1991).

Spinal cord injuries present an equally alarming picture. Each year there are 10,000 new victims, 80% of them young men, who must face the challenges of adjusting to a lifetime in a wheelchair. As a result of medical technology, survival rates for those without nervous

control from the neck down (quadriplegics) have climbed to more than 94%, as compared to 20% in 1946 (Walker, 1991.) Implications for long-term medical costs and resource allocation to rehabilitative services are profound, with one author estimating that acute spinal cord injuries cost society four billion dollars each year (Walker).

In conclusion, injury deaths have been reduced by nearly 50% in the past four decades. Injury has also moved from its place as fourth leading cause of death to fifth. However, because injury affects the young disproportionately, it remains the leading cause of Years of Potential Life Lost. Also, the rates for intentional injuries remained static between 1980 and 1991, while the rates for unintentional causes declined. Therefore, intentional injuries have increased 22% as a percentage of all external causes. Fatalities related to motor vehicles have declined by only 27% during a time when injury deaths overall dropped by almost 50%. Because motor vehicle crashes are the predominant factor in serious head and spinal cord injuries, the economic and quality-of-life implications are particularly significant.

A variety of situations have been responsible for the overall decline in injury deaths. The trend of decreasing trauma deaths offers encouragement that safety measures work, and challenges further efforts. The lack of a proportional decline in motor-vehicle-related fatalities, as well as the fact that auto crashes lead to the predominant number of head and spinal cord injured survivors with severe disabilities, points to this as an area for more intensive research and program development.

The Alaskan Perspective

Alaskan injury rates. This writer's area of interest narrowed the focus to the state level in Alaska. In 1991, injury was the third leading cause of death in Alaska with an age-adjusted rate of 62.2/100,000, as compared to the national rate of 31/100,000 (Alaska Bureau of Vital Statistics [AKBVS], 1994). Although more than double the U.S. average, this statistic is a 39% decline from the 1980 figure of 97.3/100,000 (see Figure 4).

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

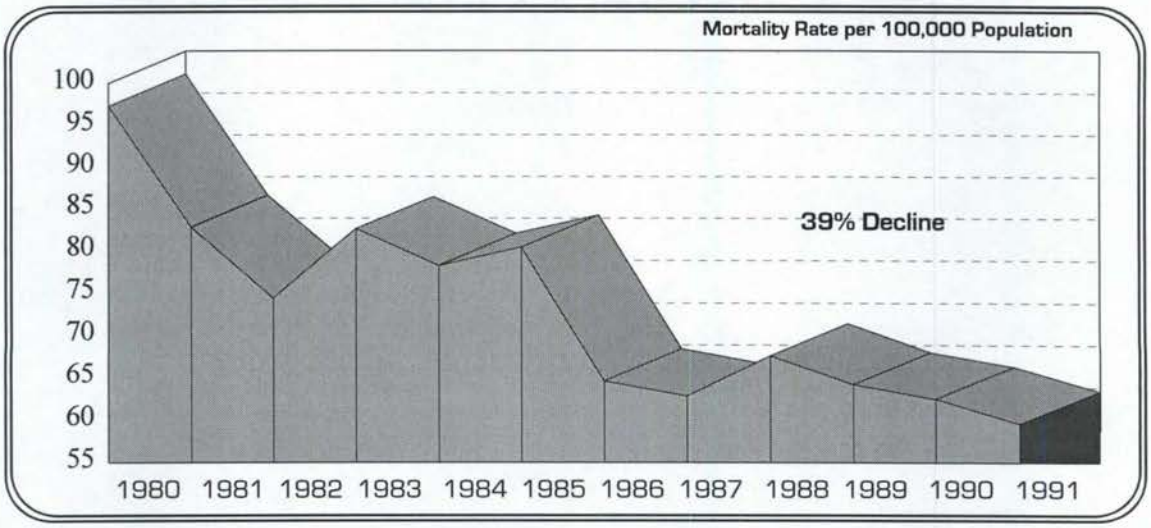


Figure 4. **Alaskan unintentional injury fatalities, crude rates, 1980 - 1991.**

During the same time, national unintentional injury death rates declined more slowly, by just 27% (see Figure 5).

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.
Health, United States, 1993 by the U. S. Department of Health and Human Services, Public Health Service, 1994, Washington, DC: U.S. Government Printing Office.

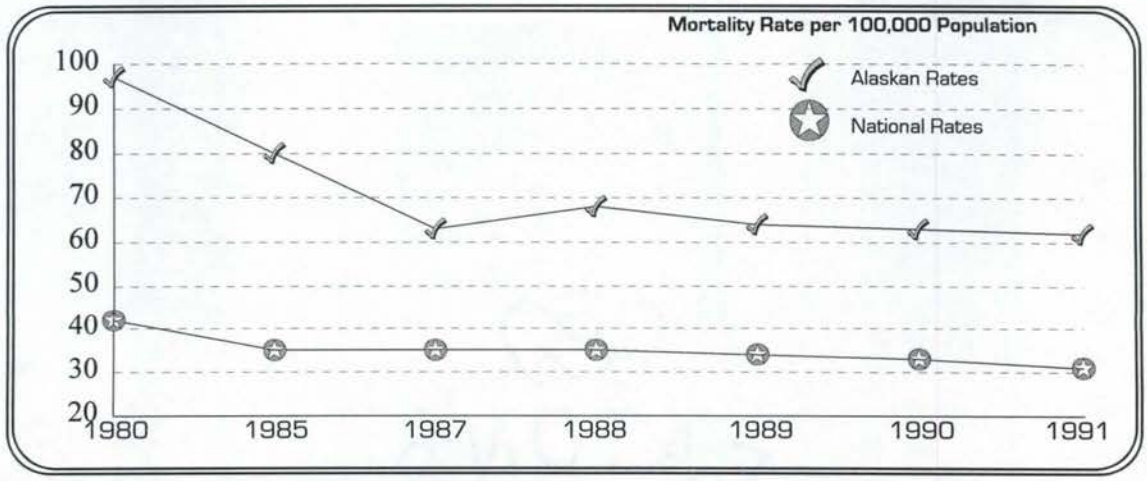


Figure 5. **Comparison of U.S. and Alaskan unintentional injury mortality rates, 1980 - 1991.**

Leading causes of injury in Alaska. Motor vehicle injuries are the predominant cause of traumatic death in Alaska (see Table 1), as they are for the U.S. as a whole. Also, for the most recently analyzed time frame, 1980 to 1989, they were the leading cause of mortality for ages 1 to 55 years (EMS Section, 1994).

Table 1

Leading Causes of Injury Fatalities in Alaska, 1988-1992

Injury Type	Sentinel Events, 5 Year Average
Motor Vehicle	122
Firearms, Intentional and Unintentional	120
Drowning/Boating	99
Aviation	46
Fall Injuries	23
Fire/Burns	21

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.
The Bureau of Vital Statistics, unpublished raw data, compiled by J. Crondahl, 1996.

However, in contrast to national trends, Alaskan motor vehicle fatality rates are rising (see Figures 6 and 7).

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

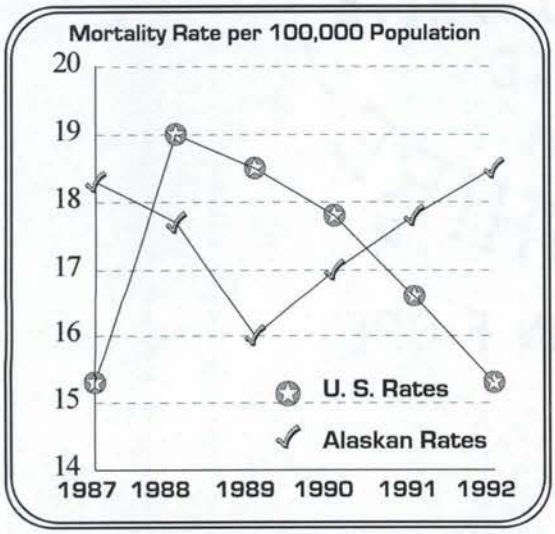


Figure 6. **Comparison of motor vehicle fatalities: U.S. and Alaska by population, 1987-1992.**

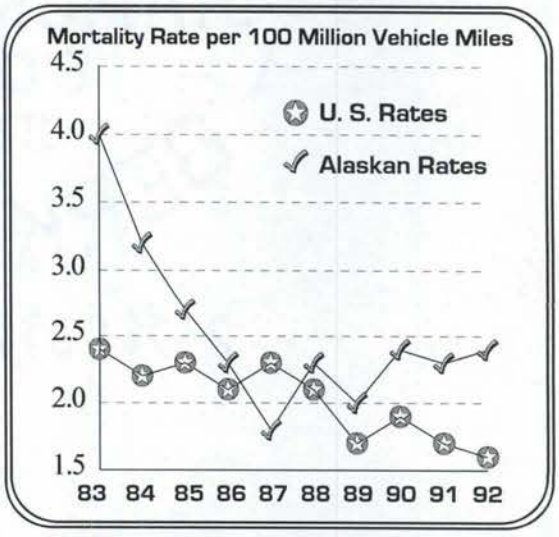


Figure 7. **Comparison of motor vehicle fatalities: U.S. and Alaska by vehicle miles, 1983-1992.**

Motor vehicle deaths can be further subdivided into five major categories. Table 2 displays the distribution of vehicle fatalities reported by FARS over a five year period.

Table 2

Motor-Vehicle-Related Fatalities Occurring on Public Roads in Alaska, 1988-1992[1]

Injury Type	1988	1989	1990	1991	1992	Total	Percentage
Automobile (occupant)	69	57	76	65	80	347	71%
Pedestrian	21	13	7	17	13	71	15%
Motorcycles	4	8	10	11	7	40	8%
Bicycles	1	2	1	3	0	7	1%
Off-Road Vehicles	**2**	**4**	**4**	**5**	**8**	**23**	**5%**
TOTAL	97	84	98	101	108	488	100%

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

The Alaska Trauma Registry, an injury surveillance data base managed by the EMS Section, began collecting data from all Alaskan hospitals in 1991. It provides detailed information on non-fatal injuries severe enough to require hospitalization or transfer from one hospital to another. Although there are plans to link the Trauma Registry with Vital Statistics fatality reports and with automated emergency department logs for non-admitted patients, these capabilities are not yet available. Table 3 summarizes motor-vehicle-related injury statistics collected through the Trauma Registry.

Table 3

Non-Fatal Hospitalized Motor-Vehicle-Related Injuries in Alaska, 1991-1992[2]

Injury Type	1991	1992	Total	Percentage
Automobile (occupant)	491	472	963	50%
Pedestrian	83	90	173	9%
Motorcyclist	71	66	137	7%
Bicyclist	94	103	197	11%
Off-Road Vehicle	**225**	**217**	**442**	**23%**
TOTAL	964	948	1912	100%

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

[1] Limited to public roadways.
[2] Includes all locations.

Of particular interest in Table 3 is the distribution of injuries caused by bicycles and off-road vehicles. Although the majority of injuries are associated with automobiles, the increased representation of bicycles and off-road vehicles is related to: (a) a more inclusive reporting system which incorporates injuries from all locations, not just public roads, and (b) less severe injuries associated with these modes of transportation. Based on these figures, all motor vehicle injury categories require attention, but the latter two, bicycles and off-road vehicles, warrant more focus than is implied by the mortality statistics alone.

A regional distribution can also be identified for motor vehicle injuries (see Table 4). This analysis creates the opportunity to tailor strategies for specific geographic areas.

Table 4

Regions in Alaska with the Highest Rates of Motor Vehicle Injuries, 1991-1992

Automobiles	Motorcycles	Bicycles	Snowmachines	All-Terrain Vehicles (ATVs)
Matanuska-Susitna Valley	Matanuska-Susitna Valley	Anchorage	NW Arctic	Bristol Bay
Copper River	Bristol Bay	Juneau	Norton Sound	NW Arctic
			Bristol Bay	North Slope
			Yukon-Kuskokwim	Norton Sound

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

Head and spinal cord injuries are the most serious consequence of motor vehicle collisions, both in terms of fatalities and long-term consequences for survivors. Nationally, the CDC estimates that vehicle crashes cause up to 50% of serious head injuries, and up to 60% of serious spinal cord injuries which result in permanent disabilities (cited in EMS Section, 1994). As Table 5 demonstrates, Alaskan statistics are consistent with those reported nationwide. Motor vehicle wrecks cause 46.2% and 56.2% respectively of all head and spinal cord injuries. Additionally, off-road vehicles are the second leading cause of both head and spinal cord injury within the motor vehicle group.

Table 5

Head and Spinal Cord Injuries in Alaska, 1991 - 1993

Injury Type	Head injuries			Spinal Cord Injuries	
	Raw Numbers	% of Total		Raw Numbers	% of Total
Automobile (Occupant)	528	26.3%		44	34.4%
Falls	456	22.7%		30	23.4%
Assault	384	19%		6	4.7%
Off-Road vehicle	**163**	**8.1%**		**19**	**14.8%**
Bicycle	90	4.5%		2	1.7%
Pedestrian	78	3.9%		3	2.3%
Motorcycle	69	3.4%		4	3%
All Other Causes	244	12.1%		20	15.7%
TOTAL	2012	100%		128	100%

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

In conclusion, Alaskan statistics point to injury as a serious and continuing public health problem. Injury is the third leading cause of death in the state, compared to its national position of fifth place. Injury deaths in Alaska have declined more rapidly in the past decade than nationwide rates, possibly due to the state's more recent development of an EMS System. However, Alaskan figures remain approximately twice the national ones.

Motor vehicle injury deaths in Alaska, like those in the U.S. as a whole, are the leading etiology of traumatic death, and, in 1980 to 1989, they were the leading cause of all mortality in persons age 1 to 55 years. In contrast to national trends, Alaskan motor vehicle fatalities are increasing. Although auto crashes remain predominant, hospitalization statistics suggest other important mechanisms, particularly off-road vehicle crashes. There is also a regional distribution for specific types of trauma. Because the most serious consequences are head and spinal cord injuries which result in disabilities, data on this type of outcome provide another important picture of the problem. Both individually and in combination, all indexes point to Alaskans as a population at risk for injury.

Demographic distribution of injuries in Alaska: age distribution. Injury in Alaska is a disease of the young, just like it is nationally. Because of the lower median age in the state, 29.4, as compared to the national figure of 33.1, injury has an even more devastating effect on life expectancy. Intentional and unintentional injury are also the only two categories of health statistics in which Alaskan numbers exceed national averages (see Figure 8).

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

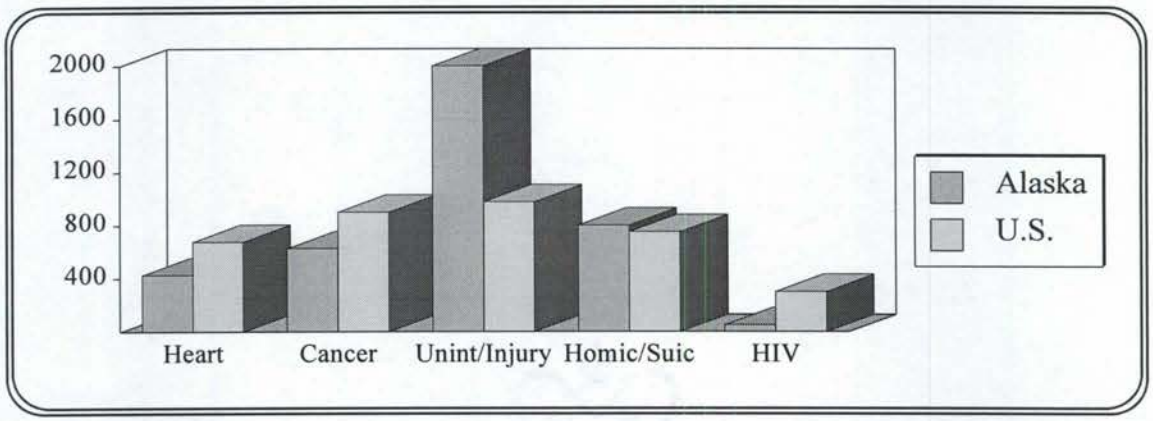


Figure 8. Leading causes of YPLL before age 65 per 100,000 population, comparison of Alaskan rates to national rates, 1991.

The Fatal Accident Reporting System (FARS) has documented the influence of motor vehicle fatalities on some of the youngest riders, ages 15 to 26 (see Figure 9). This age group has been impacted out of proportion to its representation in the population, with approximately twice as many injuries as might be expected.

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

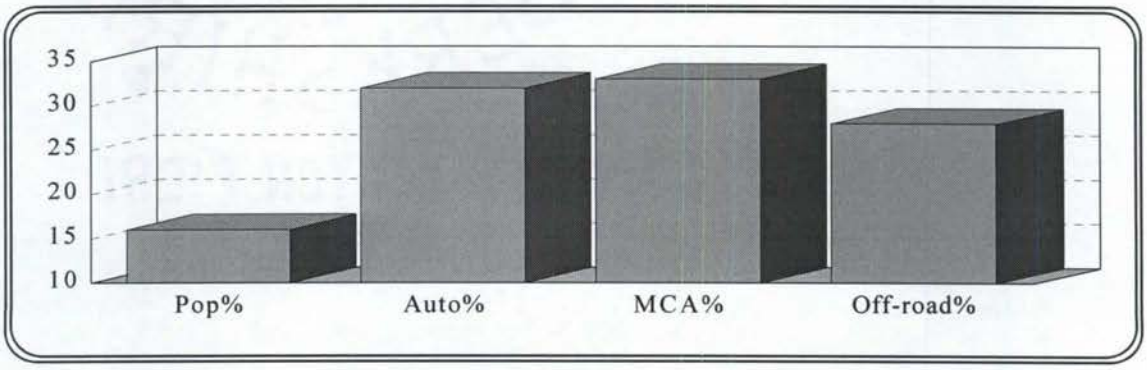


Figure 9. Comparison of the percentage of the Alaskan population ages 15 to 26 to the percentage of this population represented in fatality statistics for automobile, motorcycle, and off-road vehicle crashes, 1988 - 1992.

The median age of head and spinal cord injury victims for the years 1991 to 1993 also reflects a young population at risk (see Table 6). Of note is the small quantity of spinal cord injuries which makes this statistic unstable. The larger number of head injuries represents a better sampling size for calculating the median age for this type of trauma.

Table 6

Alaskan Statistics for Head and Spinal Cord Injuries, 1991 - 1993

Alaskan Injury Statistics	Number Injured	Median Age
Head	2178	27
Spinal Cord	27	33
Population Statistics Comparison		
Median Age USA		33.1
Median Age Alaska		29.4

Note. From "Traumatic head and spinal cord injuries in Alaska 1991-1993" by S. Warren, M. Moore, & M. S. Johnson, 1995, Alaska Medicine, 37, 11-19.

Proportionate to their percentage in the population, people under 35 were affected more often by head and spinal cord injuries (see Figure 10).

Note. From "Traumatic head and spinal cord injuries in Alaska 1991-1993" by S. Warren, M. Moore, & M. S. Johnson, 1995, Alaska Medicine, 37, 11-19.

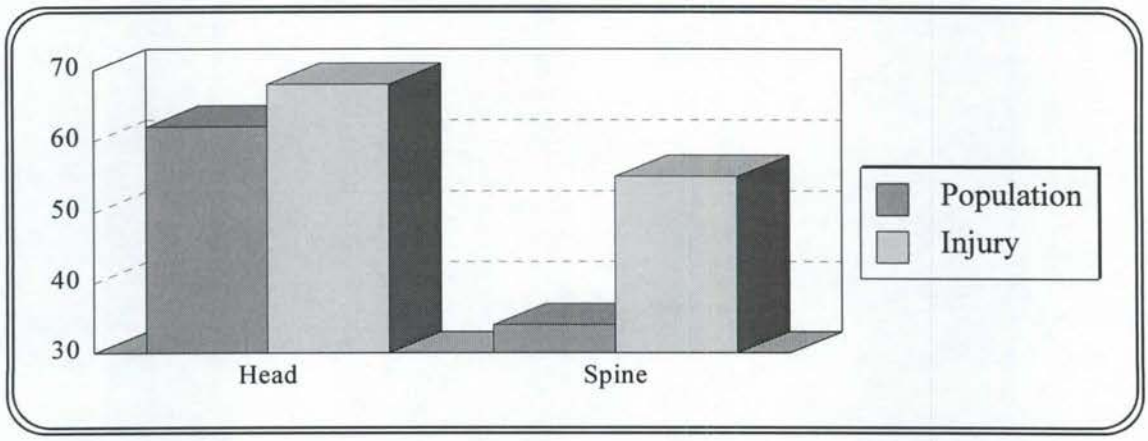


Figure 10. Comparison of the percentage of the population under 35 years of age to the percentage represented in head and spinal cord injury statistics, 1991 - 1993.

Finally, the greatest number of traumatic head injuries occurred in the 15- to 24-year-old age range, with an annual rate of 225.8/100,000, almost four times the national average. In the next decade, 25 to 34, the head injury rate plummeted to 155.8/100,000. Spinal cord injuries also peaked in these two groups, with 15- to 24-year-olds experiencing an annual rate of 12/100,000, and the rate for 25- to 34-year-olds rising to 14.2/100,000. Both statistics were at least five times the national average (Warren, Moore, & Johnson, 1995).

In conclusion, the age distribution of injuries in Alaska, especially motor vehicle injuries, and head and spinal cord injuries, reveals a consistent picture of a young population at risk. Youth are almost twice as vulnerable to a motor-vehicle-related fatality than might be expected by their population percentage. Young children, ages 5 to 14, are also two times more at risk for an auto crash than their cohorts in the lower 48 states. Years of Potential Life Lost reflects this devastating relationship, evoking Surgeon General C. Everett Koop's call to action, "If a disease were killing our children in the proportion that accidents are, people would be outraged and demand that this killer be stopped" (cited in EMS Section, 1994).

Gender distribution. Injuries affect men more often than women. In 1991, Alaskan men were almost three times more at risk for an injury-related death than women (see Figure 11).

Note. From 1991 Annual Report by the Alaska Bureau of Vital Statistics, 1994, Juneau, AK: Author.

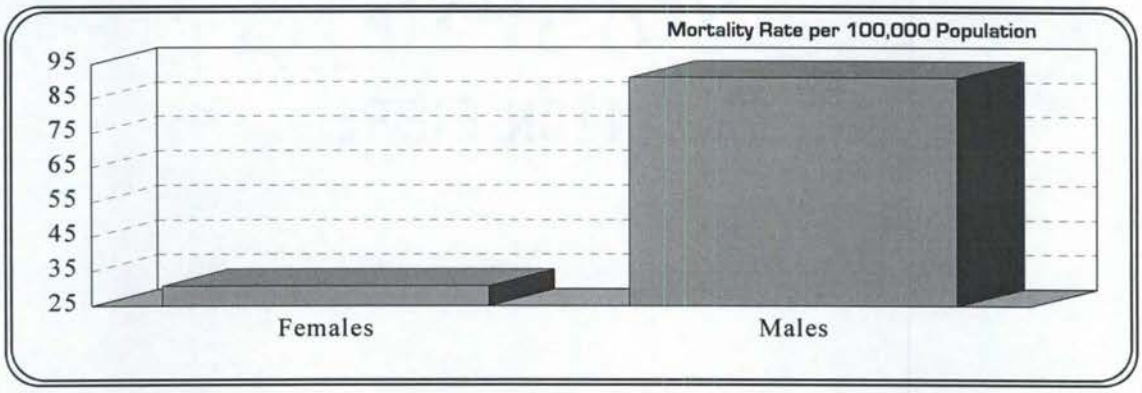


Figure 11. Comparison of the Alaskan female to male unintentional injury mortality rate per 100,000 population, 1991.

For the years 1988 to 1992, FARS reported that males were killed more frequently in motor vehicle crashes than females by a two-to-one ratio (see Figure 12).

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

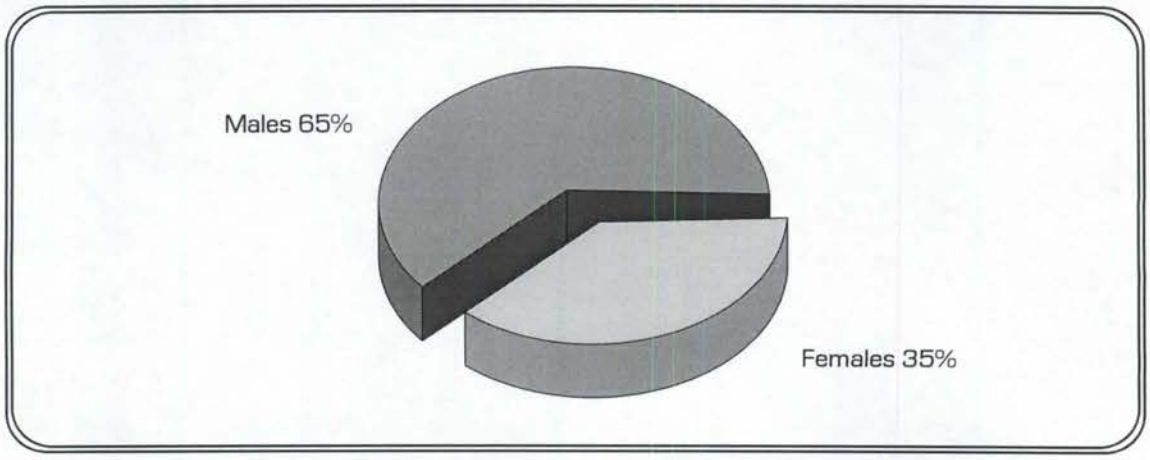


Figure 12. Comparison of the percentages of Alaskan male and female motor-vehicle-related deaths, 1988 - 1992.

Head and spinal cord injury statistics also reflect the influence of gender. Males accounted for 72.5% of all head injuries, and experienced a higher incidence than females for all ages. They also represented 83.5% of all spinal cord injury cases, and exceeded females in all categories except those over 65 (see Figure 13). Also, rates far surpassed the country's averages: double for head injuries, and triple for spinal cord injuries.

Note. From "Traumatic head and spinal cord injuries in Alaska 1991-1993" by S. Warren, M. Moore, & M. S. Johnson, 1995, Alaska Medicine 37, 11-19.

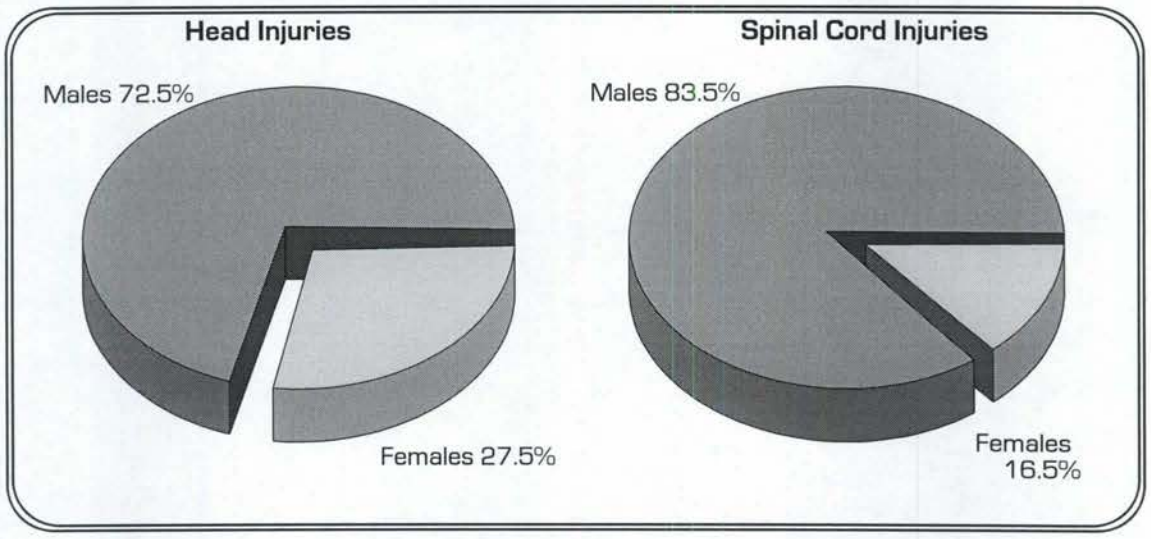


Figure 13. Comparison of the percentages of head and spinal cord injuries in males and females in Alaska, 1991 - 1993.

Young males, 15- to 24-year olds, are the population most at risk for head injuries, with an annual incidence rate of 312.5/100,000 population, approximately three times the Alaskan average and four times the national statistic. The next age group, 25 to 34, is most at risk for spinal cord injuries with an incidence of 24/100,000 population, a number approximately four times the composite Alaskan figure and ten times the national baseline (Warren et al., 1995).

In conclusion, Alaskan males are more susceptible than females to injury in general, and specifically to motor-vehicle-related injuries, and head and spinal cord injuries, by a ratio of

at least two to one in all cases. The combination of age and male gender reveals an alarming picture of a young, male, risk-taking population, with injury rates approximately four times the national average. Clearly, but sadly, the mythic image of a youthful male "easy rider," defying the odds, pushing the limits, is borne out by the injury statistics.

Ethnic distribution. In 1991, Alaskan Natives were two and a half times more likely to die from unintentional injury than non-Native residents of the state (see Figure 14). (Due to the small percentage of Afro-Americans and other groups in the population, Alaskan death rates for whites and minorities are reported as one figure. Native statistics combine Eskimo, Indian, and Aleut populations.)

Note. From 1991 Annual Report by the Alaska Bureau of Vital Statistics, 1994, Juneau, AK: Author.

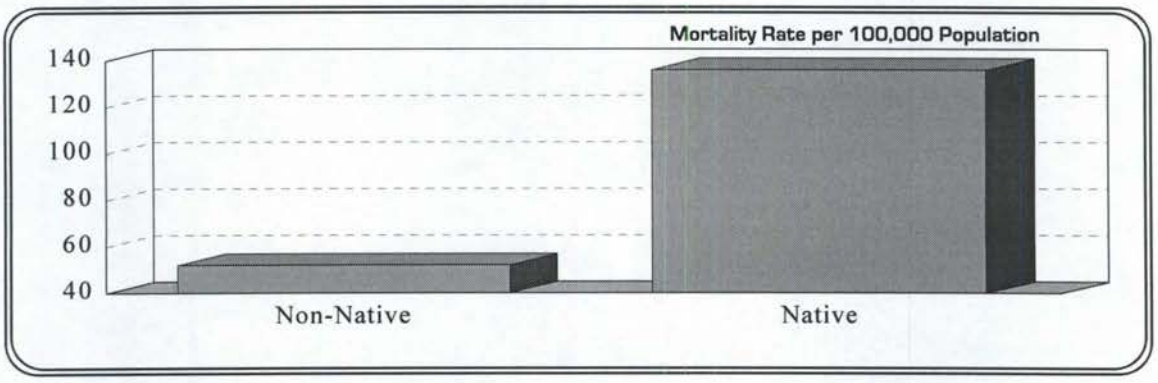


Figure 14. Comparison of non-Native to Alaskan Native unintentional mortality rates per 100,000, 1991.

Also, Alaskan Natives were killed more than two and a half times as frequently in motor-vehicle-related crashes as compared to their non-Native counterparts in 1991 (see Figure 15).

Note. From 1991 Annual Report by the Alaska Bureau of Vital Statistics, 1994, Juneau, AK: Author.

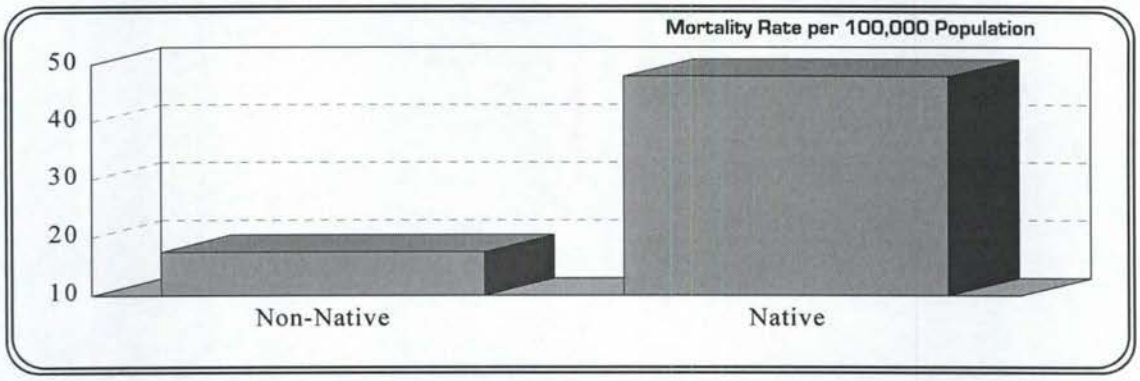


Figure 15. Comparison of the non-Native to Alaskan Native motor-vehicle-related mortality rate per 100,000, 1991.

Head and spinal cord injuries were also more common among Alaskan Natives. The incidence rate for head injury was 1.8 times that of the non-Native population, and the spinal cord rate was 1.3 times higher. Mechanisms of injury also varied between Natives and non-Natives. Automobile crashes were the leading cause of head and spinal cord injury in the non-Native population, whereas off-road vehicles were the most important motor-vehicle-related factor in head and spinal cord injury among Native groups (see Table 7). Also of note in this table is the dramatically higher incidence of trauma from off-road vehicles, bicycles, and pedestrian injury events for the Native population.

Table 7

Incidence Rates for Motor-Vehicle-Related Head and Spinal Cord Injuries Compared by the Major Racial Groups in Alaska, Native and Non-Native, 1991 - 1993

	Head Injuries		Spinal Cord Injuries	
Mechanism	Non-Native Rate	Native Rate	Non-Native Rate	Native Rate
Auto	30.4	30.1	2.9	2.4
Off-Road Vehicle	**5.2**	**35.2**	**1.1**	**2.8**
Bicycle	4.2	10.7	0.2	0
Pedestrian	3.4	12.7	0.1	0.8
Motorcycle	4.2	2	0.3	0

Note. From "Traumatic head and spinal cord injuries in Alaska 1991-1993" by S. Warren, M. Moore, & M. S. Johnson, 1995, Alaska Medicine, 37, 11-19.

In conclusion, as with the two other populations at risk, Alaskan Natives are also dramatically impacted by the injury epidemic. Of particular interest are the types of activities which place them in harm's way: off-road vehicle use, bicycle riding, and walking near public roadways. Given these factors, the U.S. Public Health Service's emphasis on reducing Native injuries appears to be well placed.

Rural versus urban distribution of head and spinal cord injuries. The statewide distribution of head and spinal cord injuries was recently described by Warren et al. (1995) in a study using the Alaska Trauma Registry. The authors found that although all Emergency Medical Services (EMS) regions exceeded the national averages, Anchorage, Alaska's only urban area, most closely approximated aggregate U.S. figures (see Table 8). (The national rate for head injuries/100,000 population is 79.3 to 89.2, and for spinal cord injuries is 2.4 to 4.3. With a population of 225,000, Anchorage also has the most stable injury rates.)

Table 8

Distribution of Head and Spinal Cord Injuries by EMS Region, 1991 - 1993

	Head Injuries		Spinal Cord Injuries	
EMS Region	**Raw Numbers**	**Annual Incidence Rate/100,000**	**Raw Numbers**	**Annual Incidence Rate/100,000**
Aleutian/Pribilofs	55	151.1	7	19.2
Anchorage	639	**91.3**	34	**4.9**
Bristol Bay	43	199.9	8	37.2
Copper River	25	302.5	5	60.5
Interior	447	160.7	15	5.4
Kenai Peninsula	198	158.9	26	20.9
Kodiak	51	123.8	3	7.3
Mat-Su	207	173.3	11	9.2
Northwest Arctic	31	166.7	3	16.1
North Slope	47	183.2	3	16.2
Norton Sound	47	187.6	3	16.2
Prince William Sound	39	176.5	1	45
Southeast Alaska	253	120.9	14	6.7
Yukon Kuskokwim	77	129.5	7	11.8

Note. From "Traumatic head and spinal cord injuries in Alaska 1991-1993" by S. Warren, M. Moore, & M. S. Johnson, 1995, Alaska Medicine, 37, 11-19.

Although Alaskan injury statistics are seldom reported in terms of "urban versus rural," possibly because Anchorage is the only truly urban area in the state, the distinction is an important one for assessing the context of injury prevention activities. In particular, pre-event and event strategies gain importance because of the distance and time delays associated with the primary post-event intervention, emergency medical services. In rural Alaska, it may take several hours for the ambulance to arrive, and, in communities which are not on the road system, the "plane may not fly" for several days due to weather. The "golden hour of trauma" exists only in Anchorage and perhaps the immediate vicinity of a few other cities such as Fairbanks, Juneau, and Ketchikan.

Conclusion. Injury is a predominant public health problem for the people of Alaska. Mortality rates are more than double the U.S. average, and in 1991 injury was Alaska's third leading cause of death. Within that category, motor vehicles were the leading factor, but contrary to national trends, Alaskan rates are increasing. Head and spinal cord injuries are the most significant consequence of a motor vehicle crash, and motor vehicle crashes lead to 46.2% and 56.2%, respectively, of all head and spinal cord injuries.

Off-road vehicles account for 5% of motor-vehicle-related fatalities in Alaska and 23% of all trauma-related hospitalizations. They are also implicated in 8.1% and 14.8%, respectively, of all head and spinal cord injuries. Alaskans between ages 15 to 26 are almost twice as prone to sustain an off-road injury as might be expected according to their representation in the population as a whole.

Statistics profile the populations at greatest risk for injury in Alaska as being young, male, Native, and rural. Unintentional injuries produce more Years of Potential Life Lost than all other leading causes of death combined, reflecting the young group impacted by the phenomenon. Alaska's median age for head injuries is 27 as compared to the U.S. statistic of 33.1 years of age. Males are two times more prone to sustain all types of injury as females, and are even more in jeopardy for head injuries at a ratio of three to one. Natives are 2.5

times more at risk than whites for all causes of injury combined, and seven times more susceptible to motor-vehicle-related head injuries. Also, rural areas of the state report head and spinal cord injury rates at least double that of Alaska's only urban center, Anchorage, whose statistics are roughly comparable to those of the lower forty-eight states.

According to *The Alaska Injury Prevention Plan*, the Northwest Arctic Borough leads all EMS regions in hospitalization rates for snowmachine injuries and is second for ATV-related hospitalizations. Demographic characteristics of the region mirror the factors which describe groups at risk for injury throughout the state: Native, rural, and young. The Northwest Arctic Borough's citizenry of merely 6,700 is dispersed over an area approximately the size of the state of Indiana. Residents are predominantly Iñupiaq Eskimo. Finally, as a whole Alaska Natives are a young population, having experienced a birth rate of 153% over the last 40 years. Their median age is 24, as compared to 29 for the remainder of the state, and 33 for the nation (U.S. Department of Commerce, 1993.)

In conclusion, the problem of off-road vehicle injuries in Northwest Arctic Borough is significant and worthy of further research and the development of intervention strategies. Given the demographic characteristics of the region, residents experience a heightened risk for all types of injury. Statewide, motor-vehicle-related injury rates are increasing, and as a component of that figure, off-road vehicle crashes represent 23% of all injury-related hospitalizations. Summary figures from *The Alaska Injury Prevention Plan* rank the Northwest Arctic Borough in first and second place respectively for snowmachine and ATV-related hospitalizations. The section to follow will describe the problem in greater detail, using unpublished raw data from the Alaska Trauma Registry, the Alaska Area Native Health Injury Surveillance System, and the Maniilaq Health Information System with the twin goals of providing a baseline and isolating factors which may distinguish the Northwest Arctic Borough from the rest of the state.

Off-Road Injuries in the Northwest Arctic Borough

The following section profiles off-road injuries in the Northwest Arctic Borough (NWAB), contrasting them to the rest of Alaska, as well as to specific regions within the state. Information was derived from three primary sources: the Alaska Trauma Registry, the Alaska Area Native Health Injury Surveillance System, and the Maniilaq Health Information System.

The Trauma Registry is an automated database managed by the State of Alaska which receives reports on all patients whose injuries were severe enough to require hospitalization or transfer from one acute-care facility to another. Gathering data statewide since 1991, system administrators adhere to rigorous standards promoted by the CDC.

The Alaska Area Injury Control Officer of the U.S. Public Health Service blends a subset of Trauma Registry data limited to Alaskan Natives with reports from Indian Health Service hospitals statewide to create the Alaska Area Native Health Injury Surveillance System. The data are cleaned a second time, reclassifying E-codes into more specific line items, e.g. a fall from a snowmachine identified as a "fall" is recategorized to "snowmachine" in this system.

Records at the Maniilaq Health Center have been automated since 1984, with a decade of health data now on-line. The hospital is accredited by the Joint Commission on Accreditation for Healthcare Organizations (JCAHO), and E-coding of records conforms to national standards identified by that agency. Included in this database are both inpatients cared for at the regional hospital and outpatients treated throughout the region. Data is collected by Community Health Aides, village residents trained to provide primary care, as well as professional providers at the regional acute care facility.

Turning first to a comparison of Northwest Arctic Borough with other Alaskan regions, Table 9 details snowmachine and ATV injuries from 1991 to 1993. The significance of the problem is readily apparent: NWAB ranks first in the state with the highest per capita rate of snowmachine injuries, second for ATV injuries, and second only to Bristol Bay for both categories combined. Rates are based on population figures and do not necessarily reflect

exposure, which would be more accurately described by the number of miles driven or vehicles per capita. Unfortunately, these figures are unavailable.

However, eye-witness reports from NWAB document that off-road vehicles are used both as the "family car" and a recreational vehicle, leading to high exposure. Although the actual number of cases is low, the small population base magnifies these figures to create a relatively high rate per capita. Anchorage on the other hand has a larger census, making its injury rate more stable.

Table 9

Distribution of Off-Road Injuries and Fatalities by EMS Region, 1991-1993

Region	Snowmachine			ATV			All Off-Road	
	Injuries		Fatalities	Injuries		Fatalities	Injuries	
	Number	Rate per 100,000	Number	Number	Rate per 100,000	Number	Number	Rate per 100,000
Aleutian/Pribilof	3	8	0	5	14	0	8	22
Anchorage	17	2	0	19	3	0	36	5
Bristol Bay	29	133	5	40	183	3	69	316
Copper River	6	71	0	5	60	0	11	131
Interior Region	67	24	7	37	13	1	104	37
Kenai Peninsula	14	11	3	21	17	3	35	28
Kodiak Island	0	0	2	12	29	2	12	29
Mat-Su Borough	67	55	4	41	34	2	108	89
Northwest Arctic	**32**	**169**	**5**	**24**	**127**	**1**	**56**	**296**
North Slope	16	85	0	20	106	0	36	191
Norton Sound	30	159	6	26	102	1	56	261
Prince William Sound	6	27	1	7	31	0	13	58
Southeast	0	0	1	15	7	2	15	7
Yukon-Kuskokwim	72	119	8	29	48	0	101	167

Note. From The Alaska Trauma Registry, unpublished raw data, compiled by M. Moore, 1995.
The Alaska Bureau of Vital Statistics, unpublished raw data, compiled by M. Moore, 1995.

Table 10 collapses regional data into a single figure for the entire state (NWAB is included) and compares it to NWAB. The statistics demonstrate that off-road vehicle injury rates in the region are 7.5 times higher than the state as a whole and that off-road

injury-related hospitalizations are nearly 4 times more common.

Table 10

Off-Road Injuries Statewide and in the Northwest Arctic Borough, 1991-1993[3]

Injury Type	Statewide			Northwest Arctic Borough		
	Number	Rate/ 100,000	As a Percent of Injury-Related Hospitalizations	Number	Rate/ 100,000	As a Percent of Injury-Related Hospitalizations
Hospitalized injuries	11,565			259		
Snowmachine injuries	376	21.9		32	169	
ATV injuries	308	18		24	127	
All off-road injuries	**684**	**40**	**5.9%**	**56**	**296**	**21.6%**

Note. From The Alaska Trauma Registry, unpublished raw data, compiled by M. Moore, 1995.

Data from the Alaska Area Native Health Injury Surveillance system paint an even more dramatic picture of the impact of off-road injuries. Compared to the Alaskan population as a whole, Natives are hospitalized with off-road injuries more than twice as often as other Alaskans, and Native residents of NWAB require inpatient care more than five times as frequently. Also, Iñupiaq in NWAB sustain nearly three times the number of snowmachine injuries as their Native brothers throughout the state (see Table 11).[4]

Table 11

Off-Road Injuries to Natives Statewide and in the Northwest Arctic Borough, 1988-1993

Injury Type	Statewide	As a Percent of Injury-Related Hospitalizations	Northwest Arctic Borough	As a Percent of Injury-Related Hospitalizations
All hospitalized injuries	4,103		333	
Snowmachine injuries	284	6.9%	65	19.5%
ATV injuries	266	6.5%	36	10.8%
All off-road vehicle injuries	**550**	**13.4%**	**101**	**30.3%**

Note. From The Alaska Area Native Health Injury Surveillance System, unpublished raw data, compiled by R. Perkins, 1994.

[3] Includes all Alaskan residents. Statewide reporting began in 1991.

[4] Statewide data on Native beneficiaries predates implementation of the Trauma Registry by three years.

Age distribution. As with injuries in general, off-road trauma is a disease of the young (see Table 12). The median age for Alaska Natives is 24, as compared to 29 for the state as a whole, and 33 for the nation (U.S. Department of Commerce, 1993). The mean age for ATV injuries among the Iñupiaq of NWAB, 21.6, falls well below the median age for Natives, although snowmachine injuries tend to occur more frequently to those in their upper twenties.

Table 12

Age Distribution of Off-Road Injuries to Natives in the Northwest Arctic Borough, 1988-1993

Vehicle Type	Injuries	Mean Age	Number under 18 Years of Age	Percent under 18 Years of Age
Snowmachine	65	27.5	13	20%
ATV	36	21.6	16	44.4%

Note. From The Alaska Area Native Health Injury Surveillance System, unpublished raw data, compiled by R. Perkins, 1994.

Contrasting age groups by decade between NWAB and the state as whole, Figures 16 and 17 depict trends for snowmachine and ATV injuries, respectively. For both vehicle types, NWAB displays a predominant peak in the 19- to 29-year age group as compared to the remainder of Alaska. Also, the rates for ATV injuries follow a different path in NWAB, rising in the 19- to 29-year age group as opposed to the rest of the state which apexes prior to that decade in the teenage years.

Note. From The Alaska Trauma Registry, unpublished raw data, compiled by M. Moore, 1995. (Figures 16 & 17)

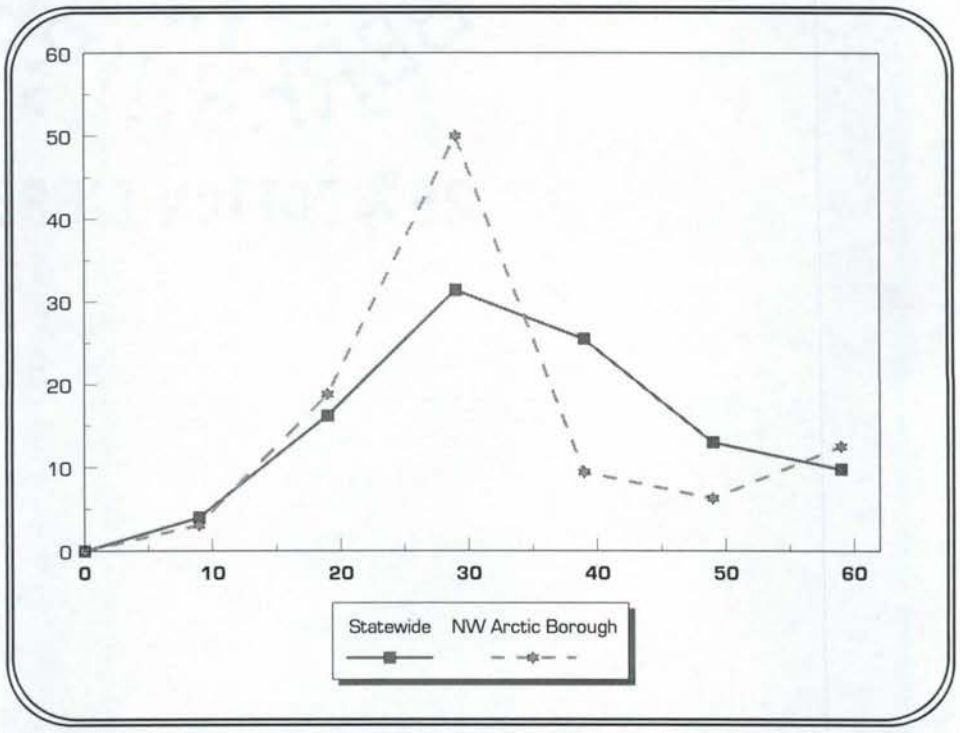


Figure 16. **Age-group distribution of injured snowmachine riders: comparison between statewide and Northwest Arctic Borough percentages, 1991-1993.**

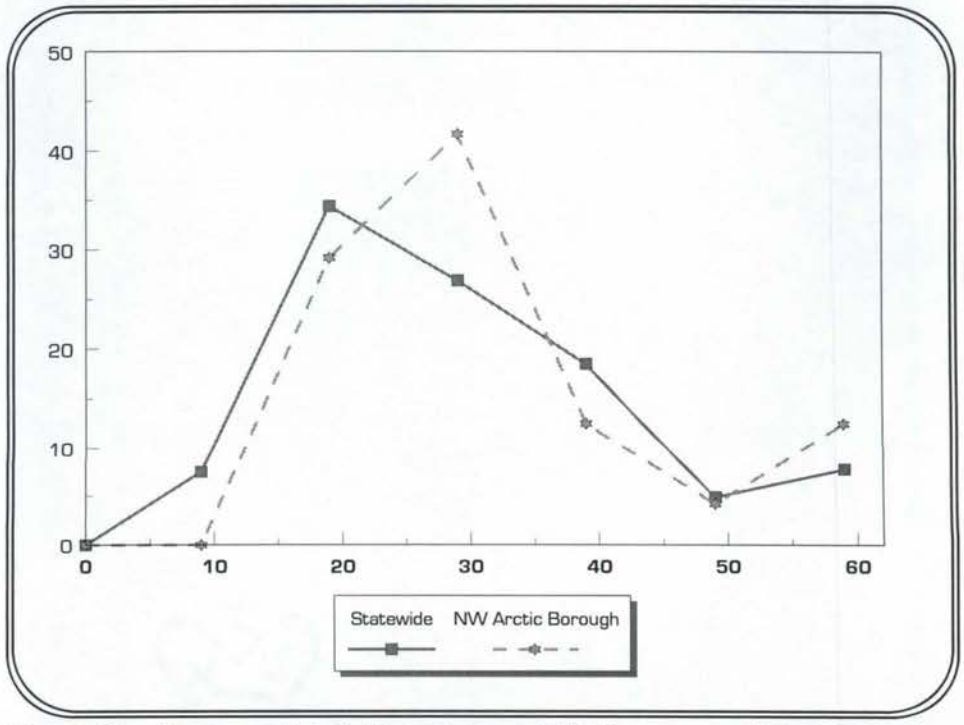


Figure 17. **Age-group distribution of injured ATV riders: comparison between statewide and Northwest Arctic Borough percentages, 1991-1993.**

Head injuries. Head injuries are the most serious and also the most preventable consequence of an off-road vehicle crash. Table 13 displays the frequency with which head injuries are associated with such events. In NWAB, fewer than one-in-five patients hospitalized following a snowmachine crash sustained a head injury. However, head injuries were implicated in more than one-in-three ATV-related hospitalizations. Helmet-use rates varied between the statewide population and NWAB residents. Virtually no NWAB crash victims (all types of patients) wore helmets. Relatively low rates also prevailed in other Alaskan regions.

Table 13

Percentage of Off-Road Crashes Which Resulted in Head Injuries Statewide and in the Northwest Arctic Borough, 1991-1993

Head Injury Etiology	Statewide		Helmet-Use Rate		Northwest Arctic Borough		Helmet-Use Rate
	Number	Percent	Percent		Number	Percent	Percent
Snowmachine	80	22%	12.8%		5	16%	0%
ATV	91	30%	6.5%		9	38%	0%

Note. From The Alaska Trauma Registry, unpublished raw data, compiled by M. Moore, 1995.

Gender distribution. The gender distribution of NWAB off-road crash victims echoed that reported for all injuries statewide. However, both ATV and snowmachine injury rates for females were higher than those seen elsewhere (see Figures 18-20). Statewide, males injured in ATV crashes outnumbered females by a ratio of three to one, but in NWAB that number dipped to two to one. NWAB statistics which included both clinic visits and inpatient stays displayed an even more dramatic gradient, with a nearly one-to-one ratio between males and females. Males hospitalized as a result of snowmachine crashes were more numerous than females by a ratio of four to one and three to one respectively, throughout the state and in NWAB. The inclusion of clinic visits drove the proportion back up to four to one for NWAB residents.

Note. From The Alaska Trauma Registry, unpublished raw data, compiled by M. Moore, 1995. (Figures 18 & 19)

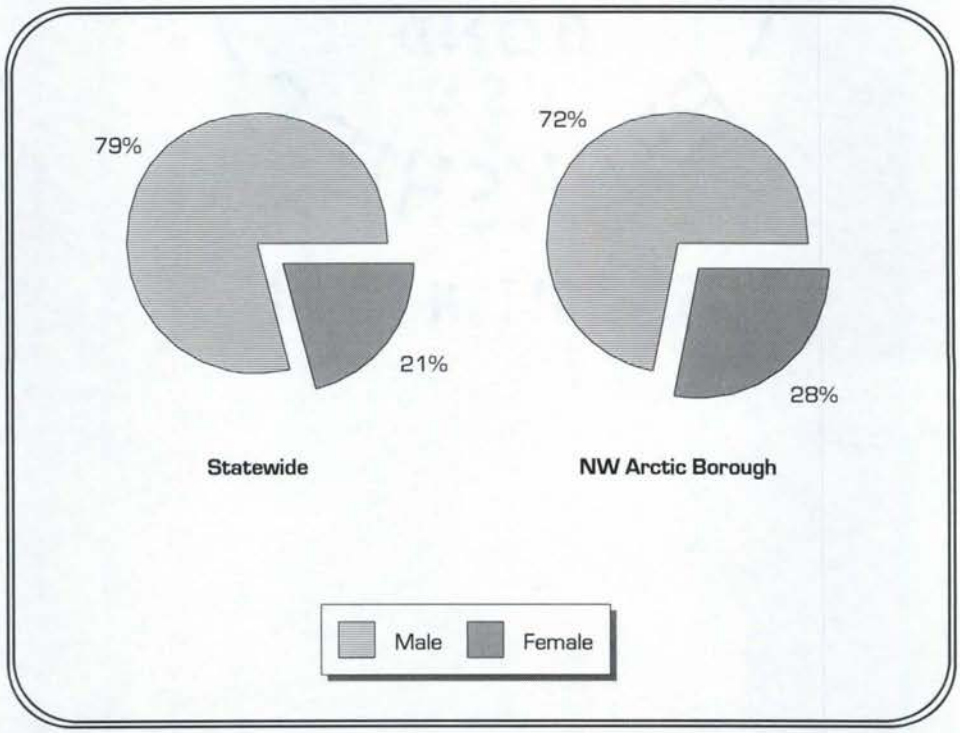


Figure 18. Gender distribution of injured snowmachine riders: comparison between statewide and Northwest Arctic Borough percentages, 1991-1993.

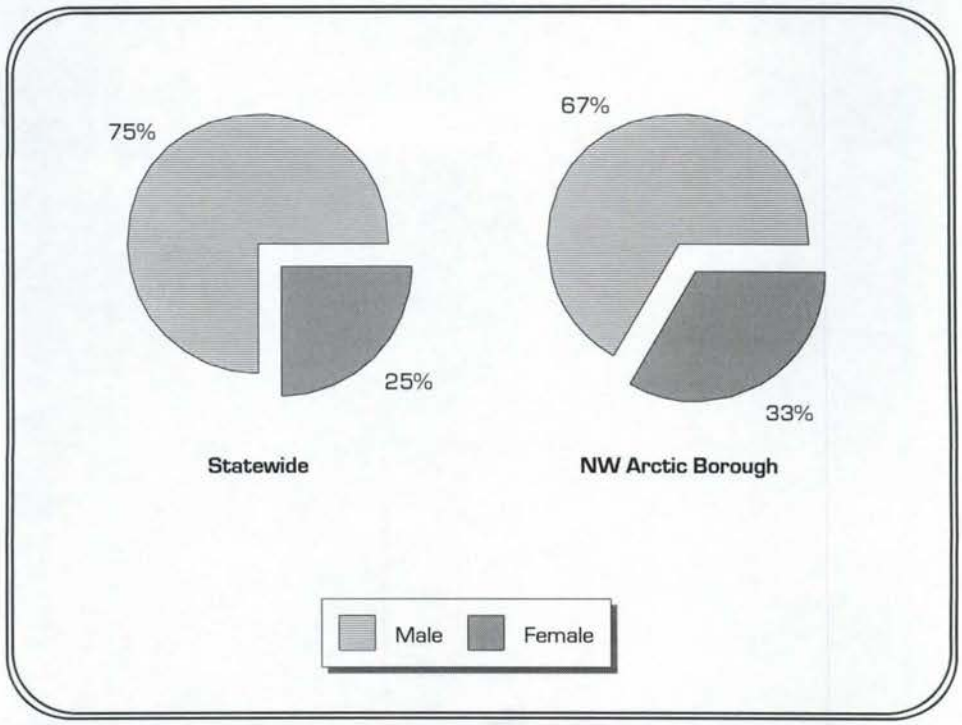


Figure 19. Gender distribution of injured ATV riders: comparison between statewide and Northwest Arctic Borough percentages, 1991-1993.

Note. From The Maniilaq Health Information System, unpublished raw data, compiled by N.C. Chijide, 1995.

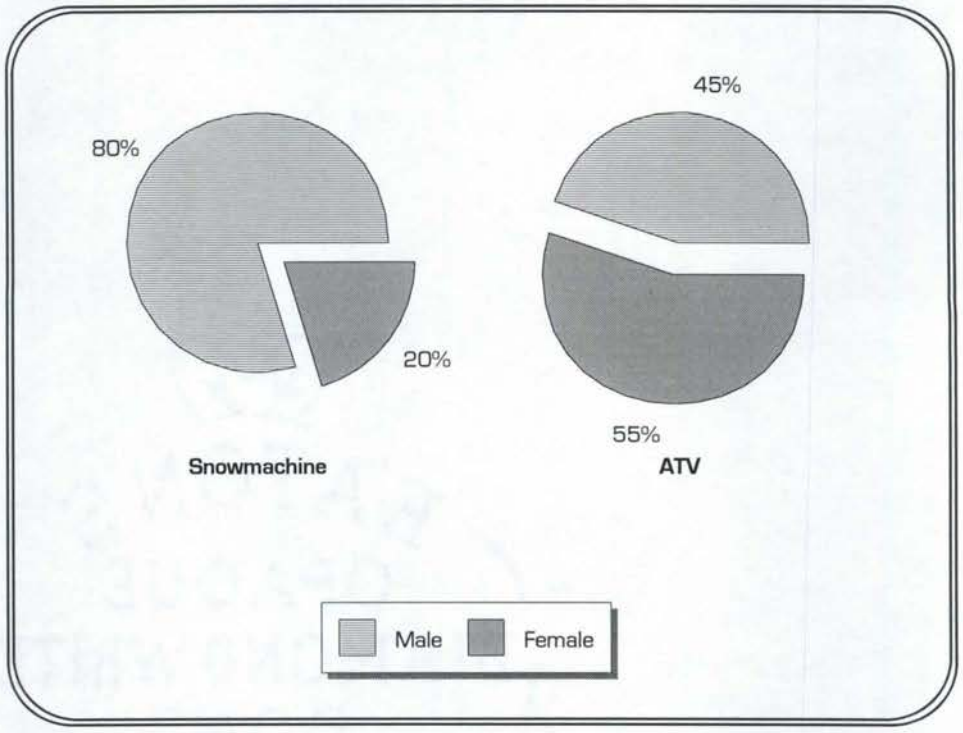


Figure 20. Gender distribution of injured ATV and snowmachine riders: clinic visits and inpatient stays in the Northwest Arctic Borough, 1984-1994.

Seasonal variations. Monthly trends in ATV and snowmachines injuries followed a predictable course, reflecting lifestyles in the region. Snowmachine injuries spiked in March, the winter month with the most daylight and mildest temperatures. ATV injuries rose in late summer, during the months when hunting and wood cutting were the most intense (see Figure 21.)

Note. From The Alaska Area Native Health Injury Surveillance System, unpublished raw data, compiled by R. Perkins, 1995.

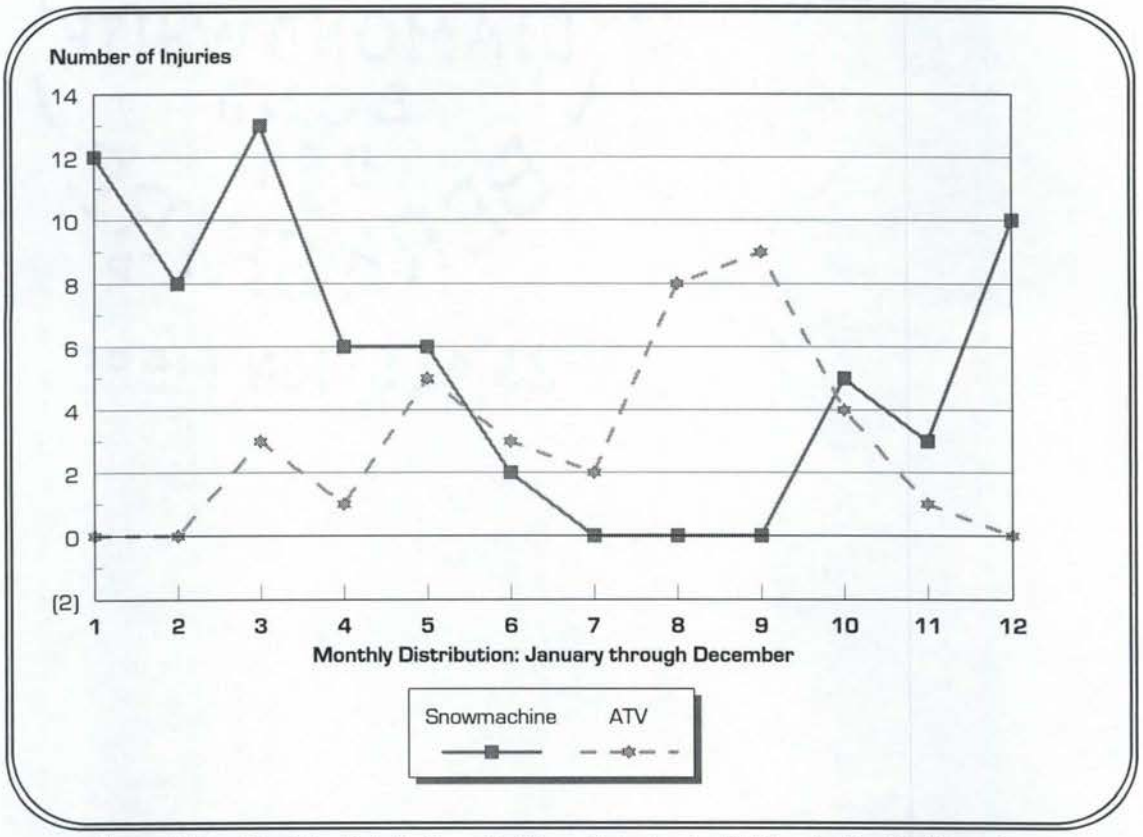


Figure 21. Monthly distribution of off-road injuries to Natives in the Northwest Arctic Borough, 1988-1993.

The location of off-road injuries. The Trauma Registry categorizes the location of events leading to an injury using a broad classification system. A comparison between NWAB and the state as a whole provides a sharp contrast. Statewide, snowmachine crashes occur more often in the wilderness than on roadways at a rate of 2.5 to 1. In NWAB, this drops to a ratio of 1.4 to 1. ATV crashes demonstrate less predilection for one locale, with the statewide ratio being nearly 1 to 1 between roadways and the wilderness. However, in NWAB far more ATV crashes occur on roads than outside town. The ratio is a dramatic 0.3 to 1 (see Figures 22-23). Unfortunately, between 12% and 25% of the patient records do not identify a location due to lack of attention to this detail by the first responders and the Health Aides who collected data on the injury event.

Note. From The Alaska Trauma Registry, unpublished raw data, compiled by M. Moore, 1995. (Figures 22 & 23)

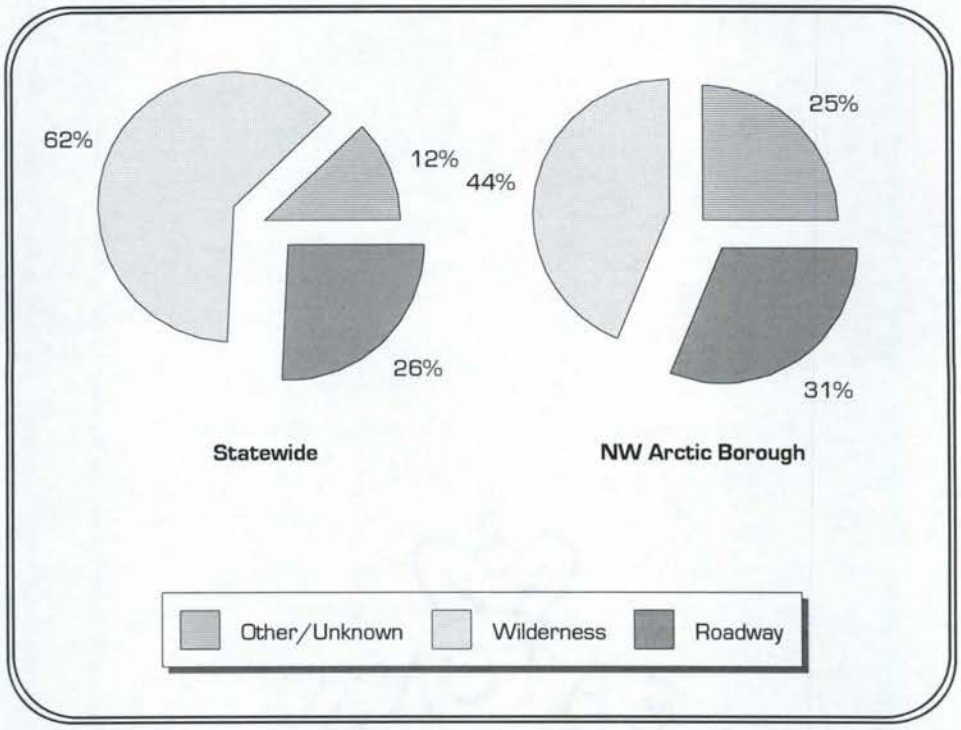


Figure 22. **Location of snowmachine crashes resulting in injury: comparison between statewide and Northwest Arctic Borough percentages, 1991-1993.**

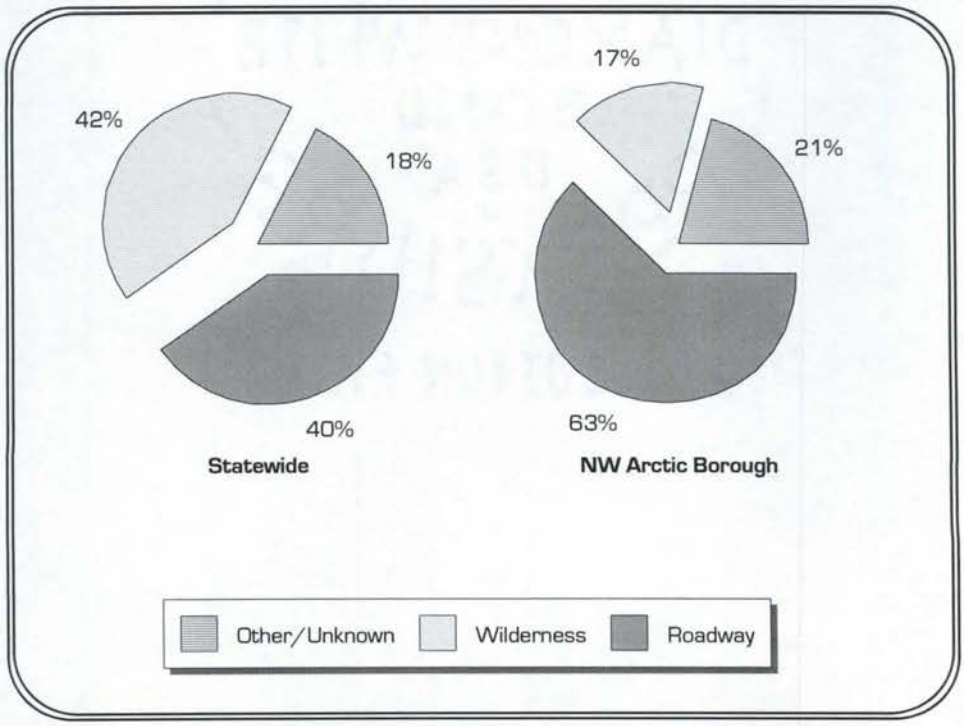


Figure 23. **Location of ATV crashes resulting in injury: comparison between statewide and Northwest Arctic Borough percentages, 1991-1993.**

Village-specific data. Statistics from the Maniilaq Health Information System provide a summary of total injuries treated in the region from 1984 to 1994 and head injuries related to off-road crashes with an additional breakdown for snowmachine and ATV injuries and gender. Raw numbers vary between communities, but off-road head injuries as a percentage of total injuries are within two standard deviations for all villages (see Table 14).

Table 14

Number of Injuries and Head Injuries Associated with Off-Road Vehicle Crashes in the Northwest Arctic Borough by Village, 1984-1994

Village	All Injuries	All Off-Road Head Injuries	
	Number	Number	As a Percent of Total Injuries
Ambler	199	13	6.5
Buckland	197	4	2
Deering	98	7	7
Kiana	228	8	3.5
Kivalina	210	18	8.6
Kobuk	56	1	1.8
Kotzebue	3,095	151	4.9
Noatak	269	13	4.8
Noorvik	365	27	7.4
Point Hope	397	29	7.3
Selawik	350	19	5.4
Shungnak	140	8	5.7
TOTAL	5,604	298	5.3

Note. From The Maniilaq Health Information System, unpublished raw data, compiled by N.C. Chijide, 1995.

Table 15 displays the number of head injuries related to snowmachine and ATV crashes respectively by both village and gender. This provides a baseline against which future trends can be measured.

Table 15

Number of Head Injuries Associated with Snowmachine and ATV Crashes in the Northwest Arctic Borough by Village, 1984-1994

Village	Snowmachine-Related Head Injuries		ATV-Related Head Injuries	
	Male	Female	Male	Female
Ambler	3	0	5	5
Buckland	1	0	1	2
Deering	3	0	2	2
Kiana	4	0	1	3
Kivalina	2	1	7	8
Kobuk	1	0	0	0
Kotzebue	43	12	39	57
Noatak	3	2	2	6
Noorvik	9	2	13	3
Point Hope	7	2	11	9
Selawik	7	3	2	7
Shungnak	3	0	2	3
TOTAL	86	22	85	105

Note. From The Maniilaq Health Information System, unpublished raw data, compiled by N.C. Chijide, 1995.

Conclusion. NWAB ranked first in the state for snowmachine-related injuries, second for ATV crashes, and placed second for both combined behind only Bristol Bay Region. Residents of NWAB were hospitalized five times more frequently with off-road injuries than the Alaskan population as a whole. Both ATV and snowmachine injuries peaked in the 19- to 29-year age group.

Head injuries occurred in more than a third of ATV crashes but fewer than one-in-five snowmachiners sustained a head injury. No injured riders from NWAB wore helmets as compared to relatively small percentages of helmeted riders from the remainder of the state.

More females were involved in ATV crashes in NWAB than their sisters in the rest of the state, and when clinic visits were considered, the gender ratio approached one to one. The male-to-female ratio of injured snowmachiners was roughly the same as that seen in other

regions in Alaska: four to one.

Crash locations differed between NWAB and other areas of Alaska. More ATVs crashed on roadways, and there were fewer injuries reported in the NWAB wilderness for both ATVs and snowmachines.

This section has dramatically profiled the public health challenges posed by off-road vehicles for the residents of NWAB. To create a more complete picture of the hazards which face riders of off-road vehicles, the next section will summarize reports from the literature which describe injury patterns among riders of off-road vehicles in other areas of the world. Articles come primarily from nations whose territories include arctic regions, such as Canada and the Scandinavian countries, and northern states of the United States.

Off-Road Vehicle Injury Patterns

During six winter seasons (1985-1991), patients treated at the Umeå University Hospital in Northern Sweden were screened for injuries related to snowmobiling (Björnstig, Öström, & Eriksson, 1994). There were 245 non-fatal cases and 104 fatalities. Fourteen percent of the survivors sustained injuries to the head or face, but 25% of those killed suffered head injuries. A collision with a solid object, such as a tree, was the most common mechanism of injury for both types of patients. Fatality situations also included reports of riders falling off the machine while traveling at high speeds, of snowmachines striking one another, and of riders falling off the snowmachine when it came to a sudden halt, e.g. when riding into a ditch. Helmet use was documented for 57% of the non-fatalities and 19% of the fatalities. (It was unknown in 50% of the fatality cases.) All but one of the fatality victims were male, and the median age was 32. The survivors were almost 75% male with a median age of 22.

Björnstig, Eriksson, and Mellbring (1984) described demographic characteristics of injured snowmachine riders in an earlier study also based in northern Sweden. They reported that males predominated over females by a ratio of four to one, and that over 75% fell in the 10- to 39-year-old age group. Also, nearly two-thirds of the crashes occurred on weekends

and three out of four happened during races or other recreational activities. Head or neck trauma was sustained by 17% of the injured riders. The most common causes for the crashes were uneven surfaces, reckless, high-speed driving, and poor visibility. Over 50% of the injuries occurred when the snowmobile collided with something, such as another machine or a ditch, or when the rider fell off the machine. Finally, nearly half of all crashes occurred in the late winter months of March and April.

Finnish Lapland was the site of a prospective study on the possible effects of the speed of the vehicle and of helmet use on the incidence of injuries to the head, face, and neck (Koskinen, 1994). Patients from three hospitals were screened, with 223 victims identified over a three-year period. Of these, 15% sustained head or facial injuries: 11 to the head, 13 to the face, and 9 to the neck. Helmets were used in 65% of the total cases. However, only 36% of those with head injuries wore a helmet. Vehicle speed was found to be below 40 kilometers per hour (kmph) in 48% of the cases, between 40 and 90 kmph in 44%, and equal to or greater than 90 kmph in 8% of the cases.

Also in Finland, all snowmobile injuries which occurred in the northern region of Lapland in 1992 were analyzed to determine injury location, with the finding that 12% affected the head and 4% affected the neck (Äijälä, Anttonen, & Niskanen, 1994). Finland adopted a helmet law for off-road vehicle riders in 1991, although some occupational groups, such as reindeer herders, were excluded. Comparison observations of helmet use in 1990, before the law was implemented, and in 1992, after it went into effect, found that the overall usage rate increased from 30% to 55%, with an even greater effect noted for young riders: a rise from 45% to 62%. However, helmet wearing by reindeer herders declined from 11% to 5%.

Hewitt, Solet, and Kiely (1995) described demographic characteristics of the victims of off-road vehicle crashes in New Hampshire between January, 1989 and February, 1992. (Since 1981, New Hampshire has required that all off-road crashes which result in an injury be reported.) During this time there were 188 nonfatal injuries and 13 fatalities. Victims were

predominantly males in their 20s who were using alcohol and driving at excessive speeds. None of the operators who were killed and only 7% of the survivors had attended a state-approved off-road vehicle safety course. Driving on a frozen body of water was associated with 56% of the fatality incidents and 36% of the nonfatality crashes. Injuries sustained in this environment occurred when the driver fell through the ice or when uneven terrain was encountered while traveling at high rates of speed. Also, 78% of the fatality crashes and 46% of the nonfatalities occurred after dark. The helmet-wearing rate was 63%, although approximately one-third of this information was based on self-report data of unknown validity.

Reporting from Wisconsin, Hargarten (1991) described the characteristics of 52 ATV-related fatalities which occurred between 1983 and 1989. Males predominated over females by a ratio of nearly six to one. Half of the cases involved riders younger than 18 years of age. Over 70% of the victims died from head and/or neck injuries, and more than 50% occurred between 4:00 p.m. and 8:00 a.m. The greatest number of cases was reported in March, followed by June and July.

Using a case-control method Rowe, Milner, Johnson, and Bota (1994) analyzed the association of alcohol and night driving with snowmachine fatality crashes. Auto and motorcycle fatality crashes were chosen as controls. Comparing 108 snowmobile fatalities with 432 car crash victims and 108 motorcycle victims from Ontario, they found that males with a mean age of 30 years predominated the population. Also, crashes more often occurred on weekends (67%) and during the night (82%). Excessive use of alcohol was documented in 64% of the cases, and after the fatalities were adjusted for their occurrence during periods of low-light levels, alcohol was the only independent variable associated with fatal outcomes.

A second study from Canada, this time in northern Newfoundland and Labrador, found a similar distribution of injuries among riders of snowmobiles (Hamdy, Dhir, Cameron, Jones, & Fitzgerald, 1988). Reviewing 310 hospital records over the years of 1969 to 1986,

the authors found the male to female ratio was more than three to one. Nearly 75% of the victims were under 30 years of age. Fewer than one in ten wore helmets at the time of the crash, and more than 25% sustained injuries to the head or neck. The most common mechanisms of injury were falling off the machine and collisions.

Conclusion. The demographic characteristics of injured off-road vehicle riders from around the world mirror those reported in NWAB. Males predominated by ratios as high as six to one. Youth was also a significant factor with one study reporting a median age of 22 for survivors and another finding over half of the cases involved riders younger than 18 years of age. Collisions were the most common events leading to injury. These included striking uneven surfaces, hitting another machine, and running into a ditch. Reckless, high-speed driving was also a significant factor, and one site found a high rate of crashes on frozen bodies of water. Finally, one article cited alcohol as the only independent variable associated with fatal outcomes.

In contrast to the helmet-use rate reported in NWAB, several northern climes found their citizenry wore helmets to a significant extent. Swedes who survived a crash were helmeted 57% to 63% of the time. Finns also wore helmets to a high degree, with 65% of the victims in one study found to be helmeted. A second article reported that Finland's helmet law had increased helmet use among all age groups.

The question remains: what tactics can be employed to reduce the tide of injuries? Subsequent sections will address this question by providing an overview of the science of injury prevention, reports from the literature on the effectiveness of helmets in a variety of settings, an insight into the cost-effectiveness of various injury prevention strategies, and finally a summary of programs which have been successful in increasing the use of helmets.

The Science of Injury Prevention

Within the past decade public health professionals and epidemiologists have turned their attention toward the investigation and control of injuries. In particular, they have focused on the relationships between the environmental cause—the agent—and the individual—commonly called the host. From this foundation, models have been constructed which allow for the systematic analysis of causal relationships and the potential impact of interventions.

Environmental, or extrinsic, causes of an injury can be divided into physical and socioeconomic categories, and their vector or vehicle. These influence exposure and vulnerability (Wilson & Baker, 1987). Host, or intrinsic, factors affect susceptibility to the agent. Almost any attribute of the host might be appropriately considered, but those commonly evaluated are age, gender, behavior, physiologic state, ethnicity, and pre-existing conditions.

Injuries are viewed within the framework of the transfer of energy. The host who is unprepared for, or cannot resist, this energy transfer will be harmed. Energy can be categorized into several forms: mechanical, thermal, electrical, chemical, and radiation. For instance, a host unprepared for the transfer of thermal energy will sustain a burn. Extrinsic factors, such as distance, clothing, time, enclosure within a building, and the temperature of the heat source influence the degree of thermal injury. Intrinsic factors such as age, body mass, health status, and behavior also affect the host's susceptibility to the thermal source and ability to survive a burn injury (Wilson & Baker, 1987).

Injuries can be prevented, or their severity reduced, by interrupting the transfer of energy. Haddon (1980) identified three stages during which this cycle can be disrupted: (a) pre-event, (b) during the event, and (c) post-event. For instance, using the example of ATV injuries, pre-event strategies might include building safer vehicles (four-wheel versus the unstable three-wheel), and segregating ATVs from other vehicular traffic. A helmet is an

example of an event phase intervention. Post-event activities are aimed at minimizing damage, and usually involve EMS, as well as other medical care.

Combining the three injury event phases with the classic epidemiological agent-host relationship, Haddon (1980) created a two-dimensional matrix which can be used to logically analyze intrinsic and extrinsic factors, as well as prevention strategies. Haddon's concept captured the imagination of the public health community and has come to be recognized as the foundation of injury control. Its primary contribution has been to balance the emphasis on public education with a focus on environmental change (National Committee for Injury Prevention and Control [NCIPC], 1989). The Haddon Matrix follows (see Table 16).

Table 16

The Haddon Matrix for Analysis of Injury Control Strategies

Event Phases	The Host (Human)	Vector (Vehicle)	Physical Environment	Socioeconomic Environment
Pre-Event	Driver's Vision Alcohol Use Education Experience Judgment Fatigue	Brakes, tires Center of gravity Jackknife tendency Speed of travel Ease of control Load characteristics	Visibility of hazards Road curvature and gradient Surface coefficient of friction Divided highways One-way streets Intersections Access control Traffic Signals	Attitudes about alcohol Laws related to driving under the influence Speed limits Governmental support for injury prevention efforts
Event	Safety Belt Use Osteoporosis	Speed capability Vehicle size Automatic restraints Placement, hardness and sharpness of contact surface and load containment	Recovery areas Guard rails Characteristics of fixed objects Median barriers Roadside embankments Speed limits	Attitudes about safety belt use Laws about safety belt use Enforcement of child safety seat laws Motorcycle helmet use laws
Post-Event	Age Chronic Medical Conditions	Fuel system integrity	Emergency communication systems Distance to and quality of EMS Rehabilitation programs	Support for trauma care systems Training for EMS personnel

Note. From Injury prevention: Meeting the challenge by the National Committee for Injury Prevention and Control, 1989, Oxford University Press: New York.

Once identified, injury prevention strategies can be further classified on an active-passive continuum (Wilson & Baker, 1987). Passive strategies prevent injury without action from the host. Inflatable air bags in automobiles and pedestrian over-passes are considered passive strategies. Moving up the continuum, smoke alarms are thought to be at least partially passive because they function continuously. However, action is required for their purchase, installation, and annual maintenance, and when they are activated, people must both hear the alarm and respond appropriately to the emergency situation.

Most difficult to implement are the so-called active strategies, such as ATV helmets, because they rely on voluntary, continuous behavior change. As might be predicted, ATV riders wearing helmets have been found to be in the minority. A recent study in six rural Alaskan villages found that only 7% of the respondents wore an ATV helmet the last time they rode. These self-report data were confirmed by observations within the villages (Sloan, 1992).

Injury prevention strategies fall into three major categories (NCIPC, 1989):

1. Education to persuade people at risk to take precautions, such as wearing a helmet
2. Legislation requiring behavior change, such as laws mandating the use of seat belts
3. Passive systems which require no further human action to provide protection, such as air bags.

As a community, injury prevention specialists prefer to focus on passive systems and legislation which requires behavior change (e.g. speed limits, car design changes.) The national movement toward seat belt laws and California's motorcycle helmet statutes are the most recent examples of public health legislation whose purpose is changing behavior.

Responses to the Epidemic of Injuries

International Initiatives

In 1989, WHO took an important step in its initiative to reduce injuries by creating The

Safe Community concept. Officially entitled the "WHO Global Programme for Accident Prevention," this international effort was committed to reducing the injury epidemic by fostering both personal and community self-reliance and self-determination. Organized through "Collaborating Centers" around the globe, "Safe Communities" have been established in Sweden, Scotland, France, Australia, and Thailand. Cities in those countries have agreed to grass-roots efforts which address local injury control issues (Klang, Andersson, & Lindqvist, 1990). Although the concept is relatively new, and the literature does not contain longitudinal data to document its effectiveness, WHO remains actively committed to universal dissemination through international conferences, promotional materials, and intensive community-based support from the Collaborating Centers.

National Injury Reduction Efforts

Injury reduction efforts have also been initiated at the national level. In 1955, a group of committed pediatric health care professionals mobilized a nationwide campaign in Sweden aimed at reducing childhood mortality from injuries. At that time Sweden's death rate from injuries exceeded that of the United States in the 1- through 4-year-old age group, and was similar in the 5- through 14-year-old age group. Their strategy was to encourage the promotion of child safety within the spheres of interest and expertise of existing organizations. Nationally, efforts were directed along three tracks: (a) development of a comprehensive injury surveillance system and of prevention research, (b) creation of a safer environment for children through legislation and regulation, and (c) distribution of a broad-based safety education campaign. Today, Sweden is looked upon as a model for all nations because it has achieved, after three decades of unremitting effort, the lowest childhood injury rate in the world (Bergman & Rivara, 1991).

On the other side of the globe in Australia, the state of Victoria has also received international attention for its own two decade-long program. Through a comprehensive set of

strategies, roadway mortality has declined by two-thirds. Specific interventions included: (a) driver's education, (b) tighter controls on driving licenses, including a demerit system, (c) expanded drunk driving laws, (d) speed limit enforcement, (e) mandatory seat belts (Victoria was the first jurisdiction in the world with such a regulation), (f) roadway engineering improvements, and (g) better emergency medical services systems for the management of injuries. Using the comparison of car-crash-related deaths per 10,000 vehicles, Australia as a whole, at 3.4 deaths/10,000, now compares favorably with its proximate neighbor, Papua New Guinea which reports 60 deaths/10,000 vehicles (Powles, 1992).

Although Canada's childhood injury mortality rates are lower across the board than those of the U.S., Macarthur and Pless (1990) reported that their regional and national health programs lacked the focus and direction necessary for injury control initiatives. Citing the emphasis on injury in a recently released policy document, *The Health of Canada's Children: A Canadian Institute of Child Health Profile,* they urged the adoption of strategies similar to those employed in the U.S. including: (a) clear governmental agency responsibility for injury control, (b) development of an injury surveillance system, (c) enforcement of current regulations, such as the child passenger restraint law, (d) public safety education, and (e) implementation of a nation-wide bicycle helmet campaign.

Echoing Canadian concerns, Manciaux and Tursz (1990) described France's lack of commitment to an injury control program. Injury is responsible for more than half of the mortality among people aged 1 to 24, but, lacking political will, France failed to enact a child passenger restraint law until 1990, three years after U.S. regulations were in place in all 50 states (Macarthur & Pless, 1990). Lobbying groups, including the automobile industry, alcohol producers, and manufacturers of household products, drugs and chemicals, exerted a powerful counterforce against improved French safety standards (Manciaux & Tursz, 1990).

In conclusion, the literature clearly shows that sustained prevention efforts, employing a variety of strategies such as policy initiatives, education, and community development,

reduce mortality rates. Recognition of the problem, belief that it is susceptible to a solution, and unremitting commitment are hallmarks of success. Nations such as Sweden and Australia, which made long-term commitments to reducing injuries, have achieved dramatic results. WHO's efforts to encourage grass-roots initiatives are modeled after effective national efforts. The results from successful programs can give direction to the efforts of developing nations whose national health systems are unprepared for the growing epidemic of injuries in their countries and point to a future where predictable, preventable injuries are controlled through science.

Injury Control Programs in the United States

Like Sweden and Australia, the United States has been looked upon as a leader in addressing the public health problem of injuries. In 1966, the National Research Council released a landmark study, *Accidental Death and Disability: The Neglected Disease of Modern Society,* which documented the nation's lack of progress toward reducing injuries or even gaining an understanding of the phenomenon. Unfortunately that first report did not catalyze national action. Almost 20 years elapsed, during which time 2.5 million Americans died traumatic deaths, before the nation once again turned its attention toward the injury problem (Committee on Trauma Research [CTR], 1985).

In 1983, Congress asked the National Academy of Sciences to prepare a report on injury, specifically looking at what was known, what areas would benefit from research, and how the government itself could be better organized to address the problem. As a result, the Committee on Trauma Research was formed, and a second landmark report was issued: *Injury in America: A Continuing Public Health Problem.* This seminal work documented both mortality statistics and an annual combined direct and indirect cost to society from injuries of $75 to $100 billion. Comprehensive recommendations included: (a) development of a center for injury control within the federal government, (b) research funding commensurate with the

level of the problem, (c) creation of statistical injury surveillance systems at all levels of government, (d) broad-based prevention strategies which included public education, and (e) improved medical care, both acute and rehabilitative (CTR, 1985).

Injury in America made a powerful case, and as a result, many of its recommendations have become reality. The Centers for Disease Control (CDC) was officially designated as the federal agency responsible for injury research and development of prevention strategies. Also, several regional injury control centers were funded, including ones at the Harvard School of Public Health, University of California, San Francisco campus, and Harborview Medical Center in Seattle. Despite lean federal budgets, an increasing percentage of CDC funding became available for "capacity building" grants which, it was hoped, would greatly improve capabilities at the state level.

Healthy People 2000: National Health Promotion and Disease Prevention Objectives was the United States's third cornerstone report on injury control. This document actually contained the second inclusive set of national health standards. The first, *Healthy People. The Surgeon General's Report on Health Promotion and Disease Prevention*, was released in 1977.

Healthy People 2000 brought together a statistical analysis of the nation's health status and research on risk factors to establish 22 health promotion and disease prevention objectives. In creating this document, the Surgeon General intended that all levels of government would use it as the basis for health planning for the following decade. Successful attainment of the objectives relies on a combination of strategies including health education, regulation, environmental design, and decreased exposure to hazards. Of particular interest, there are standards for: (a) unintentional injury rates as a whole, (b) rates for specific types of injuries such as motor vehicle crashes, nonfatal head injuries, and nonfatal spinal cord injuries, (c) risk reduction objectives, including use of seat belts, motorcycle helmets, and bicycle helmets, and (d) regulatory objectives incorporating mandates for wearing seat belts and

motorcycle helmets (Department of Health and Human Services [DHHS], 1990).

In conclusion, through the combined efforts of the Surgeon General and blue-ribbon committees, both the public and private sector have turned their attention to injury as a public health problem of the first magnitude. Injury fatality rates have responded to a variety of interventions including improved medical trauma care, safer product design, regulation, and public education. The strategies and statistics available in *Healthy People 2000* are comprehensive and can form the basis for both injury control efforts and analysis of their effectiveness into the next millennium. Unremitting effort is one of the hallmarks of success for injury reduction programs, and the U.S. appears to be posed to make significant gains as a result of this foundational work.

The Effectiveness of Helmets in Preventing Injury

Motorcycle Helmets

Numerous studies have demonstrated that motorcycle helmet wearing is effective in preventing head injuries or reducing their severity (Kelly, Sanson, Strange, & Orsay, 1991; May & Morabito, 1989; Murdock & Waxman, 1991; Offner, Rivara, & Maier, 1992; Shanker, Ramzy, Soderstrom, Dischinger, & Clark, 1992). These findings are based on comparisons of medical care and outcomes in populations of survivors who wore helmets versus those who did not. Nonhelmeted victims have consistently been more seriously injured, stayed in the hospital longer, required more costly treatments, and have been more prone to sustaining injuries which resulted in long-term disabilities. Also, nonhelmeted riders have been found to be 3.4-fold more likely to die than helmeted riders (Braddock, Schwartz, Lapidus, Banco, & Jacobs, 1992).

Motorcycle helmet laws have been associated with both increased helmet use and decreased mortality from head injuries (Fleming & Becker, 1992; McSwain & Belles, 1990;

Muelleman, Mlinek, & Collicott, 1992; Sosin & Sacks, 1992; Sosin, Sacks, & Holmgreen, 1990). In a nationwide study from 1979 to 1986, Sosin and Sacks (1992) found that states with helmet-use laws which were not age-limited ("full" helmet-use laws) consistently had lower head-injury-associated death rates than states without such laws. Fleming and Becker (1992) documented a 57% decline in motorcycle-associated head injury fatalities in Texas following re-enactment of a helmet law, as well as a 12.6% decrease in all motorcycle-related fatalities. Like Texas, Nebraska experienced a sharp drop, 22%, in serious head injuries associated with motorcycle crashes in the year following reenactment (Muelleman et al., 1992).

In a seminal study, McSwain and Belles (1990) demonstrated the effect of helmet law repeal, followed by re-enactment, in four states: Kansas, Louisiana, Colorado, and Oklahoma. They found that after repeal, motorcycle helmet use dropped from 99% to 50%. However, subsequent to reinstatement, the use rate climbed to greater than 95%. Conversely, fatality rates fell: (a) 62% in Louisiana, (b) 66% in Colorado, and (c) 42% in Oklahoma. In Louisiana, there was an 80% decrease in major hospital stays (longer than 20 days) and an 81% decrease in the cost of long-term disability. The cost savings from helmet use were also significant. Because 60% to 82% of non-helmeted riders have no health care insurance, the public (in 1989 dollars) was absorbing $4.9 billion annually, considering both direct and indirect costs. McSwain and Belles (1990) concluded that mandatory helmet legislation is by far the most effective strategy for decreasing death and disability from motorcycle wrecks.

In 1992, California expanded its motorcycle helmet law, which was previously restricted to youth under 15½, to include all ages. Following enactment of the regulation, fewer than 0.5% of motorcycle riders statewide were found to be nonhelmeted (Kraus, Peek, McArthur, & Williams, 1994). A comparison of fatalities between 1991 and 1992 demonstrated a reduction of 37.5% in 1992. The actual number of lives saved was estimated to be between 92 and 122. Also, a review of emergency department trauma records in 28 selected hospitals found that head injuries decreased 23.8% among nonfatally injured

motorcycle riders. Despite the low percentage of nonhelmeted riders (0.5%), almost 15% of the riders who were injured or killed were not wearing a helmet. The authors concluded that the implementation of a "full" helmet law significantly reduced both fatalities and serious head injuries.

Alaska failed to reenact a motorcycle helmet law in the most recent legislative session. Elected officials were heavily influenced by a well-organized lobby of motorcycle enthusiasts. Also, the executive branch opposed the legislation on the grounds of its supposed infringement on personal liberty.

Bicycle Helmets

Unlike motorcycle helmets, bicycle helmets are regulated much less widely. The first state-wide bicycle helmet law was enacted in Victoria, Australia in 1990 (Morbidity and Mortality Weekly Report [MMWR], 1993a), and the initial population-based study of its effectiveness appeared in the literature in 1994 (Cameron, Vulcan, Finch, & Newstead). Increases in helmet use and decreases in mortality were similar to those reported with motorcycle helmet laws. By the end of the first year, 75% of the population wore helmets, up from 31%. Helmet use by adults and young children exceeded 90%, with non-compliant teenagers depressing the overall statistics. During the first and second years of the law, insurance claims from bicyclists killed or admitted to the hospital decreased 48% and 70% respectively. Introduction of the law was preceded by a decade-long helmet promotion effort which incorporated mass media, support by professional organizations, and financial incentives. As a result of these strategies, public opinion shifted to support helmet use, an element that was believed to be crucial for the law's ultimate success.

Other jurisdictions, including two nations (Australia and New Zealand), two Canadian provinces, 17 states in the U.S., and 23 cities or counties in the U.S. have adopted bicycle helmet laws (Bicycle Helmet Safety Institute, 1996). However, they have not published reports

of the effectiveness of the strategy in either reducing injury or increasing helmet use.

Prior to the Australian report, studies of helmet effectiveness were retrospective or anecdotal in nature. In Seattle, Thompson, Rivara and Thompson (1989) reviewed 235 cases of head injuries to bicyclists and concluded that helmets reduced the risk of head injury by 85% and brain injury by 88%. An anecdotal study in Australia documented 64 occurrences in which riders wearing a helmet sustained an impact to the head during a crash. All serious head injuries, of which there were only three, occurred when the helmet came off, collapsed due to material defect (related to rider abuse), or when the rider was struck below the helmet's rim (Williams, 1991). In the United States, Wasserman and Buccini (1990) identified 191 recreational bicyclists who reported falling and striking their heads while cycling. Over half, 57%, were wearing helmets at the time. Helmeted riders experienced fewer skull fractures and soft tissue injuries than those not wearing helmets.

Helmets For Off-Road Vehicles

Although injuries from off-road vehicles represent a major public health problem in Alaska, the literature contains few studies which document the effectiveness of helmets in preventing head injuries on this mode of transportation. In the U.S., 18 states require all ages of ATV riders to wear helmets, and 9 states mandate helmet use by ATV riders under the age of 18 (Specialty Vehicle Institute of America, 1995). Also, one state, North Dakota, requires snowmobilers under the age of 18 to wear helmets (Alnsworth, 1993). Unfortunately, none of these jurisdictions have reported on the outcomes of their regulations in the literature.

The American study most often cited which documented the effectiveness of helmets for riders of off-road vehicles was retrospective. Analyzing data from both fatal and non-fatal ATV crashes, Rodgers (1990) concluded that helmets could reduce the risk of death by 42% and the risk of a non-fatal head injury by 64%.

Two other studies, conducted by European researches, also evaluated the influence of

helmets on head injuries for the riders of off-road vehicles. From the results of his prospective study in Finnish Lapland, Koskinen (1994) concluded that helmets protect riders from head injuries, but that neck injuries were not prevented by helmet use. He also conjectured that the severity of neck injuries, eight of which occurred at speeds between 40 and 90 kilometers per hour, might have been increased by the use of helmets which were designed for motorcycles, not snowmachines. He recommended further study of the helmet design.

Äijälä et al. (1994) conducted a field trial of eight different helmets, four open face and four full face, using reindeer herders and forestry students as subjects. They found that the most significant differences between the helmets were subjective in nature, not technical. Open-face helmets proved superior to the full-face helmets due to their lighter weight, increased visual field, ease of taking on and off, and adaptability to eye glasses.

In consideration of possible helmet redesign, subjects identified the following factors as the most important helmet features: (a) protection, (b) width of the visual field, (c) warmth, (d) no mist on the visor, (e) audibility of sounds, and (f) availability of hearing protectors and of two-way radios. In descending order, other important requirements included: (a) price, (b) weight, (c) design, (d) ease of taking on and off, (e) ease of transporting, (f) color, and (g) instructions. Based on their results, they recommended helmet redesign to both improve comfort, reduce weight, add hearing protection, and provide an information channel. They believed their findings also supported the European Union's initiative to develop separate standards for snowmobile helmets.

This gap in the literature may in part reflect the fact that helmets used by off-road vehicle riders are the same as those worn by motorcyclists. Also, speeds traveled by both types of vehicles are similar, resulting in a comparable energy vector. (Snowmachines are more commonly driven at high rates of speed—70 to 100 miles per hour—whereas ATVs tend to be used as family transportation at speeds of 15 to 40 miles per hour.) Therefore, studies of the effectiveness of motorcycle helmets may be generalized to off-road vehicle crashes.

Also, even though injury rates are significant, the opportunity to regulate helmet use is limited due to the very nature of off-road vehicles and the lack of enforcement opportunities.

Cost-Effectiveness of Helmets

Many safety strategies have proved effective in the past two decades, but their implementation has often come down to a dollars and cents issue. Although the CDC is directing unprecedented resources to combat the injury problem, grants to states remain extraordinarily competitive. Continuation of programs after federal grants expire is often problematic, considering the tenuous nature of many state budgets. Also, private grant funding is, in this writer's experience, almost non-existent.

Cost comparisons between various prevention strategies are therefore timely. Graham (1993) devised a cost-effectiveness ratio based on a program's budget divided by the estimated number of years of life saved. Costs were considered in toto, regardless of who bore them. Because injury inordinately strikes the young, Years of Life Saved was selected as the statistic which most accurately portrayed the impact to the population most at risk (see Figure 24).

Note. From "Injuries from traffic crashes: Meeting the challenge" by J. D. Graham, 1993, *Annual Review of Public Health, 14,* 515-543.

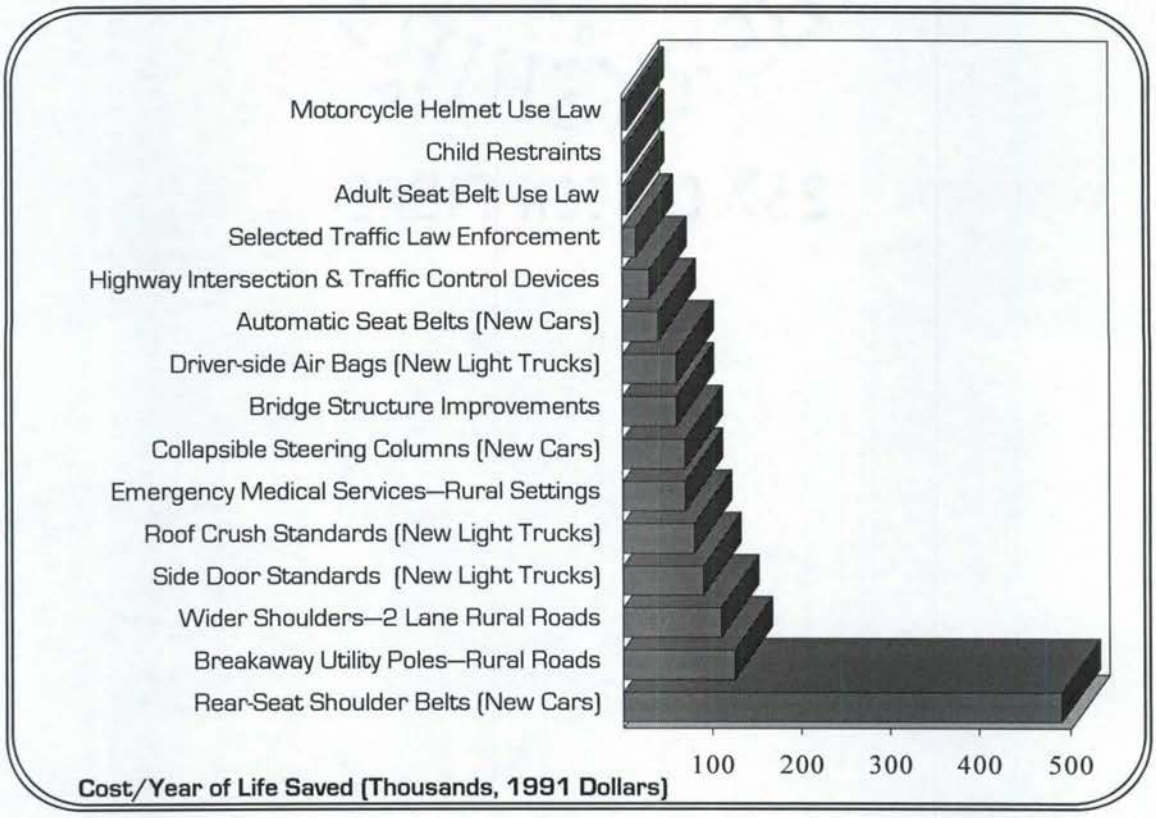


Figure 24. Cost-effectiveness ratios for traffic safety strategies in the United States.

As Figure 24 demonstrates, the strategies most commonly employed are also extremely cost effective, with the majority being well under $100,000 per life year saved. Graham (1993) found the investment in motorcycle helmet use laws, child restraints, and adult seat belt laws to be less than $100 per year of life saved. In comparison, treatment and prevention programs for heart disease also normally average under $100,000 per life year saved, but some occupational and environmental health regulations exceed that figure. Although ethical considerations cannot be discounted in the formulation of health policy, officials at all levels of government are actively seeking alternatives which provide "the biggest bang for the buck." Both in terms of lives saved and cost, it appears clear these well-known

strategies are also the best.

The cost of injuries to Alaska. The Emergency Medical Services Section (1994) estimates that injuries cost Alaska an estimated $390,492,000 annually. This conservative estimate was developed based on the finding that, in 1988 dollars, the annual national cost for injury was at least $180 billion. Included in these calculations were charges for medical care, rehabilitation, long-term care, administrative and legal costs, social services, and lost productivity (Max, Rice, & MacKenzie, 1990). The annual Alaskan cost of injury was derived using 1988 population figures and the assumptions that both injury rates and prices were the same for the U.S. and Alaska (EMS Section, 1994). (In fact, the injury rates are higher, and the Alaskan living allowance set by the federal government is 25% above baseline.) It was also reported without an inflation factor for the six intervening years.

As both the private citizen and the public sector seek ways to balance government budgets while still providing essential services, the cost of injuries to society should not be disregarded. Although dollars spent on acute care, social services, and rehabilitation help the victim, injury itself benefits no one. On the contrary, injury exacts a steep physical, emotional, and economic price. Counterarguments to injury control regulations are often couched in freedom-of-choice rhetoric. Overlooked is the true cost of injuries and the toll they take on individuals, the family unit, and society as a whole.

The Use of Helmets by Alaskans

Data from both the Trauma Registry and FARS have provided a picture of motorcycle helmet use by crash victims (see Figure 25). Although no observational data are available, other states have found that these sources correlate with actual use rates (M. Moore, personal communication, August, 1994). Both data bases report a lack of widespread motorcycle helmet use by Alaskans.

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

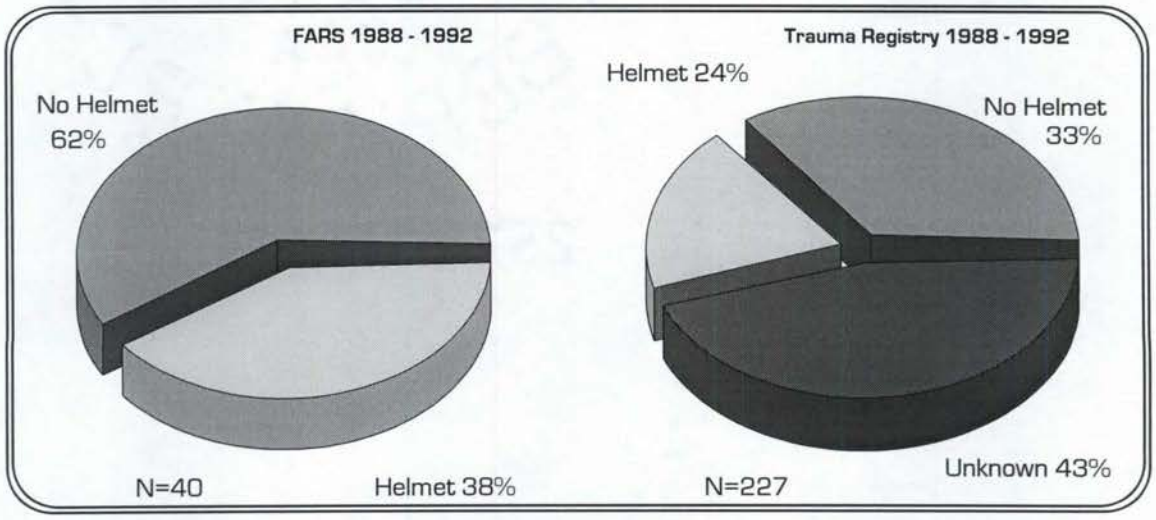


Figure 25. Use of motorcycle helmets in Alaska based on FARS and Trauma Registry data.

A report on bicycle helmets is available from just one source, the Trauma Registry (see Figure 26). Bicycle helmet use appears to be even less pervasive than motorcycle helmet use.

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

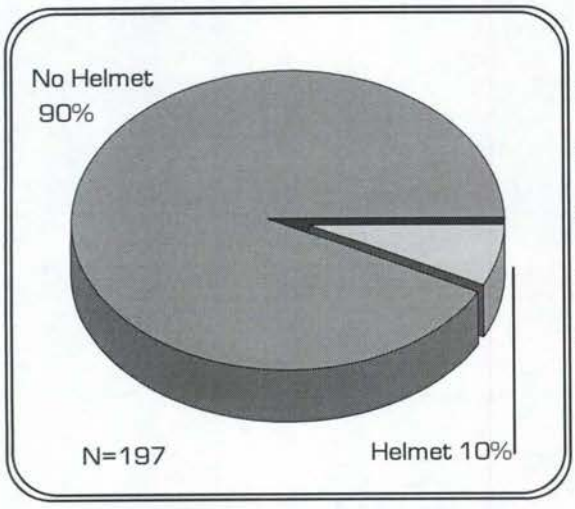


Figure 26. Use of bicycle helmets in Alaska based on Trauma Registry data.

Both FARS and the Trauma Registry report helmet wearing by riders of off-road vehicles (see Figure 27). Also, a self-report study is available from six rural villages (Sloan, 1992). Regardless of the source, it is clear the use of helmets is extremely low.

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

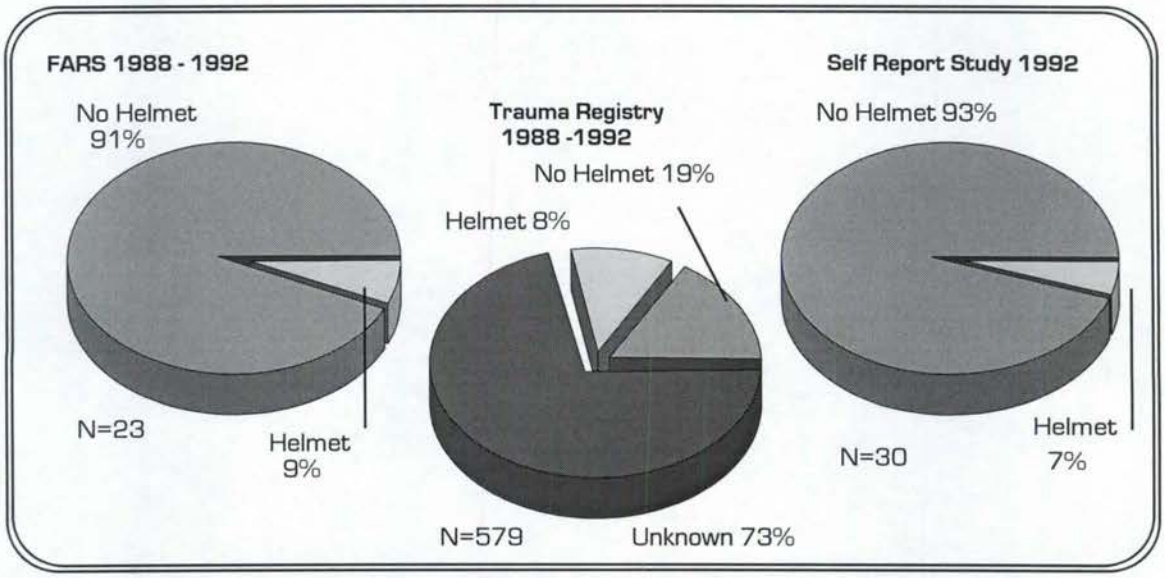


Figure 27. Use of helmets by riders of off-road vehicles in Alaska based on FARS, Trauma Registry, and self report data.

Finally, the Trauma Registry has provided data on the use of protective devices by head injured patients (see Table 17).

Table 17

Helmet Use By Head Injured Patients in Alaska, 1991-1993

Mechanism of Injury	% of Head Injured Patients Without a Helmet
Motorcycle	79.0%
Off-road Vehicle	**83.2%**
Bicycle	90.9%

Note. From "Traumatic head and spinal cord injuries in Alaska 1991-1993" by S. Warren, M. Moore, & M. S. Johnson, 1995, Alaska Medicine, 37, 11-19.

These numbers allow for analysis of the intersection of three factors: (a) mechanism of injury, (b) use of protective devices, and (c) type of injury. The percentages can be interpreted as follows: if 75 people sustained a head injury while riding a bicycle, 68, or 90.9%, were not wearing a helmet. Like other population-based studies, these figures document the relatively low helmet use rate by Alaskans on these three modes of transportation.

Injuries to Helmeted and Nonhelmeted Riders in Alaska

National studies have documented the effectiveness of helmets for riders of all motorized vehicles. Data from the Alaska Trauma Registry mirrors these results. Riders of motorcycles, all-terrain vehicles, and snowmachines were significantly less likely to sustain a head injury when a helmet was used (see Figures 28-30.)

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

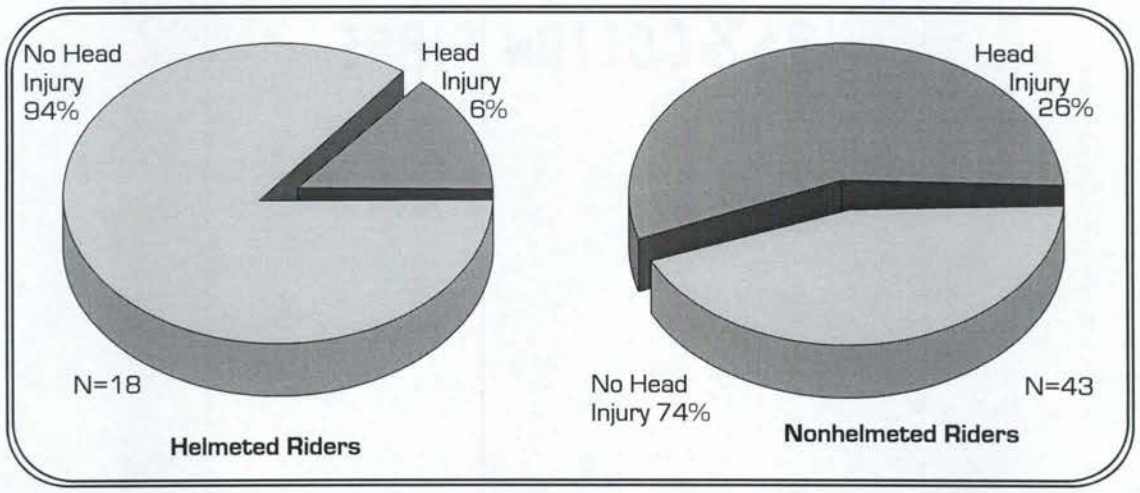


Figure 28. Comparison between the percentage of injuries and head injuries for helmeted and nonhelmeted motorcycle riders in Alaska, 1988-1992.

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

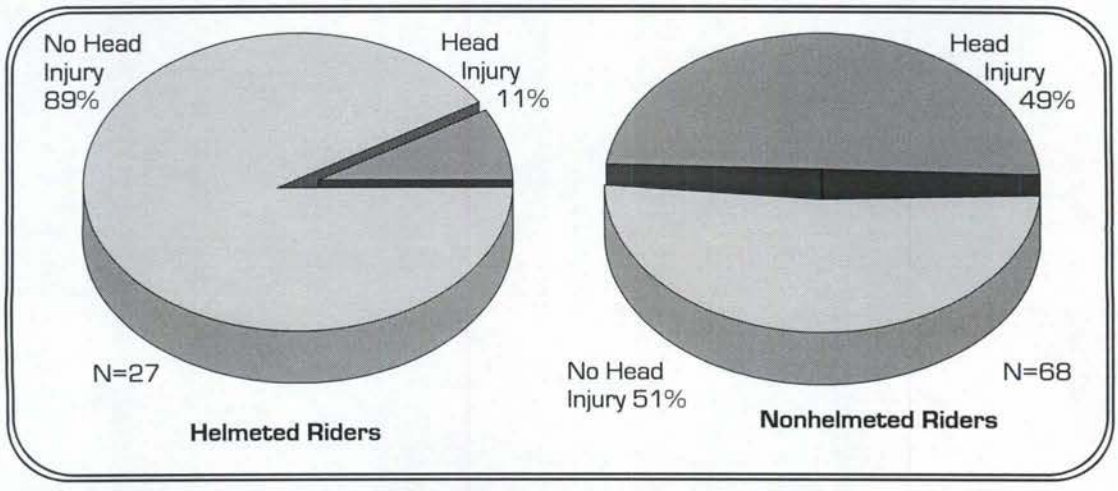


Figure 29. Comparison between the percentage of injuries and head injuries for helmeted and nonhelmeted ATV riders in Alaska, 1988-1992.

Note. From The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

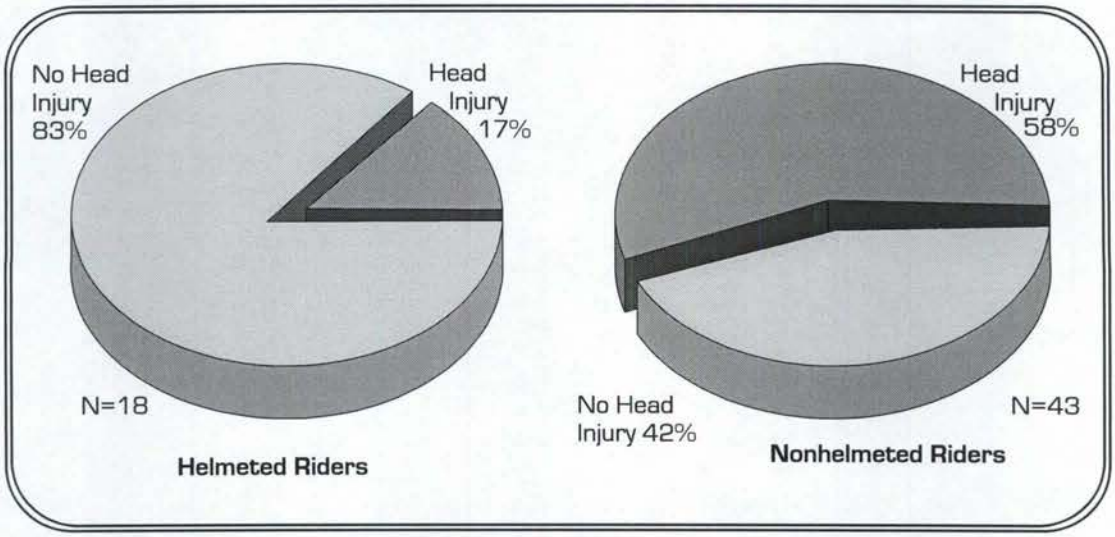


Figure 30. Comparison between the percentage of injuries and head injuries for helmeted and nonhelmeted snowmachine riders in Alaska, 1988-1992.

Standards of Comparison

Based on reports from several sources, including the Trauma Registry and FARS, helmet use by Alaskans is relatively low. However, a frame of reference is necessary to put these observations into perspective. Several standards are available for comparison with Alaskan statistics: (a) national baselines for protective device use, (b) *Healthy People 2000* Health Promotion and Disease Prevention Objectives, and (c) Alaska Year 2000 Health Objectives.

National baselines act as a snapshot in time between historical trends and the evolving standards. Reports are tabulated by the Centers for Disease Control (CDC) based on data generated by all 50 states. As such, the information is considered to be of extremely high quality.

The standards promoted by *Healthy People 2000* were developed using both the 1987 U.S. baselines and historical trends. These were compared to national and international

models of excellence, as well as to empirical data. Also considered were projected changes in demographics, potential benefits from technology, the influence of legislation, and the impact of contributing factors such as alcohol use. Combining this information, standards were then created toward which the nation was to strive between 1990 and the year 2000. Although some goals may be met earlier, or may even be within "easy reach," it was anticipated that others would be a stretch. In this sense, *Healthy People 2000* is futuristic and somewhat speculative.

The Alaska Year 2000 Health Objectives were composed in response to the publication of *Healthy People 2000*. Despite the disparity between national and Alaskan baselines, Alaska 2000 Health Objectives substantially echo the federal document.

Table 18 summarizes national baselines, *Healthy People 2000* standards, and the Alaska 2000 Health Objectives, and compares current and historical Alaskan baselines. Figure 31 contrasts Alaska 2000 Health Objectives standards with the Alaskan baseline from the Trauma Registry. Significant gaps can be identified between Alaska 2000 objectives and documented helmet use rates.

Table 18

Summary of Helmet Use Rate Standards in Comparison to Alaskan Baselines

Protective Device Use	Standards				1992 Alaskan Baseline from the Trauma Registry
	1988 National Baseline: Observed Use Rate	1991 National Baseline Observed Use Rate	Healthy People 2000 Objectives	Alaska 2000 Health Objectives	
Motorcycle Helmets	60%	62%	80%	>80%	24%
Bicycle Helmets	8%	5-10%	50%	>50%	10%
Off-Road Vehicles	not available	not available	not available	>80%	8%

Note. From Healthy people 2000: National health promotion and disease prevention objectives by the U. S. Department of Health and Human Services, Public Health Service, 1990, Washington, DC: U.S. Government Printing Office.

The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

Note. From Healthy people 2000: National health promotion and disease prevention objectives by the U. S. Department of Health and Human Services, Public Health Service, 1990, Washington, DC: U.S. Government Printing Office.

The Alaska Injury Prevention Plan by the Emergency Medical Services Section, State of Alaska, 1994, Juneau, AK: Author.

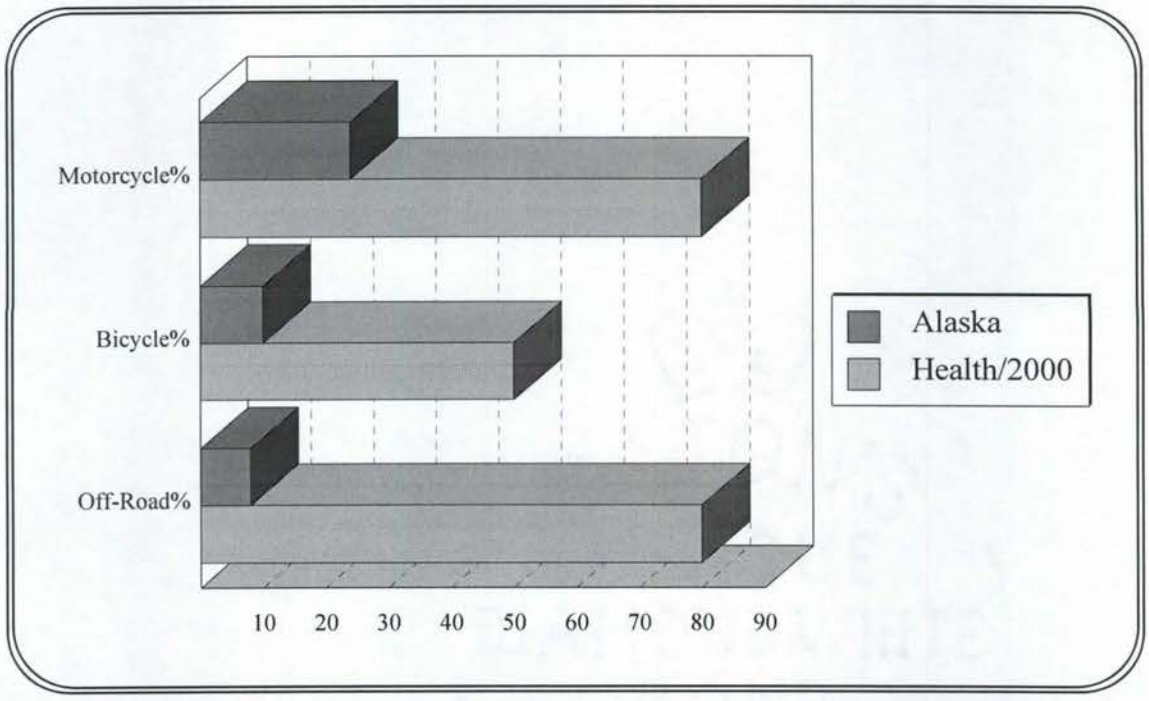


Figure 31. Helmet use in Alaska: comparison of Alaska 2000 standards to the 1992 Alaska baseline.

Strategies to Increase Helmet Use

In the past decade health education programs aimed at increasing bicycle helmet use have been widely reported in the literature. During this time, although over 40 jurisdictions have enacted regulations requiring the use of bicycle helmets, the outcome of efforts in only one major jurisdiction, Victoria, Australia, has been published in the literature (Cameron et al., 1994). In stark contrast to the educational focus employed for bicyclists, legislation has been the primary strategy for increasing helmet wearing by motorcyclists. There have been no published reports of efforts to promote helmet use by off-road vehicle riders, either through enforcement or education.

Bicycle helmet campaigns have relied on voluntary behavior change. Many strategies have combined training with pricing and other tactics which increased access to helmets.

Because these efforts most closely parallel options which might be explored for an off-road helmet campaign, several reports from the literature will be summarized to provide the foundation for development of an experimental design.

Helmet Programs

Widely viewed as a national model, the Seattle Children's Bicycle Helmet Campaign was designed by the Harborview Injury Control Research Center, a CDC-funded agency. Beginning with a baseline of 5% among school-age children, helmet use rose over a three-year period to 16%.

Prior to the experiment, a questionnaire was mailed to 2,178 randomly selected households with third-graders in the Seattle area. Responses provided information on bicycle and helmet ownership, reasons for not buying a helmet, attitudes toward helmet effectiveness and the likelihood of bicycle-related injuries, other health and safety-related behaviors, and demographic data. Parents were also asked to have their third-graders answer questions about helmet use (DiGuiseppi, Rivara, & Koepsell, 1990).

Survey results indicated that 88.1% (931) of respondent households owned a bicycle, and nearly a quarter (24%) also had helmets. Both educational level and attitudes toward safety-related issues correlated with purchasing a helmet. Parents who wore seat belts themselves were found to be 7.6 times more likely to have bought a helmet for their children. Other factors associated with helmet ownership included the belief that helmets prevent head injuries which can result from a crash, and a family member's recent bicycle injury.

Reasons given for not buying a helmet in order of frequency were: (a) never thought of it, (b) helmets cost too much, (c) the child would not wear the helmet, (d) the helmet is not needed, and (e) put off buying.

When asked whether they wore a helmet the last time they rode, 56% of the children with access to a helmet said they did. Reasons given for not wearing a helmet *in order of*

frequency were: (a) friends do not wear helmets, (b) did not think about it, (c) the helmet is uncomfortable, (d) the helmet is not needed, (e) forgot to put it on, and (f) the helmet is not attractive (DiGuiseppi et al., 1990).

As a result of the attitude survey, three campaign goals were identified: (a) increase parental awareness of the need for helmets, (b) promote helmet use by children, and (c) reduce the financial barriers to helmet purchase (DiGuiseppi et al., 1989). Efforts to increase parental awareness included encouragement from health care providers, mass media coverage, and health fair events. Messages aimed directly at the children themselves came from prominent local sports figures who acted as role models. Financial barriers were reduced via distribution of discount coupons which lowered the price of helmets from the $40 to $60 range to $25 (Bergman, Rivara, Richards, & Rogers, 1990).

The initial program evaluation found a statistically significant increase in helmet use over a three-year period, from 5% to 16%, as compared to the control city of Portland, Oregon which experienced a rise of only 1% to 3%. However, no improvement occurred in morbidity or mortality patterns. Follow-up at the five-year marker, in 1992, demonstrated that helmet use had risen to 40.2% among the school-age population. Specific evaluation of bicycle-related head injuries among members of a health maintenance organization indicated morbidity declines of over two-thirds in the 5- to 14-year-old age group (Rivara et al., 1994).

Helmet use patterns by pairs of riders was an unexpected finding. Children riding with helmeted adults were most often helmeted themselves (94.7%) and, conversely, wore helmets the least when riding with unhelmeted children of their own age (Rivara et al., 1994). Considering all age groups, the strongest association occurred when companions both wore a helmet. A second unhypothesized finding was that children riding in their own neighborhood were less likely to wear a helmet than those using bike paths, reflecting the belief that helmets were not needed close to home (DiGuiseppi et al., 1989).

In conclusion, the Seattle campaign demonstrated that community-wide change is

possible using a combination of educational and helmet access strategies. Also, it proved that significant enhancements to the public health can occur when helmet wearing becomes an accepted habit by large segments of the population.

In a related study, Thompson, Thompson, Rivara, and Salazar (1993) examined the effect of subsidies on helmet use by members of a Seattle-based health maintenance organization (HMO). They found that discounts of $5 to $10 increased helmet use rates up to 40% to 50%. This in turn hypothetically netted the HMO savings of several hundred thousand dollars based on decreased medical costs from a lower head injury rate. They concluded that financial incentives which reduced the price of helmets to $14 to $20 were cost effective due to the increased wearing rate of up to 50%.

Around the globe in Sweden, Gregersen and Nolén (1994) reported on the effectiveness of voluntary traffic safety clubs. In place long enough to be viewed as a traditional activity, approximately 20% of the 3- to 7-year-old population belong to a Children's Traffic Club. The value of the clubs was studied using a series of three questionnaires distributed to parents of both members and nonmembers. Responses indicated that children who were club members were less likely to be exposed to traffic (including autos and bicycles) and also received closer parental supervision in that environment. However, members reported more crashes per hour of traffic exposure and were therefore projected to be at higher risk for injuries. Bicycle helmet use among members was significantly higher: 70%, as opposed to 50% among nonmembers.

The authors concluded that the effects of the safety club were equivocal at best and that membership most likely did not have a positive influence on reducing accident risk. They speculated that involvement in the club itself could have caused: (a) over-reporting of collisions due to a heightened awareness of such events, and (b) over-confidence in the children's skills which might have produced a higher degree of risk-taking behavior. Recommendations for the future included both a greater understanding of the theoretical basis for clubs and a detailed

study of the effects of various strategies (Gregersen & Nolén, 1994).

The MORE HEALTH Bicycle Safety Project, a school-based educational program in Hillsborough County, Florida reported an increase in bicycle helmet use from 8.5% to 32% (Liller, Smorynski, McDermott, Crane, & Weibly, 1995). Grades K-2 in nine schools received the treatment, and nine schools in the same district acted as controls. Classroom instruction employed interactive displays of safety equipment and demonstrations portraying the effects of a crash on an unprotected brain. Helmet prices were reduced to $16. A total of 132 classes and more than 3,400 children took part in the training.

Post-program observations occurred two weeks after the intervention. In the experimental schools, helmet use increased from 8.5% to 32%, as compared to the control schools where it rose to only 10%. Although the researchers judged the program to be worthy of continuation, they found it was too soon to determine its lasting effects. They also identified the phenomenon of bicycle-riding pairs wearing helmets as a joint activity and emphasized the importance of this finding, believing that both adults and peers could act as role models for fellow cyclists.

A similar intervention conducted in a large urban center in Canada reported mixed results (Parkin et al., 1995). Building on a previous education-only approach, the authors added discounted helmets to the strategy. Three low-income schools were targeted for a week of "Be Bike Smart" events plus in-school retail sales of helmets at $10 each. By self-report, helmet ownership jumped from 10% to 47% of the total school population, with 80% indicating bicycle ownership.

Post-intervention observations occurred over six months, beginning two months after the Be Bike Smart week. Using observational data from 1990 as a baseline, helmet use increased from 4% to 18%. However, in the same time frame, frequencies in control schools rose from 3% to 19%, and, in a third set of schools which received an education-only intervention one year before, helmet-wearing jumped from 1% to 26% . All areas were

economically disadvantaged.

The authors (Parkin et al., 1995) found there were no statistically significant differences between control, education-only, and education-plus-subsidy schools. However, they reported that "children were more likely to wear helmets when riding with adults than when riding alone or with other children . . . more likely to wear helmets when riding with other helmeted children . . . and they almost always wore helmets when riding with at least one helmeted adult" (p. 285). They concluded that repeated community- and school-based interventions, as well as programs in adjoining higher income areas, were essential to changing helmet use in low-income areas. They also speculated that individual elements of a strategy, including helmet subsidies, could be less important than the cumulative effects of a long-term campaign. Emphasizing the strong association between adult and child helmet use, they called for more attention to changing parental behavior.

Taking a unique approach to learning about factors that influence helmet use, researchers in the Netherlands (Seijts, Kok, Bouter, & Klip, 1995) distributed helmets to 259 children ages 7 to 13, asking that they be worn for a 6-week period. At the end of the study, a questionnaire based on the Theories of Planned Behavior and Self-Efficacy was administered to all participants. Also, a follow-up survey three months later evaluated continuing helmet use.

Results from the questionnaire indicated that participants believed helmets were effective in preventing head injuries and that safety was the greatest motivator for wearing a helmet. Students who intended to wear a helmet also reported perceptions of positive attitudes among peers and family members (normative beliefs) and self-confidence in their ability to wear the helmet in a variety of situations (self-efficacy.)

Although the helmet-wearing rate was high at first, only 8 of the 259 participants were still wearing a helmet 3 months later. Reasons cited for discontinuing helmet use were: (a) discomfort—too hot, (b) no place to leave the helmet at destinations such as retail stores and swimming pools, and (c) negative social pressure from peers.

Describing the Netherlands as "bike country," the authors contrasted their bicycling culture with that of other nations widely reported in the literature, such as Australia and the United States. In the Netherlands, the bicycle is an important means of transportation and recreation for all citizens, not just a sports activity for a limited few, and facilities such as bike paths have been built to accommodate the public. However, helmet use is rare. The authors concluded that successful introduction of helmets within the nation's bicycling culture would require sustained effort over time. To offset negative social norms, they recommended community-based interventions, and to counteract issues related to helmet discomfort, they proposed development of new, affordable helmet models.

The impact of a mandatory helmet law has been documented in one locality in the United States: Howard County, Maryland. By self-report, helmet use there rose from 11% to 37% (Dannenberg, Gielen, Beilenson, Wilson, & Joffe, 1993). A second observational study (Coté et al., 1992) demonstrated the wearing rate among children covered by the law had jumped from 4% to 47%. These data were collected on two Saturday mornings, one year apart, by volunteers from local cycling clubs. For purposes of comparison, observers were also stationed in two adjoining counties believed to represent contrasting approaches to increasing the use of helmets: education and laissez-faire. The county using an education-only strategy reported an increase in helmet-wearing from 9% to 15%; however, rates in the laissez-faire jurisdiction fell from 19% to 4%. Frequencies were based on a total of 448 observations for the two years.

In analyzing their results, the authors emphasized that mere passage of a law does not ensure compliance. Important factors in the success of any regulation include: (a) the community base of support for the law, (b) the likelihood of detection of the violation, (c) and the swiftness and severity of the punishment for noncompliance. One benefit of mandatory helmet legislation may be its positive effect in overcoming peer pressure, especially among children who experience the greatest impact from this phenomenon.

The authors also found that the statistics from Howard County represented not only the effects of legislation, but also the results of a mixture of interventions including school-based training and media coverage surrounding the deaths of two cyclists just prior to implementation of the regulation. They concluded that it was the combination of these factors, not the law alone, that led to the highest documented helmet-use rate for children in the nation.

With over a decade of active program development in the area of bicycle helmets, Hatziandreu et al. (1995) compared the cost-effectiveness of three strategies: (a) legislation, (b) community-based programs, and (c) school-based approaches. Howard County, Maryland was used as an example of the legislative approach, with the acknowledgment that it actually represented a combination of regulation and school-based educational activities. The community-based program conducted in Seattle by Harborview Injury Control Center represented that category of intervention.

Results from a school-based approach in Oakland County, Michigan exemplified the third most frequently used model. In this design, one set of three schools received high-intensity education and helmet giveaways, while a second set was treated with lower-intensity training and no free helmet distribution. Changes in behavior were measured via a telephone survey. Results indicated helmet use in the high-intentisy schools increased from 2% to 8%, as compared to an increase of 2% to 3% in the low-intensity schools.

Based on total program costs and the helmet-wearing rate achieved, the authors calculated the cost per injury avoided. They found the legislative and community-based programs to be roughly comparable, but the school-based program was almost four times as expensive. The cost per injury avoided ranged from $36,643 to $144,498. An analysis of program budgets revealed the predominant expense was helmet purchase, not administration. The limited impact of the school-based program, as well as its tactic of giving away helmets, drove costs to a higher level. The authors also observed that helmet wearing

rose more gradually in a community-based program than in a legislative approach, representing an additional but undocumented cost. They concluded that a combination of strategies may be the most effective approach as no single intervention has achieved the year 2000 health objective of helmet wearing by 50% of all bicyclists.

In conclusion, the bicycle helmet strategies summarized here represent only a small number of the reports found in the literature. They exemplify the variety of approaches currently employed, as well as the tentative nature of the conclusions drawn to date. However, several common themes can be identified: (a) the gradual nature of change in helmet-wearing behavior, (b) the consequent need for long-term commitment by policy makers and program managers, (c) the importance of peer pressure and the benefits of role models, (d) the advantages of a multi-pronged campaign which uses a variety of avenues including education, media coverage, role models, and, when feasible, legislation, (e) the importance of comfortable helmet designs, (f) the impact of reasonable pricing, and (g) the promise of intervention strategies based in the community.

As the worldwide public health community struggles to increase helmet-wearing rates, a great variety of strategies is being tested. No single approach predominates. Some, using an education-only design, have yielded mixed results. Cost comparisons of programs which gave away helmets free have challenged the long-term wisdom of such an expense. Results from other programs piloted in low-income areas argue that cost is less of a limiting factor than might be expected. Reports from Europe, Canada, and the United States speak to the importance of change centered in the culture and the community as a whole. Conversely, programs based in single institutions, such as schools, have demonstrated little change. The effects of the helmet-wearing behavior of companions, either in the sense of peer pressure negating against the use of helmets, or in the context of the positive influence of role models promoting helmet use, has been reported again and again, both across cultures and in a variety of designs.

Finally, many authors have concluded that no single tactic, whether it be legislation, education, or increased access will achieve the goals enunciated in Healthy People 2000: 50% helmet use for all bicyclists. A combination of all of the above, and possibly more, is necessary to improve the health of the community.

Conclusion

Injury is a worldwide public health problem of the first magnitude. For decades society has viewed "accidents" as acts of fate whose course could not be altered. Through the success of injury control efforts at all levels—international, national, and local—these attitudes are giving way to a recognition that accidents are predictable events and therefore preventable. Acknowledgment of injury as a problem, belief that it is susceptible to a solution, and unremitting commitment are the cornerstones of programs which achieve change.

Motor vehicles are the leading cause of injury in all developed countries. Although mortality rates from injury have declined by 54% in the U.S. since 1950, the percentage of decline for motor vehicle injuries has stagnated at only 27%. Contrary to national trends, in Alaska the mortality rate from motor vehicle injuries has been increasing since 1989.

Off-road vehicle injuries are reported within the motor vehicle statistic. Although they represent only 5% of all fatalities within this category, they account for 23% of all serious injuries and 8.1% and 14.8% respectively of all head and spinal cord injuries.

The Northwest Arctic Borough was second only to Bristol Bay in the rate per 100,000 population of off-road injuries. Between 1991 and 1993, 27% of all injury-related hospital admissions were caused by off-road crashes. Also, from 1988 to 1993 Native beneficiaries in the NWAB sustained 20% of all off-road injuries experienced by Natives statewide, although they represented only 6.8% of the total Alaskan Native population. Head injuries, the most serious consequence of an off-road crash, occurred in more than 16% of the cases.

A program to increase the use of helmets by riders off off-road vehicles in the NWAB would address one of this region's major public health problems. Reports from the literature which document success in increasing the use of bicycle helmets can be drawn upon as models. Common themes among these interventions include: (a) the effects of peer pressure and the positive impact of role models, (b) the necessity of employing a variety of communication routes including education, media coverage, role models, and, when possible, legislation, (c) the importance of user-friendly helmets, (d) the impact of increasing access to helmets via reduced pricing, and (e) the results of intervention strategies based in the community. Although these tactics have not been applied to the arena of off-road vehicle helmets in the past, they nevertheless hold promise based both on the documented needs and the demonstrated ability of people from all over the globe to change their helmet-wearing habits.

Theories of Persuasion

I have with me two gods,
Persuasion and Compulsion.

Themistocles

The History of Persuasion

Although the science of persuasion is a 20th-century phenomenon, the concept of prevailing on another person to do something by advising or urging them (Random House Unabridged Dictionary, 1993) has ancient origins, reaching back to Greece, the birthplace of Western civilization. Down through history, moving people to action through words has forever been the province of philosophers, politicians, the religious, lawyers, teachers, and even the common man.

Plato, whose genius transcended that of all other Greeks, was known for the vision and

power of his persuasive arguments, which urged audiences to accept his picture of an ideal society led by philosopher-kings. Aristotle, the skeptic and pragmatist, took the opposite position, preferring facts to theories and knowledge to ideals (Gordon, 1971).

In his most famous work, Rhetoric, Aristotle (trans. 1932) identified practical principles of persuasion which are still in use today. His cardinal rule was echo the audience, find their self-interest. Following this prescript, his strategy was simplicity itself: link those attributes to the object up for sale. Twentieth-century theory agrees with this fundamental concept: the keys are in the audience's head, not in the piece of goods itself (Cross, 1991).

Not content to merely change attitudes, Aristotle (trans. 1932) focused on the importance of committing to action. Looking at motivations, he recommended applying logic to demonstrate truth (logos), using emotion to sway (pathos), and presenting an ethical argument to build trust and credibility (ethos). He also identified satisfaction of needs, especially emotional needs, as one of the most powerful motivators, a concept echoed by modern "needs-based" advertising (Bovée & Arens, 1986; Cross, 1991).

Aristotle (trans. 1932) viewed persuasion as a highly personal matter, best handled by direct contact. He believed the written word should also convey the naturalness of speech, reflecting the reader's language and context. In this, he foreshadowed the concepts of readability and clean, clear writing.

Moving forward in history, both the Renaissance church and state recognized persuasion as an essential tool. Responding to the Protestant Reformation and the discovery of the New World, Pope Gregory XV formed the *Sacra Congregatio de Propaganda Fide* in 1622 (Jowett, 1987). This was the first institution in Western society which openly and consciously sought to change the beliefs of the masses (Gordon, 1971). Only partially successful, it nevertheless laid the foundation for modern propaganda techniques.

Machiavelli's classic work, The Prince, described cultural, social, and political persuasion within a secular context (cited in Gordon, 1971). Seeing persuasion as a strategy

of statesmanship, Machiavelli portrayed it over a continuum which ranged from the softness of words to the harshness of armed force. His most revolutionary contribution was separating it from the purely religious domain, making it a legitimate tool of the state.

In the late 19th century literacy rates climbed dramatically and newspapers became widespread. European empires grew to span the globe, changing the locus of strategic alliances from regional to worldwide. As the stakes of international politics rose and the stability of the balance of power declined, governments found themselves more and more dependent upon their populace's active support.

During the late colonial period, both Britain and France embarked on propaganda campaigns to shore up acceptance of colonialism, euphemistically termed a "consensus on Empire" (Jowett, 1987). Britain preferred to call these efforts "education," altogether avoiding the word propaganda.

World War I was the first time entire nations were mobilized for a total war effort. To enlist public opinion in this mammoth endeavor, advertising professionals were recruited and given official positions within the government bureaucracies. In the United States, President Wilson created the Committee on Public Information (CPI), which eventually employed 150,000 people. After the war, the division's head, Creel, bragged about the agency's awesome reach in a bestseller entitled, How We Advertised America. He painted a portrait of a marketing effort so all-pervasive that no medium was left untapped. The American public responded with revulsion, creating a backlash which at least in part led to the isolationism of the 1930s (Jowett, 1987).

In contrast to America's abhorrence of propaganda for the purpose of controlling public opinion, the emerging dictatorships on the other side of the Atlantic embraced the opportunity to manipulate their citizens through the mass media. Both Hitler, in Fascist Germany, and Stalin, in Communist Russia, created vast networks to dominate the character and flow of information. Propaganda was so central to the Soviet state, that it received funding

equal to those allocations made to enhance industrialization (Jowett, 1987).

With the advent of a second world war, America once again looked to advertising experts and psychologists to mold the minds of the masses in support of the conflict. Major issues addressed were integration of civilians into the military, mobilization of women into the work force, and motivation of the troops to continue the fight after Germany's defeat. For the first time systematic studies were conducted regarding the effectiveness of different communication strategies (Severin & Tankard, 1992).

A research team of social scientists, including Lazarsfeld, Merton, Hovland, Lumsdaine, Sheffield, and others was organized in the Information and Education Division of the War Department. Their results, published in 1949 in Experiments in Mass Communication, formed the basis for the modern investigation into attitudes and communication theory. They laid the cornerstone for an immense outpouring of research.

One of the most famous studies was conducted by Hovland and his research group at the War Department and involved a series of four movies by Capra entitled "Why We Fight." The films were developed to aid new recruits with the transition to military life with the underlying assumption that motivation would come from knowing the facts about the war's origins (Hovland, Janis, & Kelly, 1953).

An experimental design was employed to compare changes in attitudes toward military life and the conduct of the air war, as well as acquisition of basic facts about the conflict. A questionnaire administered one week later confirmed the film was effective in conveying information, was somewhat effective in changing opinions about the air war, and was ineffective in altering attitudes toward military life or in deepening resentment toward the enemy. This study leant support to a growing body of evidence that one mass communication message is unlikely to alter strongly held beliefs.

After the war Hovland returned to Yale University where he continued to research attitudes. A number of his colleagues from the War Department joined him, and, with funding

from the Rockefeller Foundation, they were able to work collaboratively. Their efforts resulted in the "Yale series" of books on attitude change which provided important contributions to this emerging field (Severin & Tankard, 1992).

Theories of Persuasion

Instrumental Theory of Persuasion

Prior to the war, Hovland studied with Hull at Yale. Hull was the author of instrumental learning, the most influential educational theory of the day, and he had a profound influence on Hovland's attitude research (Severin & Tankard, 1992).

Instrumental learning theory describes a situation in which an organism responds in many different ways to stimuli in its environment. At some point one of the responses is reinforced, either through a reward or the absence of punishment. The response therefore becomes instrumental in eliciting the desired condition, and can be considered learned when it occurs consistently (Tan, 1981).

The instrumental theory of persuasion (Hovland et al., 1953) was adapted from Hull's construct. It portrays the conditions under which a new attitude can be learned or an existing attitude altered. Opinions are considered to persist like other habits until new learning occurs. Exposure to persuasive arguments is one way to modify an attitude. Key factors involved in the attitude change are mental rehearsal of the new opinion, and development of an incentive motivation for accepting it. One type of incentive motivation is the conviction the new opinion is "right." Message attributes which promote this are: (a) use of an expert source, (b) lack of bias or desire to be manipulated by the message source, and (c) social approval. Steps involved in the attitude change are attention, comprehension, and acceptance.

Insko (1967) criticized this theory for its lack of an explanation for the process by which persuasive communication provides reinforcement for acceptance of the new opinion.

He also cited the lack of direct evidence that being "right" and receiving information from a credible source is reinforcing. Finally, he challenged the generalization that learning a new attitude must follow the three steps of attention, comprehension, and acceptance. He found no basis for considering all these steps necessary, nor for assuming they must occur in sequence.

The Theory of Social Influence

Also called Kelman's Functional Theory, this is one of many of the so-called "functional" theories of attitude change. This category of constructs postulates the key to predicting and changing attitude is understanding motivations and the reason people hold certain opinions. Kelman's theory is distinguished from others because: (a) it focuses on source characteristics as important factors, (b) it specifies prior conditions and motives leading to attitude change, and (c) it has been tested empirically (Tan, 1981).

Kelman (1958) described three degrees of social conformity: (a) compliance, (b) identification, and (c) internalization. Compliance is public acceptance of an opinion without private commitment. This occurs either to gain a reward or avoid punishment. Identification requires both a public and private attitude change in response to the need to maintain a good relationship with another person who is influential. When the message itself is perceived to be intrinsically rewarding, complete integration into an individual's value system, known as internalization, happens.

Antecedents can be identified for each process: motivation, the influencing agent, and the conditions (see Table 19).

Table 19

Antecedents to Attitude Change

Antecedents	Compliance	Identification	Internalization
Motivation	Rewards Punishment	Good relationship with the influencing agent	Fitting in new opinions to personal value system
Influencing Agent	Someone with power over rewards & punishment; Able to scrutinize whether compliance occurs	Must be attractive and supportive to the person being motivated	Credibility, expertise, lack of bias, trustworthiness
Conditions	Limited choices "Or Else" situation	Clear role relationships	Acceptance of persuasion is seen as instrumental in reinforcing values

Note. From: "Compliance, Identification and Internalization: Three Processes of Attitude Change by H. Kelman, 1958, *Journal of Conflict Resolution, 2,* 51-60.

Kelman (1958) also categorized consequents according to conditions for expression and change, and the type of behavior system in which the new attitude exists (see Table 20).

Table 20

Consequents to Attitude Change

Consequents	Compliance	Identification	Internalization
Condition for Expression	Only under surveillance	When the role relationship is active	Whenever the values call upon the behavior
Condition for Change	Only when the influencing agent is present	When responses hurt the relationship	Abandoned when no longer seen as consistent with values
Type of Behavior System	External demands Specific situations	Expectations within a specific relationship	Integrated with value system; more difficult to change than other two conditions

Note. From: "Compliance, Identification and Internalization: Three Processes of Attitude Change by H. Kelman, 1958, *Journal of Conflict Resolution, 2,* 51-60.

Insko (1967) found this to be the most promising of the functional theories because its detailed descriptions make empirical testing possible. Unfortunately very few experimental studies have been reported. Without research confirmation, it is impossible to know whether the major classifications and specific descriptions are predictive (Tan, 1981).

The Persuasion Model

McGuire (1969) identified a general model for analyzing the effects of communication on persuasion. He defined the components of the communication process as: (a) source, (b) message, (c) channel, and (d) receiver. In his view, the process was sequential: (a) attention to the message, (b) comprehension, (c) acceptance of the message, (d) retention of the information, and (e) action. Attitude change happens during the acceptance stage.

McGuire (1969) pointed out that the interaction of the message with the receiver can have unexpected consequences if the many possible variables are not considered. For instance, receivers with high self-esteem may pay more attention to the message and comprehend it better when they are not threatened by new information. However, resistance is a possibility if they are satisfied with current circumstances. A similar effect might occur with highly intelligent people. Also, fear appeals may be so gruesome they turn people away from the message entirely.

The most common result of unexpected interactions is a curvilinear relationship between the variables. Persuasive messages may be most effective for people with moderate levels of self-esteem and intelligence. Likewise, medium levels of fear appeals could work better than high ones in creating behavior changes.

Although the components identified by McGuire (1969) have proved useful in analyzing the interactions of variables with attitude and behavior change, the concept of sequential steps has been challenged. For instance, other research (detailed reports follow) has indicated that receivers can be persuaded solely by the credibility of the source, while disregarding details of

the message. Research in compliance points out that behavior change can occur prior to acceptance of the message, whereas McGuire assumed acceptance must come first. Finally, this model relies on a rational, logical receiver, one who makes decisions without emotion. Such a decision-making condition is a rarity (Tan, 1981).

Attitudes and Behavior

Almost 60 years ago Allport (1935) identified attitudes as "the most distinctive and indispensable concept in contemporary American social psychology" (p. 798). For many years researchers believed opinion change invariably led to behavior modification. Allport reflected this conviction in his definition of attitude:

> . . . a mental and neural state, of readiness to respond, organized through experience, and exerting a directive influence upon the individual's response to all objects and situations with which it is related. (p. 810)

Attitudes were therefore thought to have a "directive influence" on behavior. This assumption fostered the popularity of survey-style research because it was believed attitudes equaled action (Tan, 1981).

Since the days of Allport's confident description, the link between attitude and behavior has become one of the most fiercely debated battlegrounds in both social psychology and health education. Tan (1981) described the origins of this controversy as a 1934 study by La Piere. In the early 1930s La Piere had the opportunity to accompany a Chinese couple who were touring the United States. They visited 251 hotels and restaurants and were refused service on racial grounds only once. Six months later he mailed a questionnaire to these same establishments, inquiring about their policy on serving Chinese. Of the 128 replies he received, only one definitely indicated unconditional acceptance of Chinese guests, whereas more than 90% responded they did not serve Chinese. This study is considered classic in pointing out the discrepancy between attitude and behavior.

Tan (1981) reported further inquiry into this area by Festinger, author of the theory of cognitive dissonance. In 1964 Festinger's curiosity on the subject was ignited by a manuscript from Cohen, which stated little work on attitude change had dealt explicitly with the behavior that followed. Looking for studies that investigated both, Festinger was able to find only three. All of these reported an inverse relationship between attitude and behavior change: individuals who voiced the most concern after receiving the persuasive message showed the least change in reported behavior. Based on this, Festinger challenged the prevailing paradigm which equated attitude with behavior.

Wicker (1969) provided additional support to Festinger's criticisms. Through a review of 30 studies on attitudes and behavior, he was able to report the correlations between the two factors were "rarely above 0.3, and often are near zero" (p. 65). He concluded that attitudes were at best only slightly, if at all, related to action.

These two contributions led to more theoretical inquiry and the eventual development by Fishbein and Ajzen of the Theory of Reasoned Action. As previously discussed, this construct takes into account environmental influences, as well as individual attitudes.

Source Credibility

Research into the effects of the source on persuasion also traces its origins back to the war years. Severin and Tankard (1992) described a study conducted by Hovland and Weiss which was inspired by the fund-raising success of singer Kate Smith. In just one 18-hour marathon program, she motivated thousands of Americans to pledge $39 million dollars for war bonds. This was a truly outstanding financial performance for the 1940s.

In 1951 Hovland and Weiss conducted the first systematic study of source credibility. Four different controversial messages were presented to two random groups. These concerned: (a) the sale of antihistamines without a prescription, (b) the practicality of building atomic submarines, (c) the impact of television on movie attendance, and (d) whether or not the steel industry was to blame for the steel shortage. Messages varied only in the attribution

of their source: a high- or low-credibility person. Their hypothesis was that messages from a highly credible source would be more effective in changing opinions. Questionnaires administered one week later tended to support this, but a second set of questionnaires given after a four-week interval yielded different results. The number of respondents concurring with the high-credibility source had decreased although the number agreeing with the low-credibility source increased. These findings were the basis for the term "sleeper effect." Hovland and Weiss (1951) explained this phenomenon by conjecturing that over a period of time people tended to dissociate the message from its origin.

Research following this ground-breaking study has sought to identify the dimensions of source credibility, especially the attributes of expertise and trustworthiness (Tan, 1981). Learning theory predicts that expert sources are effective persuaders because receivers have been rewarded in the past for taking correct positions advocated by experts. Knowledgeable sources have therefore been associated with the rewards that come from such behavior. Functional theory predicts that expert sources will be effective when receivers identify with the same values as the source.

Learning theory also supports trustworthiness as a persuasive element. In the negative sense, contact with biased sources may result in behavior change which has unhappy consequences. Adults do not like to be manipulated and resist change when there is any indication this is occurring. On the other hand, credible sources provide a give-and-take interaction which usually offers better results. Functional theory supports this attitude for the same reasons it validates expertise (Tan, 1981).

Research results. Research has upheld the predictions of learning theory and functional theory. In 1968 Whitehead used semantic differential scales to rate two speakers. Asking subjects to score the two sources solely on the basis of tape-recorded introductions, he found there were four dominant factors: trustworthiness, professionalism, dynamism, and objectivity.

McGinnies and Ward (1974) examined the effectiveness of source credibility in five countries: the United States, Japan, New Zealand, Australia, and Sweden. Subjects were asked to read a message from either a low- or high-credibility source. There was significant attitude change in three of the five countries: the United States, Australia, and Sweden.

Kelman and Hovland (1953) tested the hypothesis that highly credible sources will continue to be more persuasive than those with low credibility if subjects are reminded of the origin of the information just before testing. Questionnaires completed three weeks after the initial message supported the hypothesis.

McCroskey (1976) attempted to differentiate between the effects of source credibility and the quality of the persuasive argument by combining low- and high-credibility sources with weak and strong arguments. He reported no difference between the low- and high-credibility groups when a strong argument was used. However, source credibility did have an impact in combination with a weak argument. His conclusion was that both source and message affect persuasion.

Birnbaum and Stegner (1979) conducted a series of experiments that attempted to distinguish source characteristics including expertise, bias, and trustworthiness. They found that the effect of source credibility on opinion change depended on three factors: expertise, bias, and the receiver's point of view. Sources with high expertise were more persuasive. Biased sources who were also experts were less likely to be believed than those who were not. However, the coincidence of a receiver's opinions with those of a biased source increased the likelihood of acceptance.

Summary. In conclusion, empirical evidence has continued to support Hovland and Weiss's ground-breaking research of more than 50 years ago, demonstrating source credibility as an important element in the persuasive message. Additional key attributes of the source have also been identified, including expertise and trustworthiness. The impact of the persuasive message therefore cannot be separated from its origin, and those interested in

moving an audience to action should select their spokesperson with care.

The Message

Media messages promoting products, services, and even affiliations seem to pervade every corner of daily life in the late 20th century. The roots of this phenomenon can be found in the late 1900s when capitalism merged with mass communication to create the art and science of advertising. As with persuasion theory, World War II provided both the opportunity and means to investigate the effects of the content and type of messages.

One-sided and two-sided messages. After Germany's defeat, Hovland and his research team at the War Department were called upon to help the Army get the message out to the troops that the war was not over, that in fact it would probably continue for at least two more years. Severin and Tankard (1992) described Hovland's use of "one-sided" and "two-sided" messages in this effort. Two radio communications were prepared. The one-sided message brought forth arguments in favor of continuing the fight, such as Japan's armed strength and the determination of its civilians. A slightly longer two-sided message presented this viewpoint plus the other side of the picture—that the war would truly be long and difficult.

Two experimental groups were surveyed one week before the radio program and afterward. There was no difference in attitudes between the two groups after exposure to the message. However, differences were reported based on the receiver's initial opinion of the war. The one-sided message was most effective for people originally in agreement with the need to continue the fight, whereas the two-sided message was most successful with those who believed the war would be over soon. Hovland also found educational level interacted with the type of message. Those without a high school diploma responded more favorably to the one-sided message, whereas graduates were more persuaded by the two-sided message.

Since this first study, most investigators have discovered no main effects from either one- or two-sided messages (Tan, 1981). However, interaction effects between the audience,

the message topic, and the type of message have continued to be reported. McGuire (1969) observed that when subjects are familiar with the topic, a two-sided message is more effective. A two-sided message is also more persuasive when the subjects will be exposed to counterarguments later on and when the topic is controversial.

Fear appeals. Fear appeals are common in health education. For instance, the Harborview Injury Prevention Center has created both video public service announcements and posters depicting neurosurgical instruments alongside a bicycle helmet. The caption reads: "To avoid needing these (the drills), wear one of these."

Learning theory predicts fear appeals will lead to increased attitude change through arousal, which in turn leads to increased attention and comprehension. Motivation to accept the recommendations is also stimulated. Reinforcement theory also supports this concept because the new attitudes and behaviors will be associated with reduced anxiety. On the other hand, the high degree of emotional tension could lead to defensive reactions and distortion of the message (Severin & Tankard, 1992; Tan, 1981).

Hovland et al. (1953) reported a seminal experiment by Janis and Feshbach which examined the impact of fear appeals. The topic of the study was dental hygiene. Three different levels of fear appeal messages were designed. The researchers found the most effective message to be the mildest, whereas the least effective was the strongest. Subjects were also asked to report their changed dental care, making this study compare favorably to the plethora of attitude surveys. Long-term changes continued at the one-year mark.

Leventhal and Niles (1964) reported findings somewhat in disagreement with the previous study. Audiences at a New York health exposition were presented with a "Stop Smoking" message with varied levels of fear appeal. Results showed a direct correlation between intention to stop smoking and the level of the fear appeal. They concluded the recommended treatment was so effective in combating the potential health outcomes that people responded logically.

R. W. Rogers (1975) took research of fear appeals one step further by creating the Protection Motivation Theory. Drawing upon results from previous studies, he identified three key elements: (a) the magnitude of the noxiousness of the pictured event, (b) the probability of the event's occurrence, and (c) the efficacy of the recommended protective response. Like other theories of attitude change, this model assumed that each element elicited a cognitive appraisal process. Attitude change is a function of the amount of protection motivation aroused by the fear appeal.

Rogers and Mewborn (1976) reported an empirical test of the theory on a population at risk for sexually transmitted diseases. They found that when health care recommendations were perceived to be relatively ineffective, neither high- nor low-fear appeals worked. However, highly effective treatments benefited from either a low- or high-efficacy message. Therefore, the perceived effectiveness of the treatment was a crucial factor.

Reardon (1989) also studied protection motivation in relation to another sexually transmitted disease, AIDS. Her study population was a group of teenagers, to whom the possibility of death seemed remote. She recommended focusing the fear appeal message on consequences familiar to the age group, such as skin rashes, mental problems, and a restricted social life. She also suggested public information be combined with question and answer sessions which helped identify ways to avoid the health risks.

Other studies have pointed toward two more probable relationships between fear appeals and compliance (Tan, 1981). The first focused on the role of intervening receiver variables: chronic anxiety and perceived vulnerability. More attitude changes seemed to occur as these factors decline. Conversely, increased levels appeared to cause a defensive reaction which restricts the impact of a high-fear appeal message. A seat belt study by Berkowitz and Cottingham (1960) gave some support to this concept. The researchers found high-fear appeals were more effective when the actual threat was not highly relevant to the receiver. For instance, people who drove little reported a greater willingness to wear seat belts.

McGuire (1969) postulated a curvilinear relationship between fear appeals and attitude and behavior change. He believed that low-fear appeals will not be as effective because the message content is less interesting, whereas high-fear appeals may lose some of their impact due to the defensive reactions they arouse. On the other hand, medium-fear appeals may combine the best elements of both extremes: the interest level of the high-fear appeal and the low defensive reaction of the low-fear appeal.

A study by Krisher, Darley, and Darley (1973) leant support to McGuire's interpretation. Three types of messages about mumps vaccine were administered to different treatment groups: low-, high-, and high-fear appeal in combination with an audio recording of a pulse. Subjects in the high-fear, pulse combination group heard what they believed to be their own heartbeats during the message presentation, a tactic designed to convince them they were more anxious than they actually were. Results indicated subjects in the high-fear appeal group actually received mumps vaccinations more than subjects in the other two conditions. However, the reported intent was the same across all groups.

In conclusion, although fear appeal research has yielded contradictory and potentially confusing results, it has pointed to several factors worthy of continued consideration: the message level, the intervening receiver variables, and the potential effectiveness of the treatment. Fear appeals are commonly used in health education, and understanding the variables involved is essential to maximizing their effectiveness.

Inoculation theory. Using the analogy from medicine of a vaccine which immunizes against future exposure to an infectious disease, inoculation theory assumes beliefs can be bolstered against future challenges through exposure to either counterarguments or supportive reasoning (McGuire & Papageorgis, 1961). Otherwise, attitudes which have not been immunized will be easily swayed by a strong verbal attack.

To test this theory, McGuire and Papageorgis (1961) selected four cultural truisms: (a) everyone should get a Chest X-ray every year, (b) Penicillin has been without exception

beneficial to man, (c) most types of mental illness are not contagious, and (d) everyone should brush their teeth after every meal, if at all possible. Groups were exposed to either supportive statements or refutational material which included counterarguments paired with rebuttals. There was also a low- and high-participation condition, differentiated by a reading only or a combined reading and writing exercise.

Results supported the hypothesis. Groups not in contact with either condition were impacted the most by strong challenges. The group exposed to the counterarguments changed their opinions the least. Also, groups receiving the passive treatment (reading only) experienced less opinion change than the active treatment groups who were required to write out their responses.

McGuire and Papageorgis (1961) followed this study with one in which they investigated the concept of generalized immunity. They hypothesized that one inoculating experience would confer immunity to attacks on other topics. The mechanisms at work included: (a) lowered credibility of succeeding verbal attacks, and (b) development of counterarguments for subjects beyond the one under discussion. Their hypotheses were upheld.

Summary. In conclusion, research has demonstrated that message-framing techniques offer opportunities to increase the effectiveness of the persuasive argument. In addition, messages interact with the receiver in predictable ways. For instance, one-sided messages are more effective when directed at people who already agree with the position and at those who have not graduated from high school. Fear appeals may more readily persuade people for whom the message has decreased relevance, but will lead to defensive reactions among those for whom the message "hits closest to home."

The implications of this research are far reaching. Understanding the composition and prior attitudes of the target market becomes essential to designing the right message. In the absence of market research or pre-intervention questionnaires, messages must be framed

with consideration to the broadest possible audience.

Therefore, several assumptions might be appropriate when introducing an injury prevention strategy to a community: (a) disagreement with the recommendations exists, (b) the message will be highly relevant to at least a portion of the population, and (c) counterarguments will be part of the environment as the intervention continues in the community. Therefore, a message should: (a) be two-sided, (b) be no higher than the medium level of fear appeal, and (c) contain counterarguments paired with rebuttals.

Diffusion of Innovations

History. Although advertisers, politicians, and others interested in controlling public opinion may view their persuasive arguments as being aimed in only one direction—from the media straight to each receiver—there are in fact many routes information can travel. "Word-of-mouth advertising," the term coined to describe personal, indirect, persuasive arguments, is believed by many marketing professionals to be the most powerful medium for changing opinions. However, until the late 1930s, this communication method received no recognition, nor was it consciously exploited.

However, the worldwide political and economic upheavals between the world wars brought attention to this poorly understood medium. In particular, federal officials became concerned about its potential impact on voting behaviors. Severin and Tankard (1992) reported the seminal study conducted by Lazarsfeld, Berelson, and Gaudet.

The year was 1940, and Franklin Delano Roosevelt was running for an unprecedented third term. Government authorities engaged Columbia University's Bureau of Applied Social Research to study voting behavior in a typical American setting: Erie County, Ohio.

Three control groups and one treatment group were selected. The treatment group was interviewed every month from May until the November election. Its members were charged with influencing the opinions of fellow voters in the control groups whenever possible.

The control groups were interviewed initially in May, then only once before election day.

Much to their surprise, the researchers discovered that the most influential factor in voting decisions was not the media; it was personal contact. Also, voters who changed their minds later in the campaign were more likely to be affected by other people rather than by the media. Opinion leaders, those who affected others, were found to be more exposed to the mass media than those who were less influential.

From these findings, a two-step communication process was postulated. Opinion leaders, in contact with the latest news, impacted the remainder of the community in a two-step, non-reciprocal process. Coming from all social stratum and from every ethnicity, they were thought to be very similar to the groups they affected. Unfortunately, the details on the word-of-mouth process they employed were the least documented part of the study, due to the unexpected findings. Despite this deficiency, the study was the catalyst for an entirely new direction in persuasion research: diffusion of innovations.

Following the war, Lazarsfeld and his colleagues continued their research on the electorate in another typical American city: Decatur, Illinois. Their findings expanded the concept of a two-step flow of information. Opinion leaders reported being influenced themselves by yet other opinion leaders. However, they were not influential all the time nor on all subjects. Instead, they were limited both by the specific topics and by the structure and values of the groups of which they were members. A major conclusion of this study was that more study needed to occur on information flow chains longer than two people.

The role of the community in decision making. Although the seminal studies on voting behavior pointed the way toward a revolutionary new understanding of individual decision making, they provided little insight into how decisions were made within a group or larger community. The next research step therefore required investigation at the aggregate level, with a special emphasis on the communication of ideas over a period of time (Severin & Tankard, 1992).

Lewin's work with groups provided early direction in this area. During the war years, Lewin (1958) was enlisted by the Department of Agriculture to help with communication strategies. One of his assignments was the development of a training program which would motivate housewives to serve their families organ meats such as beef hearts, sweetbreads, and kidneys, so the better cuts of meat could be sent to the front.

He designed two experimental groups: a lecture condition and a group decision condition. The lecture condition received an oral presentation on nutrition, home economics, and cooking methods for the identified cuts of meat. Recipes were also mimeographed and passed out. In the group decision condition, subjects were given a brief presentation followed by the opportunity to discuss problems "housewives like ourselves" would experience in preparing this type of food. Techniques and recipes were offered only after the group became sufficiently involved to request specific problem-oriented information.

At the conclusion, participants were asked for a show of hands to indicate who would be willing to try out one of the cuts of meat within the next week. Subjects were then surveyed to see who had actually followed through. Results were dramatic: only 3% of those from the lecture condition cooked organ meat, as compared to 32% from the group decision condition .

Lewin (1958) concluded several factors were at play: group discussion, public commitment, coming to a decision on future action, and perception of a group consensus. Later research by Pelz (1958) found that group discussion and public commitment were not as important as the decision to take future action and the perception of a group consensus.

Building on the earlier voting behavior studies, Katz (1957) decided to study the process doctors followed in making the decision to adopt a new drug. He asked physicians to name three sets of colleagues, each with three members: those with whom they discuss their practice, those from whom they were most likely to seek information, and those with whom they were most likely to socialize. He also asked them to keep a record of decisions about using the new drug.

Katz (1957) was able to draw several conclusions from this study. He reconfirmed earlier findings that personal influence was both the most frequent and most effective means of persuasion. He also found that doctors who were the most integrated in the medical community were the early adopters of an innovation. He believed this was due to two factors: (a) they were more in touch with current medical developments, and (b) were able to count on support from other key members of the medical community during the risky phase of new product introduction.

Katz (1957) was able to describe attributes of an opinion leader. He found that they personified important societal values, and that they were admired and respected by others. Also, they held key social positions both within the group and with figures outside the group who could offer advice and assistance. Finally, they were both competent and accessible to their followers.

During the 1970s research on the diffusion of information in society was extremely active. In 1983 E. Rogers took the opportunity to consolidate and synthesize this truly massive amount of literature by writing what is still considered the definitive book on the subject, Diffusion of Innovations. Summarizing more than 2,000 empirical studies and 3,000 publications, E. Rogers developed categories for the characteristics of an innovation, the steps of the process, and a description of how specific types of people react to new ideas.

According to E. Rogers (1983) the characteristics of an innovation which affect the rate of adoption include: (a) relative advantage over previous technology or systems, (b) compatibility with existing values and the needs of the potential adopters, (c) ability to be trialed prior to complete adoption, (d) complexity, and (e) observability, or the extent to which the results will be visible to others. The innovation process itself includes five steps: (a) knowledge; (b) persuasion, (c) decision, (d) implementation, and (e) confirmation or reinforcement of the innovation decision that was made.

Categories of adopters are:

1. Innovators—those eager to try new ideas

2. Early adopters—people who usually demonstrate the highest degree of opinion leadership

3. The early majority—who interact extensively with peers but seldom are leaders

4. The late majority—who adopt only due to economic necessity or increasing group pressure

5. Laggards—those who strive to live in the past and maintain traditional lifestyles.

From his review of the literature E. Rogers (1983) again confirmed that interpersonal communication was more effective than the media in changing opinions. This was especially true when the receiver was either resistant or apathetic and when there was a two-way exchange between the persuader and the receiver. He also reported mass media were effective transmitters of information, but it could only impact weakly held attitudes.

E. Rogers (1983) coined the term "change agents" to describe key figures in the evaluation and trial stages of an innovation. These were defined as professional people who attempted to influence adoption decisions. As such, they were outside the group they were attempting to sway, and required the enlistment of local opinion leaders.

Another key finding was that a combination of interpersonal communication and mass media was the most effective strategy for introducing new ideas and inducing people to try innovations (Rogers & Shoemaker, 1971).

In conclusion, although advertising is a billion-dollar-plus industry, and "Madison Avenue's" reach seems to be ubiquitous, research on the diffusion of information in the community paints a much different picture. New ideas and information spread through networks driven by opinion leaders, who are much more influential than the mass media. Innovations have identifiable characteristics which promote or inhibit their adoption. Also, the process follows typical steps. Group dynamics affect both decision making and the rate of

adoption. Understanding these well-documented events provides an important piece of the puzzle in any community health education campaign.

Self-Efficacy

Originated by Bandura (1977, 1982), the Theory of Self-Efficacy states behavior change and maintenance are a function of:

1. Outcome expectations about what will occur from engaging in the behavior
2. Efficacy expectations about one's own capabilities to successfully engage in the behavior.

Perceptions about capabilities influence behavior, but are not necessarily reflective of "true" capacities. Self-efficacy beliefs are specific to a situation, and, unlike the locus of control construct, are not meant to be generalizable across a range of behaviors.

Sources of efficacy expectations include:

1. Learning through personal experience
2. Learning through observation of events or other people, also called "models"
3. Verbal persuasion
4. Anxiety.

Learning through personal experience is the most powerful source of self-efficacy expectations. Both skills and problem-solving mechanisms are developed to handle similar situations in the future.

Models provide the second-strongest impact. For a model to be effective, he or she must be similar to the learner in characteristics such as age and sex, and must be perceived to have mastered the situation under discussion after some struggle and hard work. The model also must be able to demonstrate that the end result was worth the effort.

Verbal persuasion is a commonly used tactic in health education, but Bandura reported it was less effective than either skills mastery or modeling. Anxiety, *as evidenced by*

symptoms such as sweaty palms, tachycardia, and "butterflies" may be interpreted subconsciously by a person as a predictor of personal failure. Its opposite, relaxation, can lead to an impression of confidence and potential success.

Efficacy expectations are created through several mediating functions. Selective self-monitoring describes the tendency to pay attention to different aspects of personal performance. For instance, by focusing on positive accomplishments, an individual may increase self-confidence, perhaps even beyond realistic levels.

Information can also be weighted, giving it more or less value. For example, a highly credible model may provide input which is viewed more positively than information from less reliable sources. Interpretation is the last type of mediator. This concept refers to the enhancement of self-efficacy which comes from success based on personal ability or skills. Success attributable to outside sources such as luck or another person's intervention does not increase self-efficacy. The level of effort also affects these feelings. Success obtained through modest effort may enhance self-efficacy more than success obtained following a great expenditure of time and energy.

People tend to choose behaviors or situations which they perceive to be within their range of capabilities, and avoid situations they believe exceed their talents. Beliefs about the potential outcome of a behavior will not override the decision to not participate, based on a negative perception of capability. In other words, no matter how attractive the outcome, an individual must believe in his ability to succeed before trying.

Self-Efficacy and Health

Self-efficacy is widely reported in the literature, and, unlike several other theories, its use seems to be growing. Although the theory is appropriate to a broad range of situations, Bandura (1990) emphasized its application to health care, focusing on its role in controlling AIDS. However, the concepts are applicable to any preventive process.

Bandura (1990) reported that the most effective health communications help people

believe they have the power to change their health habits and then go on to tell them exactly how to do so. Disagreeing with fear appeal tactics, he wrote people "do not have to be scared out of their wits to act" (p. 11). Successful messages raise self-efficacy rather than heightening fear or the feeling of threat. Changing habits is also a matter of perseverance, with "success . . . achieved through renewed effort following failed attempts" (p. 11). Health communications should therefore emphasize the importance of tenacity and rebounding from setbacks.

Bandura (1990) went on to describe the components of effective self-directed health change as: (a) information, (b) development of self-protective skills, (c) enhancement of social proficiency, and (d) social support for personal change. He advised using "a variety of diffusion vehicles . . . in a public health campaign" (p. 13) due both to the high cost of mass media and to the need to tailor the message to various groups and cultures.

However, getting the information out is not enough. Citing a recent intensive educational effort at Stanford, Bandura (1990) reported that even after the campaign, fewer than 50% of the sexually active students used safer sex methods. As an alternative to a strictly informational approach, he recommended social modeling, a strategy which can increase knowledge and build skills. Also, through the medium of videotape, he believed the model could reach an expanded audience.

Modeling acts to build self-confidence and conveys insight into ways to handle difficult situations. Models affect individuals' beliefs about their own capabilities through comparison. For this reason, the most effective ones are also the most similar to the groups they attempt to influence. Seeing them surmount troublesome circumstances inspires others to believe they too can be successful.

After people learn new skills and social strategies, they need continued guidance and the chance to practice. Simulated situations and role-playing offer excellent opportunities to increase skills and self-confidence. This can also be handled through non-traditional media

such as videotapes or self-directed mental rehearsal.

All new behavior occurs within the social context, and these influences can either aid, delay, or sabotage an individual's efforts to alter health practices. A major benefit of a community health program is that it can impact the formal and informal social network as well as the individual. Both institutions and groups can be transformed to provide support and incentives, making the new behavior the norm.

Meta-Analyses

Despite self-efficacy's potential for application to health care, Strecher, DeVillis, Becker, and Rosenstock (1986) reported it "has received relatively little attention in the health education research and practice literature" (p. 73). To support the theory's extension, they reviewed and summarized 7 experimental designs and 18 surveys. They concluded: (a) self-efficacy was a significant predictor of short- and long-term success in survey research, and (b) in experimental designs, manipulation of self-efficacy had consistently proven to be powerful in initiating and maintaining change. Following are examples of three different types of experimental designs which employed self-efficacy theory.

In several cases, self-efficacy was increased through a ruse. For instance, in a study on smoking cessation, subjects randomly assigned to one of two groups were falsely told they had a higher potential to succeed based on a pre-test, thereby increasing their self-confidence. This group was more successful in changing smoking habits than the control.

Another design tested skills mastery. Subjects in the experimental group were given an explanation of the concepts of self-efficacy and were then asked to choose progressively more difficult situations in which to refrain from smoking. Their accomplishments were subsequently interpreted in the group meeting as demonstrating increased competency and mastery over cigarette smoking. Subjects in this group had the highest abstinence rate and the most enhanced scores on a measure of self-efficacy.

Contraceptive behavior also responded to self-efficacy through a cognitive behavioral

intervention. Participants were given both information and the opportunity to role-play difficult situations. They reported marked improvements in their own assessment of their ability to use birth control.

In an effort to encourage the use of self-efficacy in the daily practice of health education, Strecher et al. (1986) identified several essential steps:

1. Break out the complexities of the target behavior into components which are more easily managed.

2. Identify which aspects of the behavior require skill development.

3. Order the tasks from easy to hard.

4. Provide ongoing encouragement as progressively more difficult tasks are accomplished.

5. Attribute the accomplishments to the individual's abilities.

6. Treat lapses as opportunities to develop a better understanding of the factors involved.

In conclusion, Strecher et al. (1986) encouraged health educators to design programs which directly target self-efficacy-enhancing behaviors. They found that the traditional "medical model" of treatment strips the patient of personal responsibility in favor of the care-giver, negating self-confidence. On the other hand, they cited Bartlett who believed "self-efficacy theory provides a theoretical buttress for the notion of an 'activated' patient" (p. 89). The Theory of Self-Efficacy therefore has a timely application in the age of holistic health care.

Holden (1991) conducted a meta-analysis of journal articles on self-efficacy with health-related outcomes, published between 1981 and 1989. The final sample included 56 articles in the following categories: (a) cigarette smoking 32%, (b) pain-related 25%, (c) weight loss 14%, and (d) exercise 8%. Overall, he concluded there was a statistically significant relationship between self-efficacy and health-related outcomes.

Holden (1991) also tested and was able to support three of his four hypotheses.

Based on his review of the literature he confirmed:

1. The mean effect size of the combined studies reached statistical significance (although he in part discounted this finding as an "apples and oranges" comparison).

2. The predictive strength of self-efficacy declines over time.

3. The predictiveness of self-efficacy, when tested in combination with other constructs such as locus of control, could not be distinguished.

4. Self-efficacy was predictive of four of five categories of outcomes, including cigarette smoking, pain, exercise, and dental hygiene. However, it was not predictive of weight loss.

Research Reports

Besides these two cumulative meta-analyses, the literature contains numerous individual studies. A few will be summarized here with the goal of providing an overview of the type of research being conducted and its results.

Kok et al. (1991) reported on a smoking intervention which tested for self-efficacy before, during, and after, but was not itself designed to enhance it. They found that both the change in self-efficacy during treatment, as well as its post-treatment level, were predictors of either abstinence or relapse one year later. Their conclusion was that the most important goal for health education should be improvement of self-efficacy because that change in turn stimulates the desired new behavior.

Mailbach, Flora, and Nass (1991) conducted a study which evaluated a minimal contact, community-based health promotion campaign. Its goals were both behavior change and self-efficacy improvement. The hypotheses were:

1. Exposure to a health campaign will enhance self-efficacy.

2. Baseline self-efficacy will contribute to postintervention rates of health behavior.

3. Positive changes in self-efficacy will enhance postintervention health behavior.

4. Baseline health behavior will influence postintervention levels of self-efficacy.

5. Positive changes in health behavior will enhance postintervention self-efficacy.

The intervention involved contact through a variety of mass media techniques such as self-help kits, lectures, TV, and newsletters. Weekly reports of health behaviors and indexes to measure eating and exercise self-efficacy were collected. Although the authors concluded that all the hypotheses were supported, they also emphasized that improvements in health behavior were at least in part the direct result of enhancements in perceived self-efficacy, and were not an outcome of exposure to the campaign.

They recommended that future health education programs:

1. Use modeling because it was the self-efficacy strategy most adaptable to mass media campaigns.

2. Encourage progress toward the final target behavior in terms of easy, small steps, such as walking before running.

3. Tailor the persuasive messages to convince the audience it possesses the ability to reach the goal.

4. Customize the message to the target population.

McAuley (1992) recruited subjects via the local media to participate in a five-month exercise program. Two measures were administered to assess self-efficacy related to conditioning. He found that self-efficacy was a significant predictor in the early adoption phase, but later on in the program, as habit took over, efficacy played a less prominent role. Individuals with higher self-confidence appeared to endure the rigors of the program during the initial adoption phase, allowing them to persevere to the point where habit could take over.

Kasen, Vaughan, and Walter (1992) surveyed 181 tenth-graders regarding AIDS preventive behavior. They found that students with lower self-efficacy for refusing sex were twice as likely to have had intercourse. Also, students with lower self-confidence for correct, uniform condom use were five times less likely to have used condoms consistently. They concluded that the focus for AIDS prevention programs for adolescents should include: (a)

enhancing prevention through modeling, (b) practicing, and (c) reinforcing social skills related to AIDS prevention.

Duncan and McAuley (1993) conducted an experiment to investigate the extent to which efficacy cognitions and social support influence the maintenance of exercise behavior in an at-risk population of sedentary, middle-aged adults. They hypothesized that self-efficacy mediates between social support and health-promoting behaviors such as exercise. Measurements included two exercise-specific self-efficacy tools and the Social Provisions scale.

The results supported the hypothesis. Social support was an indirect influencer of exercise behavior with self-efficacy acting as mediator. Their conclusion was that relapse could be avoided when self-efficacy is bolstered by friends and family.

Muary and McMillan (1993) asked 400 women in Northern Ireland to complete a questionnaire about their cancer-screening behavior, health beliefs related to cancer, their health locus of control, and their emotional control. They found that although components of the HBM and the HLOC were predictive of breast self-examination (BSE), the most important predictor was self-efficacy. They also related their findings to a 1987 study by Craun and Deffenbacher which reported the most rapid increase in BSE knowledge and confidence occurred among a group of women who had first observed a demonstration of the technique, then were allowed to practice it on a model.

Jemmott, Jemmott, Spears, Hewitt and Cruz-Collins (1992) conducted an experiment to investigate the impact of a social cognitive intervention designed to increase self-efficacy and favorable outcome expectations regarding the hedonistic consequences of using condoms. There was one experimental condition, one control, and a third condition which received an informational approach.

The subjects were 19 sexually active black adolescent women recruited from an inner city family planning clinic. The study's goals were to: (a) increase the subjects' confidence

regarding their ability to implement condom use, and (b) address expectations regarding sexual pleasure associated with condom use. To do this the researchers used: (a) exercises in which the subjects responded to questions about responsibility and facts versus myths, (b) role-playing of situations which led to condom use, (c) practice of condom application on a banana, and (d) review of a video which featured scenes of an inner-city black adolescent woman and her mother and scenes of a sexual encounter which involved successful negotiation of condom use.

The information-only condition provided a film which included a multi-ethnic cast and a humorous demonstration of the banana-condom application. Subjects also played AIDS basketball, a card game in which they earned points for knowledge about AIDS. The general health-promotion condition acted as the control. Subjects in this group were given only basic information about how health risks could be reduced through diet and exercise.

Women in the social cognitive condition reported both greater intentions to use a condom and greater self-efficacy related to its use. Participants in both the information-only and social cognitive conditions demonstrated improved AIDS knowledge as compared to the control group. However, subjects in the information-only condition did not express a greater intention to use condoms, leading the researchers to conclude that increases in knowledge are not necessarily linked to planned behavior changes.

Strecher, Becker, Kirscht, Eraker, and Graham-Tomasi (1985) conducted an experimental design which enrolled 213 Veterans Administration patients in a stop-smoking program. The control group had no clinical intervention, and the treatment group received minimal practitioner-initiated contact regarding smoking. Three months later subjects with both the highest sense of susceptibility and the highest self-efficacy reported the greatest reduction in smoking. Those least likely to have changed their smoking habit reported high susceptibility combined with low self-confidence.

The authors concluded that: (a) fear appeals, a common tactic in health education, risk

increasing susceptibility in low self-efficacy patients, and (b) that individuals with a heightened feeling of susceptibility but without an associated sense of self-confidence could lapse into a state of helplessness. To reverse this decline into counterproductive behavior, they recommended that smokers be provided with an effective abstinence strategy. They also found that social support exerted a buffering influence on the interaction between susceptibility and self-efficacy, opening up the opportunity for supportive friends and relatives to help the smoker abstain.

Schiaffino, Revenson and Gobofsky (1991) surveyed arthritis patients drawn from a clinic population at a large metropolitan hospital. At the beginning of the study they conducted an in-home interview following a structured protocol, and one year later they mailed out a questionnaire. Items included questions about self-efficacy, coping, and adjustment. They found that self-efficacy beliefs were associated with both less functional disability and improved problem-solving.

Lorig and Gonzalez (1992) reported modifying an existing arthritis education program using the Theory of Self-Efficacy. Their hypotheses were: (a) efficacy-enhancing arthritis patient education will improve health status independent of the behaviors taught, and (b) an arthritis patient education program designed to enhance self-efficacy would produce more improvement in health status than the original program.

Several teaching strategies were derived from the theory:

1. The use of arthritis patients as models in the classroom

2. Weekly progress reports on skills development, combined with encouragement from the class

3. The choice by participants of which behaviors they would modify, along with a rating of how confident they felt in achieving that goal (If the confidence level was below 70%, another behavior was selected with an associated higher confidence level.)

4. Training on reinterpretation of symptoms such as pain, stress, and depression,

with an emphasis on the link between the three

5. Persuasion by group leaders who urged and encouraged the participants to do a little more than they were presently doing.

Participants were randomized to three interventions, with a waiting list acting as a control. Exercise was emphasized by the first version, cognitive pain management by the second version, and the third version combined both exercise and cognitive pain management. The same teaching strategies were used in all three courses.

All subjects demonstrated statistically significant improvements in one or more areas of health status, and in self-efficacy. Comparison of the three courses using analysis of variance showed no difference between them. Therefore, the authors concluded that the first hypothesis was supported. Efficacy-enhancing education improved health status independent of the behaviors taught.

A later trial of a combined curriculum was compared to results obtained from previous training which was not grounded in the Theory of Self-Efficacy. Differences in sample size (500 versus 97) did not allow for direct statistical comparisons. However, the authors were able to report that increases in health status obtained from the revised course ranged from 1.4 to 12 times that seen in the original course. On the basis of these results, the second hypothesis was also upheld.

In conclusion, Lorig and Gonzalez (1992) acknowledged that many questions and research opportunities remained. The causal relationship between self-efficacy and health was not clearly established, and a third factor affecting both might be at work. Another explanation could have been that improved health status itself led to enhanced self-confidence. Also there was little information about which single self-efficacy strategy or which combination affects health status change. An area identified for further research was the generalizability across cultures, as only a few studies have been done on Hispanic/Latino populations.

Conclusions

Bandura's (1977, 1982) Theory of Self-Efficacy focuses on the individual's expectations of the outcome of personal actions, as well as the ability to achieve that result. Expectation beliefs are created in a variety of ways, but the learner's willingness to enter into a situation is primarily mediated by faith in potential success, not the possible reward achieved through the effort.

Strategies which enhance self-efficacy have been identified as: (a) learning through experience, (b) learning through observation of events or other people, also called "models," (c) verbal persuasion, and (d) anxiety. Because the theory has operationalized training techniques, self-efficacy has the distinction of being widely employed in experimental designs. Research reports cited are just a small sampling of the growing body of evidence validating the construct. Two meta-analyses also substantiated this writer's review of the literature.

In conclusion, self-efficacy offers promise as a theory supported by both survey and experimental research. In contrast to constructs such as the Health Belief Model, Reasoned Action, and the Health Locus of Control appear to have stagnated in academia through an excessive reliance on survey designs, self-efficacy is being applied in clinical practice, and, as such, is beginning to point the way toward a theoretical base for health education.

Summary

Although the scientific study of persuasion is a 20th-century phenomenon, the concept has a rich history, extending back to Plato and Aristotle in ancient Greece. Until the Renaissance, persuasion was used primarily by one person to move other individuals or a group. However, in the great upheavals which followed both the discovery of the New World and the Protestant Reformation, the Catholic Church formed the first organization, the *Sacra Congregatio de Propaganda Fide,* whose acknowledged purpose was changing the beliefs of the masses.

The 20th century has seen two world wars, and both times opposing governments

found the tools of propaganda to be one of their most potent weapons. The scientific study of persuasion was born in the efforts of Hovland and fellow social psychologists who worked for the War Department. With thousands of soldiers at their disposal as test subjects, they were able to provide the first documentation of the effects of such independent variables as source credibility, and one-sided and two-sided persuasion. Working in the Agriculture Department, Lewin conducted ground-breaking work on group decision making. Later theoretical development by many of these same pioneers led to theories of persuasion including the Instrumental Theory of Persuasion, the Theory of Social Influence, and the Persuasion Model.

Since Hovland's initial experiments with the troops in World War II, investigation into persuasion, communication, and diffusion of innovations has proliferated. Although fear appeals are a common health communication strategy, research into their effectiveness has yielded mixed results. Factors which must be considered are the level of the fear appeal message, intervening receiver variables, and the potential effectiveness of the recommended treatment.

Inoculation theory suggests some logical approaches to the communication of injury prevention information because: (a) disagreement with the recommendations exists, (b) the message will be highly relevant to at least a portion of the population, and (c) counterarguments will be part of the environment as the intervention continues in the community.

Diffusion of information research also has its roots in World War II with the famous study of voting behaviors in Erie County, Ohio. This research was the first to establish "word-of-mouth" advertising as superior to the mass media in influencing opinions. From these beginnings the concept of opinion leaders was expanded and described by E. Rogers (1983). Through an exhaustive review of thousands of articles, he defined the steps in the innovation process, the categories of adopters, and the characteristics of an innovation which influence its adoption.

Bandura (1977, 1982) created the Theory of Self-Efficacy which focuses on the individual's expectations of the outcome of personal actions, as well as his or her ability to achieve those results. Belief in the probability of a particular effect comes about in many ways. Willingness to attempt a new learning experience or engage in a new activity is primarily based on the chances of success, not eagerness for associated rewards.

Because the theory has operationalized training techniques, self-efficacy has the distinction of being widely employed in experimental designs. It offers promise as a theory supported by both survey and experimental research.

The practical use of theories such as the Health Belief Model, Reasoned Action, and the Health Locus of Control appears to have come to an impasse based on their almost singular reliance on survey designs. In sharp contrast, the functionality of self-efficacy in the world of clinical practice is increasing, and the results are encouraging. As such, it is pointing the way toward a theoretical foundation for health education.

Conclusion

For it is commonly said: completed labours are pleasant.

Cicero

Synopsis of the Review of Related Literature

From antiquity to modern times physical health has more often been viewed as the province of religion, the occult, or mystery, than that of science. Following these assumptions, disease has been laid at the door of gods, fortune, ill winds, even sin. Going to the opposite extreme, the scientific revolution of the 1700s swept away these notions—decreeing the body was a machine immune to the influences of mind and soul.

Beginning with the great public health movement of the 1800s, there was a growing

acknowledgment of the effects of both environment and behavior on wellness. Even as truly scientific medicine created the age of medical miracles in the 20th century, the wheel turned again, shifting the paradigm toward a holistic view of health. Everything is related. Leonardo da Vinci's famous pen and ink sketch of man contained within a unifying circle is now a mirror for our understanding of the intimate relationship between body, mind, spirit, the environment, and wellness.

Recognizing the circle is round, that behavior and health are one and the same, has led both psychologists and health care professionals to speculate on the fascinating question of why people do not always act in their own best interests. Knowing that smoking is linked to lung cancer and emphysema, why does anyone smoke? Knowing that driving without a seat belt can be deadly should a crash occur, why do people ride unrestrained? Knowing Attu in the Aleutians is at least 12 hours away from a hospital, why would anyone there ride an ATV without a helmet?

Beginning with the ground-breaking work of public health physicians in the 1950s who wanted to understand why free preventive services were not being used, many theories have been advanced to explain the apparently inexplicable. Two theories have gained the greatest recognition through continued research and reporting: the Health Belief Model, and the Theory of Reasoned Action. Barriers to health have proved to be the most predictive component of the Health Belief Model. Although more complex theories continue to be advanced, and some authors even call for a return to the epidemiological concept of host-agent-environment, these two models, or some combination, are at the core of scientific understanding in this area.

Unfortunately, despite pleas by the theories' originators, investigation into both constructs has been almost exclusively limited to self-report data surveying their effectiveness as predictors of health behavior. Experimental designs, which could test academic theory against the "real world" of clinical practice, have been almost completely avoided. Qualitative designs are also exceedingly rare.

Theorists have acknowledged the limitations of their constructs in relation to the prediction of habitual behavior because studies have measured one-time, singular cognitive decision-making processes. Research into health habits appears to be historical rather than current, and there is a paucity of theoretical development. Information about methods appropriate to enhancing change of habitual unhealthy behaviors is also limited.

Theories of adult learning and motivation, although little used in the health care arena, offer important direction to health educators. Behaviorism has contributed the ubiquitous "behavioral objectives," a formula without which any health education program would be incomplete. However, the stimulus-response concept appears to lack validity in the field of disease prevention because the outcome—disease or injury—is distantly related in time to the behavior.

Cognitivists moved the focus of learning away from the environment to the individual learner, a concept essential to health care interventions. Political philosophies developed by Kant (1976) and Mill (1989) originally validated the supreme importance of the individual's decision-making power in a free society. With a passion equal to that of political revolutionaries, advocates for the holistic health movement have adopted similar beliefs, placing the patient in control of his or her body and health care decisions.

Humanists, advocates for the individual's unlimited potential to grow and develop, created an optimistic, empowering view of the adult learner. Self-directed learning and a belief that the individual, not the subconscious or the environment, controls his or her own destiny are key concepts.

Experiential learning theorists carried humanistic concepts of empowerment and human potential into the arena of daily life, even into situations of great poverty and powerlessness. From the emancipatory learning of Mezirow (1981) to the deschooled society of Illich (1984), they advocated learning which both originates in experience and returns to its foundation in real-life situations.

Theories of motivation support an understanding of why learners engage in the educational process. Maslow's hierarchy of needs placed safety and health at one of the most basic levels of motivation (1970). Many learning theorists contributed to the concept of relevance, which in simple terms means that learners are motivated to participate in education if they view the content as directly applicable to their own lives. The experiential learning theorists, Mezirow (1981), Freire (1986), and Illich (1971) believed that relevant learning began with experience, was based in the community, and should be controlled by the learner.

Attribution theory described the tendency to search for a cause for experiences, especially those which are negative, unexpected, or important (Weiner, 1979). The cognitive component of attribution theory predicts that when past failures are attributed to a stable cause (one which recurs), efforts to deal with the same situation in the future will be characterized by reduced energy, thus perpetuating the cycle of failure. Den Boer et al. (1991) compared this concept to Bandura's theory of self-efficacy which assumes a low sense of self-confidence will lead to task avoidance.

Theories of community development are important to health educators because so much of the "real work" of the profession occurs in this context. Unfortunately, this area is marked by uneven contributions. Not unlike health education programs, bits and pieces of the models have found their way into current practice, although other concepts are too new to have been tested. Sanders's typology of community development functions, locus of decision making, and functionaries provides a framework for evaluating the assets and potential problems for various strategies. The discussion of ethical considerations offers insight into some of the controversies which make health education such a complex field.

Although the quantity of health education programs has exploded in the past two decades, few have been guided by science. Nor are there any theories which can be

specifically claimed by the discipline; all have been borrowed from other fields. However, themes which can be identified throughout the literature include:

1. An emphasis on the importance of both experience and relevance
2. The need to empower the autonomous individual to make the best possible decisions for his or her own health
3. The need to help people believe they can be successful in making changes
4. The importance of interpersonal, social, and cultural relationships in making health changes.

Injury has been recognized as a worldwide public health problem of the first magnitude, arising primarily from motor vehicle crashes. The United States has taken a leadership role in addressing the epidemic of injuries through increased funding, designation of a lead agency within the government, and the publication of national injury reduction goals in *Healthy People 2000.* Around the world injury rates are declining in response to programs characterized by their recognition of the problem, their belief that a solution is feasible, and their unremitting commitment over decades.

Although the aggregate U.S. injury rate has declined by 54% since 1960, the rate for motor vehicle injuries has shrunk by only 27%. Head and spinal cord injuries are the most serious consequence of motor vehicle crashes, and the majority of cases of quadriplegia and paraplegia result from these events. Since 1987 Alaskan motor vehicle rates have been increasing, contrary to nationwide trends.

The demographics of injury are well documented. Populations most at risk both nationally and in Alaska are young, male, Native, and rural. In Alaska, off-road vehicles account for only 5% of motor-vehicle-related fatalities but contribute to 23% of motor-vehicle-related hospitalizations. In rural areas, off-road vehicle injuries predominate over those sustained from automobiles.

Northwest Arctic Borough leads the state in per capita snowmachine injuries and ranks second for ATV injuries. NWAB's head injury rate (from all causes) is approximately twice the U.S average, and spinal cord injuries are at least four times the national rate. Off-road crash victims in NWAB are distinguished from those in other Alaskan regions in the following ways: (a) no injured riders wore helmets, (b) more females were involved in ATV crashes, and (c) more crashes occurred on roadways and fewer were reported in wilderness locations.

Helmets have been well documented as an effective deterrent to head injuries for motorcycle, off-road vehicle, and bicycle riders. Programs aimed at increasing the use of helmets through voluntary decision making are widely reported in the literature. Although a great variety of approaches is currently employed, and the conclusions are tentative, several common themes can be identified: (a) the gradual nature of change and the consequent need for long-term commitment by policy makers, (b) the impact of both peer pressure and role models, (c) the importance of a multifaceted strategy which includes a variety of approaches such as education, marketing, role models, and regulations, (d) the value of affordable and comfortable helmets, and (e) the promise of programs based in the community.

The scientific study of persuasion was born in the efforts of Hovland and fellow social psychologists who worked for the War Department during World War II. With thousands of soldiers at their disposal as test subjects, they were able to provide the first documentation of the effects of such independent variables as source credibility and one-sided and two-sided persuasion. Since Hovland's initial experiments with the troops, investigation into persuasion, communication, and the diffusion of innovations has proliferated. Fear appeals and inoculation theory have received considerable theoretical development. The diffusion of information in a community has also been studied extensively, resulting in descriptions of the process, the characteristics of an innovation which inhibit or promote its adoption, and the attributes of groups which either embrace or avoid innovations.

Bandura's Social Learning Theory (Self-efficacy) has provided an understanding of the importance of helping people believe they can succeed, as well as identifying ways in which these expectations are formed. Self-efficacy has been widely reported in the literature, and, unlike several other theories, its use seems to be growing. Also, unique among the most widely reported theories, it has been successfully used in several experimental studies. Although constructs such as the Health Belief Model, Reasoned Action, and the Health Locus of Control appear to have been shipwrecked on the shoals of excessive reliance on survey designs, self-efficacy is being applied in clinical practice, and, as such, is beginning to point the way toward a theoretical base for health education.

Conclusions from the Review of Related Literature

Conclusions which can be drawn from this literature review are:

1. Behavior and health are intimately related.

2. Where health is concerned, people do not always act in their own best interests, nor does behavior always follow knowledge of healthy lifestyle practices.

3. Theories which explain why people behave the way they do regarding their own health are emerging, and have some predictive ability.

4. The Health Belief Model assumes that decisions are made based on the individual's subjective reality rather than the objective environment (Maiman & Becker, 1974; Rosenstock, 1974). Barriers to taking action are the most predictive component of the Health Belief Model. Other factors which affect attitudes include perceptions of: (a) susceptibility to the health condition, (b) the severity of the consequences of contracting the condition, and (c) the effectiveness of health care treatments in reducing susceptibility to or the severity of the disease. Cues to action, alerting an individual to feelings, are necessary to activate the conscious decision-making process described by the Health Belief Model.

5. The Theory of Reasoned Action identifies the sole determinant of behavior as the intention to perform it (Ajzen & Fishbein, 1973). Factors which affect intention are attitudes toward behavior (behavioral beliefs) and the perceived expectations of important groups or individuals (normative beliefs). Behavioral beliefs are affected by perceptions of the consequences of carrying out an action, either beneficial or harmful.

6. Lewin (1958) and Pelz (1958) both reported that factors which affect future action by group members include perception of a group consensus and the public commitment to take action.

7. Both the Health Belief Model and the Theory of Reasoned Action are based on situations in which a conscious, one-time decision is being made, and are acknowledged to have limitations in predicting habitual behavior.

8. Learning theories which emphasize the individual's ability to change and grow, especially in the context of experience, have particular relevance. Kolb (1984) reported that learning is an interaction of the individual with experience. Knowledge is created when events are transformed into concepts. Illich (1984) believed "that most people learn most of the time (and that) they give purpose and give meaning to whatever they come in contact with" (p. 96-97).

9. Injuries are a predictable and therefore preventable phenomenon. Motor vehicle crashes rank first as a cause of injury and contribute to the majority of cases of quadriplegia and paraplegia. In Alaska, motor vehicle injury rates are increasing. Off-road vehicles are the primary factor in motor-vehicle-related injuries in the rural areas of Alaska, where the rates for head and spinal cord injuries (from all causes) exceed the national baseline by a factor of two and four respectively. Northwest Arctic Borough leads the state in per capita snowmachine injuries and ranks second in ATV injuries. Residents of NWAB were hospitalized five time more often than other Alaskans as a result of off-road injuries, and they sustained head injuries in more than a third of all ATV crashes and in one out of five snowmachine crashes.

10. Bandura (1977, 1982) found that behavior change and maintenance are a function of outcome expectations about what will occur from engaging in the behavior and efficacy expectations about one's own capabilities to successfully engage in the behavior. Learning through observation of other people, also called models, provides the second strongest influence on self-efficacy expectations, and learning through personal experience provides the strongest impact.

11. James described habit as a chain, which is initiated by a cue and continues until the last event in the chain is completed (cited in Stephens & Marlatt, 1987).

12. Habit sequences can be changed, although with great difficulty. The individual's attention and conscious decision making must be restored to the activity via forces which disrupt the continued satisfaction of needs (Stephens & Marlatt, 1987).

13. The gradient of reinforcement concept from instrumental learning theory describes the finding that immediate consequences exert greater control over behavior than delayed ones. This is especially true when the instantaneous effects meet needs but aftereffects are negative. Changing such habit patterns is particularly difficult (Stephens & Marlatt, 1987).

14. Cohen et al. (1990) found that the health habits of junior and senior high students were consistent with adults' lifestyles. He also discovered that in most categories elementary school students reported the healthiest habits.

15. The theories and models of community development are worthy of consideration, especially in an evaluation of the potential problems and assets of a given strategy.

16. Rogers (1983) described the factors which impact the diffusion of innovations in a community. He concluded that personal contact is more effective in changing opinions than the media, especially when the receiver is resistant or apathetic. He also described change agents as professional people who were key figures in the evaluation and trial stages of an innovation. Community members were categorized according to their response to change; as

a group early adopters exerted the highest degree of opinion leadership over the rest of the group.

17. The effectiveness of fear appeal persuasive techniques has been found to vary based upon intervening variables in the message's receiver. Berkowitz and Cottingham (1960) found that the response to a fear appeal was mediated by perceived vulnerability. In their study, subjects who drove the least reported the greatest intention to alter their behavior to wear a seat belt. Conversely, drivers who traveled the most experienced the greatest resistance to adopting the new behavior.

18. Health education programs based on the theory of self-efficacy (Social Learning) have shown promise in experimental designs, but many aspects of the theory remain untested in this context.

Summary of Conclusions

Although the link between behavior and health is undisputed, and theories of health behavior exist which are predictive of personal lifestyle decisions, the field of health education has enjoyed little direct benefit from these models. Experimental designs which could link the practical world of clinical practice to academic theories have been little used.

Theories which have particular application to the field of injury prevention health education are essentially untested, especially in the specific area of ATV training. The identification of strategies which are effective in increasing the use of ATV helmets could direct future programs. Also, application of theory-based training techniques would provide an important contribution to the field of health education in general.

CHAPTER THREE

METHODS

To be both a speaker of words and a doer of deeds.

Homer

Design of the Study

This study was designed to determine if health education strategies are effective in increasing the use of helmets by riders of ATVs and snowmachines in rural Alaska, and to describe personal characteristics of both helmet users and nonusers.

A quasi-experimental design employing three sets of three villages each provided a comparison between two treatments and a control. In consideration of barriers, which is the most predictive element of the Health Belief Model, access to helmet purchase was identified as a key issue. Two tactics were devised to reduce the barriers to owning a helmet: placement for sale in the Community Health Clinics of all treatment villages, and lowering of the price from $275 for a helmet alone to $40 for a set of helmet and goggles.

In the first group of three villages, low-cost helmets were made available, but no training occurred ("helmets-only" villages). The second group of three villages received helmets plus exposure to modeling, a training technique drawn from Bandura's theory of self-efficacy ("modeling-plus-helmets" villages). An additional three villages acted as controls. The isolation of all nine villages enhanced the separation of strategies, one from the other.

Observation of helmet use by off-road vehicle riders occurred before, during, and at the

conclusion of the experiment. In all villages, observers were stationed in front of the U.S. Post Office. This site was selected because it was a high-traffic zone which could not be avoided in response to the observer. A uniform time was also established: one hour before the close of business. Observers were asked to complete reports six days a week for 30 minutes each day. The study spanned 12 weeks.

Pre-intervention observation over a 14-day period established a baseline. During a second two-week cycle, helmets were made available for sale in the clinics and, in the villages receiving training, the models began wearing their helmets and speaking with village residents about the advantages of helmet use. Retail sales and modeling continued throughout the remainder of the study.

Curbside interviews, using a standardized, short list of questions, were conducted during the next two-week interval. Responses elicited information on: (a) perceptions of normative beliefs about helmet use (Theory of Reasoned Action), (b) social learning in response to off-road injuries, (c) attitudes toward helmet use in relation to components of the Health Belief Model (susceptibility, severity, benefits, and barriers), (d) helmet-wearing habits, (e) personal history of off-road vehicle injuries, and (f) response to the two treatment conditions.

Also, following the interview, all nonhelmeted riders and walkers were reminded of helmet availability (a "cue to action"). Helmet use was also encouraged. Although the interview was conducted only once per person, cues to action were repeated.

Another 14-day circuit of data collection followed the interview and cue-to-action phase. Four weeks after this, during week 12 of the study, final observations occurred over a seven-day period.

From beginning to end, data collection spanned 12 weeks and was scheduled for a total of 61 days.

Observations were made by village residents who were closely supervised by staff from

the Office of Environmental Health (OEH) in the Maniilaq Health Corporation. Although based in Kotzebue, OEH staff traveled to the villages frequently.

Qualitative interviews were conducted following the study using a standardized format which incorporated questions from the curbside interview and also elicited information about the community's health needs and response to the treatment. Community Health Aide Practitioners (CHAPs) from all study villages acted as key informants, and the role models were also debriefed.

Retail sales of helmets were analyzed by village and treatment condition.

Table 21 provides an overview of the study design.

Table 21

Design of the Study

Village Strata	Treatment Condition	Study Weeks						
		1-2	3-4	5-6	7-8	9-10	12	13+
S	Control	O	O	OI	O		O	Q
M	Control	O	O	OI	O		O	Q
L	Control	O	O	OI	O		O	Q
S	Helmets-Only	O	OH	OHI	OH	H	OH	Q
M	Helmets-Only	O	OH	OHI	OH	H	OH	Q
L	Helmets-Only	O	OH	OHI	OH	H	OH	Q
S	Helmets-plus-Modeling	O	OM	OMI	OM	M	OM	Q
M	Helmets-plus-Modeling	O	OM	OMI	OM	M	OM	Q
L	Helmets-plus-Modeling	O	OM	OMI	OM	M	OM	Q

KEY:
Village Strata: S = Small Village, M = Medium Village, L = Large Village
Study Weeks: O = Observation, I = Curbside Interview, H = Helmets-Only Treatment
M = Helmets-plus-Modeling Treatment, Q = Qualitative Interviews

Description of the Site

Nine of the eleven villages within the Northwest Arctic Borough of Alaska were selected as study sites.

As the name implies, the Northwest Arctic Borough is located in Alaska's northwest corner. On the west, it is bounded by the Chukchi Sea, which empties into the Arctic Ocean. Kotzebue, hub city for the region, lies just 200 miles east of Russia. Prehistorical relationships ally the Iñupiaq Eskimos of the area more closely to the peoples of Siberia than to those of Europe or of the contiguous forty-eight states.

The Arctic Circle passes through the middle of the borough, with nine of the eleven villages north of this latitude. Wintertime is remarkable for its extremes of cold, dark, and wind. Temperatures of minus 40 to minus 60 degrees Fahrenheit are not uncommon and are often accompanied by strong gusts, adding a significant chill factor. Winter lasts at least seven months, descending in mid-September and continuing until early May. Although the Arctic sun enhances personal energy and outdoor activities in the summer, its loss for significant portions of the winter poses a variety of challenges, both psychological and physiological. Also, travel in the dark and the very cold climate presents special hazards.

Wilderness covers much of the borough. The Bering Land Bridge National Preserve flanks the borough's southwest corner, and the northeast is bounded by the Kobuk Valley National Park and Gates of the Arctic National Park and Preserve. Terrain varies widely, from mountains to giant sand dunes, tundra, and boreal forests. Five major river systems drain from the mountains down to the Chukchi Sea.

By both Alaskan and "Lower 48" standards, the borough is vast. Covering 39,000 square miles, it is the second largest in Alaska. Its size compares roughly to the state of Indiana. Connections to the world outside the region are primarily by air. No road systems exist, either within the region or between Alaska's major urban areas and Kotzebue. Small "bush" airplanes, able to land on short ice and snow strips in the winter and dirt strips in the summer, link the villages. Winter transportation options include dogsled and snowmobile, while ATVs roam summer's boggy tundra and boats ply the riverine highways. Although automobiles are driven around town in Kotzebue, they are not a major means of transportation. Off-road

vehicles take their place.

Kotzebue has a modern jet airport, but distances to Alaska's population centers are significant. Fairbanks, an interior city of approximately 50,000, lies 450 air miles to the southeast, and Anchorage, Alaska's largest city at 225,000, is even more distant at 545 air miles.

Although Kotzebue boasts a hospital (the Maniilaq Health Center) which is capable of primary care and stabilization, the facility has no surgeon, orthopedist, or other specialist. Patients requiring surgery, comprehensive diagnostic testing, or intensive inpatient care are sent to Anchorage. Transport times to reach a tertiary-level acute care hospital where definitive treatment can occur are significant, and time spent away from the village recuperating may be weeks or even months.

The total population of the Northwest Arctic Borough is 6,700 (Northwest Arctic Borough). Table 22 displays its 11 communities, their census, the percentage of Iñupiaq residents in each, and the village's air miles from Kotzebue.

Table 22

Villages in the Northwest Arctic Borough: Population, Ethnicity, and Air Miles from Kotzebue

City	Population	Percent Iñupiaq	Air miles from Kotzebue
Ambler	169	89%	138
Buckland	104	100%	75
Deering	160	97%	57
Kiana	434	100%	57
Kivalina	290	99%	80
Kobuk	86	94%	128
Kotzebue	3,705	74%	N/A
Noatak	300	100%	55
Noorvik	560	97%	45
Selawik	682	96%	70
Shungnak	237	98%	150

Note. From "Northwest Arctic Borough: Wise Development For a Secure Tomorrow" by the Northwest Arctic Borough, 1994, Anchorage, AK: Northern Printing.

As Table 22 demonstrates, villages vary in size and distance from the hub city. Kotzebue, with 18.5% Caucasian and 6% other Native population, is the only community with a significant non-Eskimo populace.

All villages have a Community Health Clinic (with the exception of Kotzebue, which is served by the Maniilaq Health Center.) Clinics are staffed by CHAPs, local residents who have received specialized training for their roles through the Indian Health Service. They provide primary care to the village, and are supervised daily via radio by physicians in Kotzebue.

Description of the Population

Villages of the Northwest Arctic Borough are primarily populated by indigenous peoples of the Iñupiaq Eskimo culture. As such, they form a unique and separate group from the three other Native peoples of Alaska: the Athabascans to the south and east, the Aleut to the south on the Aleutian chain, and the Tlingit-Haida tribes in the southeast panhandle of the state. Most experts believe the Iñupiaq have occupied the North Slope of Alaska for at least 10,000 years.

During that time, and even to the present day, they have pursued a hunter-gatherer lifestyle, living off the bounty of the land. Their diet consists of native berries and other vegetation gathered in the summer, caribou hunted primarily in the fall and winter, salmon, whitefish, and crab caught in the spring and summer, and, most importantly, small marine mammals, especially the seal, which are accessible year round. Although the Iñupiaq live in established villages during the winter, ranging the immediate vicinity for food, they disperse to fishing camps as soon as summer arrives.

Given the lack of a modern road system, snowmachines and ATVs have become an essential part of village life. As all-purpose vehicles, they provide basic transportation around and between villages, support access to the remote wilderness, sustain hunting and fishing

activities, and even act as a "baby-sitter" for restless youth bored with village life. They are as ubiquitous as cars in urban America, and taken for granted just as much.

Following a subsistence lifestyle, many Iñupiaq live outside the modern cash economy. Most of their basic health and human service needs are met through treaty obligations and state appropriations. Health care is provided at no cost, and all but the tiniest villages have their own schools, enrolling students from kindergarten through grade twelve.

The Alaskan Native Claims Settlement Act (ANCSA) of 1971 attempted to settle once and for all issues of native sovereignty, aboriginal hunting and fishing rights, and land claims. As a result of this legislation, profit-making regional "Native corporations" were established throughout the state to administer commonly held funds, and nonprofits were chartered to provide basic health and human services to tribal populations. Over the past 20 years, Native health associations have gradually assumed more responsibility for direct management, and, in some regions, even the operation of acute and primary health care. Funding comes from a variety of sources including both the federal and state governments.

The Northwest Arctic Native Association (NANA) Regional Corporation was founded under ANCSA as the for-profit Iñupiaq business of the region. It has a wide range of investments including seafood processing, jade mining, oilfield services, catering, industrial security, and hard-rock exploration within the mineral-rich borough.

Maniilaq Association is the regional nonprofit organization which serves the health and social needs of the 11 villages in the borough and of Point Hope (under contract to North Slope Borough). Over its 20-year history, Maniilaq Association has grown from an agency which administered a limited number of programs to one which manages a wide range of state and federal services including the hospital in Kotzebue and clinics in all the villages.

Of particular importance to this study is the establishment within Maniilaq of an Injury Control Program (organized within the Office of Environmental Health) which is staffed with an Injury Control Specialist. Employed by all Native health corporations, Injury Control Specialists

(ICSs) are responsible for developing and implementing programs aimed at reducing the primary cause of death in the Alaskan Native population, ages 1 to 44: injury. Coming from a variety of backgrounds, they frequently qualify for their positions by tribal status or local residence. As such, they most closely resemble the "lay health advisor" described by Eng and Young (1992) or the "local lay leader" described by Sanders (1958).

Technical expertise is available to the Injury Control Specialists from the U. S. Public Health Service, which maintains an Injury Control Office in Alaska. Working in a matrix relationship with the ICS's, the Area Injury Control Officer provides direction and assistance. Cordial working relationships are maintained through commitment to a common goal.

Selection of the Sample

To control for potential extraneous variables created by village population dynamics, villages were stratified by size into small, medium, and large (see Table 23):

Table 23

Stratification of Villages in the Northwest Arctic Borough

Strata	Range	Villages	Population
Small	0 - 199	Kobuk	86
		Buckland	104
		Deering	160
		Ambler	169
Medium	200-499	Shungnak	237
		Kivalina	290
		Noatak	300
		Kiana	434
Large	500+	Noorvik	560
		Selawik	682
		Kotzebue	3,705

Note. From "Northwest Arctic Borough: Wise Development For a Secure Tomorrow" by the Northwest Arctic Borough, 1992, Anchorage, AK: Northern Printing.

The experimental and control villages were selected as follows (see Table 24):

Table 24

Village Strata Selection

Experimental Condition	Village Strata Selection
Control	1 small, 1 medium, 1 large
Helmets-Only	1 small, 1 medium, 1 large
Modeling-Plus-Helmets	1 small, 1 medium, 1 large

A random method was employed to determine which villages were assigned to each treatment group, as well as which villages acted as controls. Table 25 displays the results of the random selection process.

Table 25

Selection of Control and Treatment Villages

Experimental Condition	Small Villages	Medium Villages	Large Villages
Control	Ambler	Shungnak	Selawik
Helmets-Only	Deering	Noatak	Noorvik
Modeling-Plus-Helmets	Buckland	Kiana	Kotzebue

Preliminary Steps

Observer Recruitment and Training

Residents from the nine villages participating in the study were recruited to act as observers. The Injury Control Specialist from the Maniilaq Office of Environmental Health was instrumental during this process, drawing upon his personal contacts and knowledge of people within each village. Selection criteria included reliability, ability to follow the study guidelines, and literacy. Although observers came from a variety of occupations, they were all involved in the village cash economy, either through the city government or through positions sponsored by

Maniilaq, such as Community Health Aide Practitioner and Village Public Safety Officer (VPSO).

They were paid a total of $300 for data collection. A payment of $150 occurred upon completion of the first two weeks of observations, with the second check coming at the conclusion of the study, in week twelve.

Training for the observers occurred on a one-to-one basis in their home village. During the two months prior to the study, the Injury Control Specialist traveled to all nine villages to set up the study. Observers were provided with three-ring binders, which organized the materials they would be using, and waterproof enclosed clipboards to protect the data collection forms from the elements. All forms were customized with the name of the village as a means of avoiding mislabeling. To ensure that all participants received the same information, a videotape describing the study outline and observation techniques was prepared by the researcher. The Injury Control Specialist used this during the briefings, which occurred in the Community Health Clinics of each village. Also, the training class itself was videotaped.

After showing the videotape, the Injury Control Specialist reviewed documents key to the study's success: (a) the Study Schedule (Appendix A), (b) the Helmet Observation Form (Appendix B), (c) Observer Instructions (Appendix C), (d) the Curbside Interview Form for Nonhelmet Wearers (Appendix D), (e) the Curbside Interview Form for Helmet Wearers (Appendix E), and (f) the Curbside Interview Instructions (Appendix F).

Following an opportunity for questions and answers, the Injury Control Specialist monitored the observers while they practiced completing the Helmet Observation Form on the village street. The hands-on portion of the training continued until the observers were able to manage the documentation without supervision. The observers also completed a return demonstration with the Curbside Interview Form to assure their competency in its administration. No difficulties were encountered during this phase. At the conclusion of the briefing, the observers were asked to sign an agreement restating the study guidelines and their willingness to participate (Observer Agreement Form, Appendix G).

Role Model Recruitment and Training

Role models were selected for the villages of Buckland, Kiana, and Kotzebue. Criteria for their recruitment included: (a) local residency, (b) status as an upstanding community citizen, and (c) frequent use of off-road vehicles. Also, when feasible, Natives were sought out because of the need to match role models as closely as possible with the population targeted for change. To be chosen as a role model, whites had to be permanent residents of the region as evidenced by long-term employment and/or by marriage to an Iñupiaq.

The role model in Buckland was a Native male who operated the village's water treatment plant and electric utility. Kiana's role model was the VPSO, a white long-term resident married to an Iñupiaq. Two role models were selected in Kotzebue: a Native male known for his hunting prowess and expertise in the operation of off-road vehicles, and a white male who had worked for Maniilaq for over a decade, having resigned his commission in the U.S. Public Health Service for the love of a local Native woman.

As with the observers, training for the role models occurred on a one-to-one basis during the two months prior to the start of the study. The Injury Control Specialist met with the candidates and reviewed a videotape prepared by the researcher. In return for a free helmet and goggle set, the role models agreed to: (a) wear the helmet every time they drove an off-road vehicle during ten weeks of the study, (b) address two community groups on the benefits of helmets, and (c) informally encourage village residents to wear helmets. Key points they agreed to discuss were: (a) their belief that is was important to wear a helmet all the time to prevent head injuries, (b) the importance of "doing as I do," (c) ways they remembered to wear the helmet, (d) the warmth and comfort of the helmet, and (e) the importance of the end result of safety.

At the conclusion of the meeting, the role models were asked to sign an agreement restating the study guidelines and their willingness to participate (Role Model Agreement Form, Appendix H).

Helmet Selection and Distribution

Barriers to helmet access were reduced through two strategies: (a) sales in the villages rather than in the regional hub, Kotzebue, and (b) a price reduction from $275 for a helmet alone to $40 for a helmet and goggle set.

The Community Health Clinics were chosen as the sites for retail sales because they were a high-traffic, public area and because of the natural connection between the study, whose goal was promoting the welfare of the community, and the mission of the clinics. Additionally, as fellow Maniilaq employees, the Injury Control Specialist had direct access to the CHAPs. It was believed that staging helmet sales in the clinics, under the auspices of Maniilaq, would finesse the issue of competition with retail stores, and this indeed turned out to be the case. As an incentive, the clinics were given a 10% commission ($4) for each sale. In the two months prior to the study, the Injury Control Specialist contacted CHAPs in the six clinics which would be receiving helmets (Deering, Noatak, Noorvik, Buckland, Kiana, and the Maniilaq Health Center in Kotzebue) to secure their permission and support for the project.

Training for the CHAPs occurred on a one-to-one basis, as it did with other study participants and was conducted in the two months prior to the study. The Injury Control Specialist reviewed the Helmet Sales Tracking Form (Appendix I) and emphasized the importance of placing the products in the waiting area of the clinic where they would be highly visible and would attract attention. As a final step, a Health Clinic Agreement Form (Appendix J), which restated the guidelines and confirmed willingness to participate, was signed.

Prior to purchasing the helmets, various designs were reviewed for their appropriateness to the Arctic environment. Important considerations were identified through discussions with local residents, including: (a) compatibility with knit caps and thermal face masks, (b) functionality while sighting a rifle, (c) ease of taking on and off, and (d) ability to keep the helmet-wearer warm. Based on these criteria, several styles were tested during the two months prior to the study. The ultimate selection was an open-faced helmet with a wind visor.

Colors were limited to white and black, both with eye-catching racing stripes. Employing the concept of a starter-set, black goggles were added to the package. It was believed they would help keep people warm in the extreme climate and would also be perceived by the consumer as an added value.

Funding for the purchase came from two sources: the Alaska Area Office for Injury Control (U. S. Public Health Service) and the State of Alaska EMS Section. A bulk order was placed with a national retailer, and because of the discount obtained, the final sales price represented only a 50% loss. Maniilaq Association bore the considerable expense of shipping to the villages. The purchase price of $40 was determined with several goals in mind: (a) keeping the products affordable, (b) generating sales income to fund future purchases, and (c) creating a sense of value in the customer's eyes because "free" goods are often perceived as being worth their purchase price—essentially nothing. The dollars produced from sales were placed in a dedicated account whose status could be maintained from one fiscal year to the next.

The number of helmet and goggle sets distributed to each community was based on the village strata and population (see Table 26.)

Table 26

Helmet Distribution Scheme

Village	Strata	Total Number of Helmets Distributed	Helmet Sizes
Deering	Small	7	4 extra large, 2 large, 1 small
Buckland	Small	7	4 extra large, 2 large, 1 small
Noatak	Medium	14	8 extra large, 4 large, 2 small
Kiana	Medium	14	8 extra large, 4 large, 2 small
Noorvik	Large	18	10 extra large, 5 large, 3 small
Kotzebue	Large	34	20 extra large, 10 large, 4 small

Kotzebue was singled out to receive more helmets than the other large village,

Noorvik, due to the population disparity between the two communities (Noorvik has 560 residents versus 3,705 in Kotzebue.) The total number of helmets purchased was limited by the funding available. Due to the extended lead time required for shipment to Alaska, helmets could not be restocked during the study when income from sales became available.

Community Announcements

As a means of alerting residents of the six experimental communities to the availability of helmets in the clinics, a series of posters was created. For the three villages treated with only increased access to helmets, the message was a simple advertisement (see Figure 32) plus a pen and ink sketch of helmet and goggles (see Appendix K):

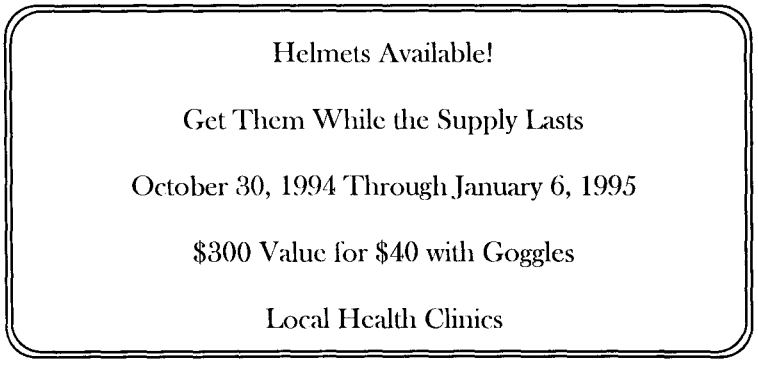


Figure 32. Community announcement A.

A second set of posters was created for communities treated with both increased access and modeling. Messages combined modeling theory with the "Iñupiaq Values," a summary of tribal beliefs published throughout the region (see Figure 33).

Note. From "Maniilaq Association: Kotzebue, Alaska" by the Maniilaq Association, 1992, Kotzebue: Author.

Every Iñupiaq is responsible to all other Inupiat
for the survival of our cultural spirit,
and the values and traditions through which it survives.
Through our extended family, we retain, teach, and live our Iñupiaq way.

With guidance and support from elders,
we must teach our children Iñupiaq values:

Knowledge of Language
Sharing
Respect for Others
Cooperation
Respect for Elders
Love for Children
Hard Work
Knowledge of Family Tree
Avoid Conflict
Respect for Nature
Spirituality
Humor
Family Roles
Hunter Success
Domestic Skills
Humility
Responsibility to Tribe

Our understanding of our universe and our place in it is a belief
in God and a respect for all His creations.

Figure 33. Statement of Iñupiaq values.

Key aspects of modeling theory were selected for the posters which reiterated the instructions given to the role models. These included: (a) the belief that overcoming previous habits was feasible, (b) techniques for remembering to wear the helmet, (c) the importance of making the new behavior a permanent change, (d) an emphasis on the end result of safety, and (e) the essential message of modeling—that others should "do as I do." Pen and ink graphics were created from photographs taken in the region during the two months prior to

the study, resulting in the use of familiar and appropriate images. Information on helmet pricing and availability repeated the communication provided to villages receiving only increased access to helmets. Messages on the posters in the villages treated with modeling and increased helmet access follow (Figures 34-37, see also Appendixes L - P) :

I'm Responsible to My Family and My Tribe for My Own Safety

I Have the Power to Improve the Health of My People

I Always Wear My Helmet!

Figure 34. **Community announcement B.**

We Hang Our Helmets by the Door

We See Them and Remember to Wear Them

It's Worth it Because We Feel Safe

We Always Wear Our Helmets!

Figure 35. **Community announcement C.**

It Was Hard Work to Remember to Wear a Helmet.

But It Was Worth It!

I Always Wear My Helmet!

Figure 36. **Community announcement D.**

I Can Stay Warm in My Helmet

I Can Be Warm and Safe

I Always Wear My Helmet!

Figure 37. **Community Announcement E.**

Pilot Testing of the Helmet Observation Form

During June and July of 1994, the Helmet Observation Form (Appendix B) was pilot-tested in Kotzebue by the Injury Control Specialist. Observations were made on the streets under conditions identical to those which would be encountered in the study. As a result, several changes were made in the form which: (a) decreased daily identification to the minimum of the date, (b) created boxes for the hash marks instead of lines, (c) more clearly labeled the adult and youth sections, (d) segregated documentation for ATV and Snowmachine ("Snowgo") riders, and (e) reversed the entry fields for riders with "no helmets" versus those "with helmets."

Distinct sections were added for ATVs and Snowmachines because it was unknown if there were helmet-wearing differences between riders of those two vehicle types. To accommodate the addition of these separate sections, the form was changed from portrait to landscape format.

During the pilot testing phase, the volume of traffic passing through the observation point was also identified. Based on the number of potential observations, the daily schedule was reduced from 60 minutes to 30.

Consideration was given to capturing information on the helmet-wearing patterns of pairs of riders based on reports in the literature which demonstrated joint behavior to be a strong predictor. However, after further review it became apparent that *a second tool* would

be necessary, giving the observers two forms to deal with concurrently. Based on the Alaska Area Injury Control Officer's experience in conducting research in rural Alaska, this level of complexity was abandoned as impractical in field conditions.

Pilot Testing of the Curbside Interview Form

The Curbside Interview Form was created to elicit information from village residents on helmet-wearing habits, their off-road vehicle riding patterns, and attitudes toward helmets. Demographic data were also collected. Specific questions reflected: (a) perceptions of normative beliefs about helmet use (Theory of Reasoned Action), (b) social learning in response to off-road injuries, and (c) attitudes toward helmet use in relation to components of the Health Belief Model (susceptibility, severity, benefits, and barriers).

The Injury Control Specialist pilot-tested the form in the Outpatient Clinic of the Maniilaq Health Center in Kotzebue in June and July of 1994. This environment provided access to village residents who had traveled to the regional hub for medical care. It was believed this population duplicated groups who would be participating in the interviews during the study itself. Twenty-five forms were completed.

Changes made as a result of the pilot testing included: (a) clarification of instructions for individuals who walked or drove an auto through the observation area, and (b) directions on proceeding from item 7 to item 12 if the respondent did not own a helmet. After further review, three questions were added to elicit information on contact with components of the study, specifically: (a) attendance at a safety class, (b) contact with the community announcements, and (c) observation of an increased number of helmet-wearers. It was believed this additional information would be useful in evaluating the penetration and prevalence of the treatment in the experimental communities.

Administration of the Experiment

Base Line Observation

Observation of helmet use in the experimental and control villages occurred over a 14-day period prior to the treatment. During this phase of the experiment, the volume of traffic passing through the Post Office check points was identified as significant, with even small villages such as Ambler documenting 18 riders in 30 minutes, and Kotzebue reporting 71 observations. However, daily variances did occur as a result of blizzards, which descended on the region with uncommon frequency during the study. Village residents were confined to their homes two days during this period alone due to the weather.

The data collection sheet proved itself easy to use, with no observers reporting questions or problems to the Injury Control Specialist.

Training and Decreased Pricing

During this second two-week period, helmets and goggles went on sale in the clinics of the six treatment villages, community announcements were posted, and the role models began wearing their helmets and promoting helmet purchase and use as outlined in their position descriptions.

In Buckland, the role model created discussion about the project by displaying his helmet in the city's Washeteria, a facility frequented by the entire community because it is the only public access to running water and to liquid waste disposal. The VPSO in Kiana had frequent contact with community residents, particularly those operating off-road vehicles in a reckless manner. During these conversations, as well as in his other social and business contacts, he presented the importance of wearing helmets and advised residents about their availability in the clinic. The Native role model in Kotzebue focused his attention on youth, a population he believed to be especially at risk for off-road vehicle injuries. The second role

model in Kotzebue, a white long-term resident married to an Iñupiaq, networked with the non-Native community, personnel working for the Maniilaq Association, and his social group, as well as many casual contacts on the roadways of the city.

Although it was anticipated the role models might extend the reach of their message by presenting the helmet project as an agenda item at community groups, this strategy proved impractical. Village life in rural Alaska is a diverse mixture of Western civilization and ancient Iñupiaq traditions. Social institutions taken for granted in other areas of the nation often do not exist in this setting. Community councils are the only assemblage of residents which meet on a regular basis, yet their activities are often politically charged, even to the point of becoming conflictual. When debriefed, the role models indicated their hesitancy in entering into such a scenario. Instead, they each developed strategies for influencing circles of people with whom they normally associated.

Observations continued during the second two-week segment of the study. Reports were forwarded regularly from villages receiving the modeling treatment and two of the three villages in which only helmets were placed in the clinic. However, after receipt of the first payment, the observer in Noorvik (a village with only helmets in the clinic) and two of the three observers in control villages grew disinterested and their reporting became erratic. Due to the difficulty of securing a reliable replacement mid-way through the study, the Injury Control Specialist chose to concentrate his efforts on supporting the data collection in the remaining six villages.

Interview Form and Cue to Action

Observations, helmet sales, and role modeling activities continued unabated during the next 14-day cycle. In addition to collecting the daily count of helmeted and nonhelmeted riders, a curbside interview form was completed using the population passing through the checkpoint. The observers accomplished this by stationing themselves inside the Post Office and soliciting

interest in completing the questionnaire from everyone using the facility. No incentives were offered, and the form was administered only once per person. Individuals not wearing helmets were reminded about their availability at discounted prices in the clinic (except in control villages) and were encouraged to buy and wear a helmet the next time they rode (the cue to action.)

Following is a summary of the distribution of completed surveys (see Table 27):

Table 27

Distribution of Completed Curbside Interview Forms

Village	Nonhelmet Wearer Interviews	Helmet Wearer Interviews	Observations During this 14-Day Cycle	Percent
Buckland	9	1	213	4.7%
Deering	10		114	9%
Kiana	35	1	246	14.4%
Kotzebue	12	3	402	4%
Noatak	8		219	3.7%
Noorvik	15		334	4%
Selawik	5		774	1%
Total	**94**	**5**	**2,302**	**4.1%**

Post-Cue-to-Action Observations and Conclusion of the Study

Helmets sales, role modeling activities, and observations continued during the next two weeks. The original study schedule then called for a three-week hiatus for the observers, which was planned to allow them time to rest and recuperate. However, once in the habit of the daily schedule, observers in Deering, Kotzebue, and Buckland continued to report. Data collection concluded on the 12th week of the study.

Helmet Sales

As planned, helmet and goggle sets were sold in the clinics of all treatment villages. Prior to the end of the study, two villages, Kiana and Kotzebue, sold all their helmets and experienced a continuing demand which could not be satisfied. Due to the lead time required for shipping from outside Alaska, replenishment of stock was not feasible during the study.

Two clinics experienced difficulties handling the volume shipments. At one site, the Buckland Health Clinic, helmet and goggle sets were stored in a back office area under a pile of other supplies, as opposed to being displayed in the waiting room. Storage of the products was also an issue in Noorvik, where the large container came to rest in the middle of the lobby, with the helmet and goggles displayed on top of it.

Qualitative Interviews

Qualitative interviews occurred after the conclusion of the study, and were accomplished by travel to the villages. Two groups were targeted: (a) role models, and (b) Community Health Aide Practitioners from the study villages. Role models were debriefed regarding their experiences and observations related to helmet use and to off-road vehicles in general. CHAPs were viewed as both a source of knowledge about the study and key informants regarding attitudes toward health care and wellness in their respective communities. At least one CHAP was interviewed per village, and in many villages two were questioned.

A standard format was followed which repeated questions from the curbside interview as a baseline, then went on to inquire about community-related issues (see Appendix Q). Questions in this section were open-ended and sought to elicit information about: (a) community attitudes toward helmet use, (b) patterns of helmet wearing, (c) the potential benefits of regulations mandating helmets, and (d) the influence of the study on local attitudes and behavior.

A signed consent was obtained prior to the interview (see Appendix Q), and subjects were assured of their confidentiality. With permission, the interview was audiotaped. One subject declined to be recorded, and the conversation was documented manually.

Hypotheses

The hypotheses for the study were:

1. Helmet purchase and use will increase in villages where the barriers to helmet purchase are removed.

Support for Hypothesis 1: The Health Belief Model assumes that decisions are made based on the individual's subjective reality rather than the objective environment (Rosenstock, 1974). In 1984, an analysis of 29 Health Belief Model studies found barriers to taking action as the most significant dimension of the model (Janz & Becker, 1984).

2. Helmet use will increase more in villages exposed to modeling behaviors than in villages exposed to increased access alone.

Support for Hypothesis 2: Bandura (1977, 1982) found that behavior change and maintenance are a function of outcome expectations about what will occur from engaging in the behavior and efficacy expectations about one's own capabilities to successfully engage in the behavior. Learning through observation of other people, also called models, provides the second strongest impact on self-efficacy expectations.

3. Repeated cues to action will increase helmet use.

Support for Hypothesis 3: Habit sequences can be changed, although with great difficulty. The individual's attention and conscious decision making must be restored to the activity via forces which disrupt the continued satisfaction of needs (Stephens & Marlatt, 1987). Rosenstock (1974) reported that cues to action, alerting an individual to feelings, are

necessary to activate the conscious decision-making process described by the Health Belief Model.

4. Small and medium-sized villages will experience a greater percentage increase in helmet use than large villages.

Support for Hypothesis 4: Ajzen and Fishbein (1973,1986) proposed in the Theory of Reasoned Action that the sole determinant of behavior is the intention to perform it. Factors which affect intention are attitudes and the perceived expectations of important groups or individuals.

Lewin (1958) and Pelz (1958) reported that future action by group members is affected by a perception of a group consensus.

Rogers (1983) described the factors which impact the diffusion of innovations in a community. He concluded that personal contact is more effective in changing opinions than the media, especially when the receiver is resistant or apathetic. He also described the role of the change agent and early adopter in the personal persuasion process. It was hypothesized that community-wide change would occur more rapidly in a smaller setting than in a larger one due to the role of a few key individuals in the process of innovation.

5. There is no relationship between gender or ethnicity and helmet use.

Support for Hypothesis 5: There is a void in the literature in this area. Therefore, no relationship is predicted.

6. Helmet use will be more prevalent in youth than in adult age groups.

Support for Hypothesis 6: Cohen et al. (1990) found that the health habits of junior and senior high students were consistent with adults' habits. Also, in most categories elementary school student reported the healthiest habits.

7. Helmet use will be more prevalent among riders who use the ATV less frequently.

Support for Hypothesis 7: Berkowitz and Cottingham (1960) found that response to a

fear appeal message was mediated by perceived vulnerability. In their study, subjects who drove the least reported the greatest intention to alter their behavior to wear a seat belt. James described habit as a chain, which is initiated by a cue and continues until the last event in the chain is completed (cited in Stephens & Marlatt, 1987). Changing such habit patterns is particularly difficult (Stephens & Marlatt, 1987).

8. Knowledge regarding helmet effectiveness in a crash does not increase helmet use.

Support for Hypothesis 8: The gradient-of-reinforcement concept from instrumental learning theory described the finding that immediate consequences exert greater control over behavior than delayed ones. This is especially true when the immediate effects meet needs but aftereffects are negative. Changing such habit patterns is particularly difficult (Stephens & Marlatt, 1987). Following the ATV example, immediate gratification occurs through riding, either with or without a helmet. The delayed effect of a head injury exerts much less, if any, influence on habitual behavior.

Both the Health Belief Model and the Theory of Reasoned Action are based on situations in which a conscious, one-time decision is being made, and are acknowledged to have limitations in regard to the prediction of habitual behavior (Fishbein & Ajzen, 1975; Janz & Becker, 1984).

9. Helmet use increases when there is a history of personal injury on an ATV.

Support for Hypothesis 9: Kolb (1984) reported that learning is an interaction of the individual with an experience. During this process the individual creates knowledge by transforming the experience into concepts. Illich (1984) believed "that most people learn most of the time (and that) they give purpose and give meaning to whatever they come in contact with" (p. 96-97). The Health Belief Model identified perception of the potential severity of an injury and susceptibility to it as two of the four predictors of health attitudes. Bandura's (1977, 1982) theory of self-efficacy (Social Learning) recognized learning through personal

experience as the most powerful source of self-efficacy, and stated that one of the two determinants of behavior change was outcome expectations about what will occur from engaging in the behavior.

10. Habit is the predominant reason for subjects not wearing a helmet when one is available to them.

Support for Hypothesis 10: Habit sequences can be changed, although with great difficulty (James, cited in Stephens & Marlatt, 1987). The individual's attention and conscious decision-making must be restored to the activity via forces which disrupt the continued satisfaction of needs (Stephens & Marlatt, 1987).

11. Positive perceptions of helmet wearers will increase personal helmet use.

Support for Hypothesis 11: In the Theory of Reasoned Action, Ajzen and Fishbein (1973,1986) proposed that the sole determinant of behavior is the intention to perform it. Factors which affect intention are attitudes and the perceived expectations of important groups or individuals.

12. More subjects who are exposed to the modeling behavior and training will begin wearing a helmet or will state an intention to wear a helmet the next time they ride than those not exposed to the modeling behavior.

Support for Hypothesis 12: Bandura (1977, 1982) found that behavior change and maintenance are a function of outcome expectations about what will occur from engaging in the behavior and efficacy expectations about one's own capabilities to successfully engage in the behavior. Learning through observation of other people, also called models, provides the second strongest impact on self-efficacy expectations.

13. Knowledge regarding the effectiveness of a helmet in a crash will increase support for a law.

Support for Hypothesis 13: The Health Belief Model viewed conscious decisions as fundamental to health behavior (Maiman & Becker, 1974). Three of the four factors which

affect attitudes include perceptions of: (a) susceptibility to the health condition, (b) the severity of the consequences of contracting the condition, and (c) the benefits of medical actions to reduce susceptibility or the severity of the disease.

The Theory of Reasoned Action (Fishbein & Ajzen, 1975) stated that attitudes toward behavior, behavioral beliefs, are affected by perceptions of the consequences of carrying out the action. Attitudes are formed in part when the individual believes the planned behavior will lead to consequences more beneficial than harmful.

Analysis of the Data

Data were analyzed as follows:

1. Frequency tabulations of pre- and post-training helmet use by treatment condition
2. Frequency tabulations of retail sales by village and week
3. Frequency tabulations of responses to the curbside interviews
4. Comparison of the means for helmet sales by treatment condition
5. Simple linear regression analysis of time series data
6. Cross tabulations and Z scores of nominal data from the curbside interviews
7. Cross tabulations of helmet-use observations
8. Qualitative analysis of the information obtained from debriefing the role models and the CHAPs.

Method of Analysis for Hypotheses (Dis)Confirmation

The data collected will provide information about the hypotheses in these ways:

Table 28

Method of Analysis for Hypotheses (Dis)Confirmation

Hypotheses	Method of Analysis
1. Helmet purchase and use will increase in villages where the barriers to helmet purchase are removed.	1.a. Helmet-use observation in the control villages and experimental villages 1.b. Sales records from the experimental villages 1.c. Time series data
2. Helmet use will increase more in villages exposed to modeling behaviors than in villages exposed to increased access alone.	2.a. Comparison of helmet use between villages with increased access and the villages with increased access plus modeling 2.b. Time series data
3. Repeated cues to action will increase helmet use.	3.a. Observation of helmet use during the "post-cue" phase 3.b. Time series data
4. Small and medium-sized villages will experience a greater percentage increase in helmet use than in large villages.	4. Comparison between time series data from small, medium, and large villages
5. There is no relationship between gender or ethnicity and helmet use.	5.a. Cross-tabulation between helmet use and gender 5.b. Cross-tabulation between helmet use and ethnicity 5c. Cross-tabulation for walkers between previous helmet use, gender, and ethnicity
6. Helmet use will be more prevalent in youth than in adult age groups.	6. a. Cross-tabulation between age and helmet use 6.b. Cross-tabulation between age and previous helmet use
7. Helmet use will be more prevalent among riders who use ATVs less frequently.	7. a. Cross-tabulation between helmet use and off-road vehicle riding frequency 7.b. Qualitative interviews
8. Knowledge regarding helmet effectiveness in a crash does not increase helmet use.	8. a. Cross-tabulation between helmet use and knowledge regarding helmet effectiveness 8.b. Qualitative interviews
9. Helmet use increases when there is a history of personal injury on an ATV.	9. a. Cross-tabulation between helmet use and history of injury in an off-road vehicle crash 9.b. Qualitative interviews

Hypotheses	Method of Analysis
10. Habit is the predominant reason for subjects not wearing a helmet when one is available to them.	10. a. Frequencies of response to the survey question inquiring why a helmet was not used when one was available 10.b. Qualitative interviews
11. Positive perceptions of helmet wearers will increase personal helmet use.	11. a. Cross-tabulation between helmet use and perceptions of other helmet wearers 11.b. Qualitative interviews
12. More subjects who are exposed to the modeling behavior will begin wearing a helmet or will state an intention to wear a helmet the next time they ride than those not exposed to the modeling behavior.	12. a. Cross-tabulation between treatment condition and future intention to wear a helmet 12. b. Cross-tabulation between exposure to safety messages and future intention to wear a helmet 12. c. Frequencies of responses to reasons for wearing a helmet 12. d. Qualitative interviews
13. Knowledge regarding the effectiveness of a helmet in a crash will increase support for a law.	13. a. Cross-tabulation between history of personal injury on an off-road vehicle and support for a law 13. b. Qualitative interviews

CHAPTER FOUR

RESULTS

Man can learn nothing until he proceeds from
the known to the unknown.

Claude Bernard

This chapter includes the results obtained from the observation of off-road vehicle riders, the records of helmet sales, the responses to the Curbside Interview, and the qualitative information elicited from the Community Health Aide Practitioners and role models. The chapter is organized into five sections: (a) execution of the study, (b) limitations of the study, (c) results of the hypotheses, (d) unhypothesized findings, and (e) conclusion.

Execution of the Study

Problems inherent to the nature of field research in a remote location prevented completion of the observation schedule in four of the nine villages. Although the research assistant contacted the observers regularly, he found that individuals immersed in a culture in which hourly employment was uncommon sometimes lacked the internal motivation to complete the contracted work. Observers in the control villages displayed the least precision. They commented to the research assistant that since "nothing was happening in their village," they saw no purpose to their efforts and therefore discontinued them. Payment was an insufficient motivator to keep them on the job.

A second major issue arose in the village of Buckland. Both the role model and the

CHAPs failed to participate fully in the study. The role model did not wear his helmet when riding an off-road vehicle. Instead, he displayed it in the village Washeteria, his job site, calling this activity "modeling." In the clinic, the Health Aides kept the box of helmets in the backroom among other supplies, rather than displaying them prominently in the lobby. Because of this, visitors to the clinic did not encounter a visual reminder of the study nor were the helmets a natural topic of conversation between clinic staff and the public as they were in other villages.

Table 29 summarizes execution of the observation schedule, and Tables 30 to 34 display the data collected.

Table 29

Execution of the Study

Village	Village Strata	Treatment Condition	Study Weeks					
			1-2	3-4	5-6	7-8	9-11	12
Ambler	S	Control	O	O				
Shungnak	M	Control	O	O	O	O		
Selawik	L	Control	O					
Deering	S	Helmets-Only	O	O	O	O	O	
Noatak	M	Helmets-Only	O	O	O	O	O	
Noorvik	L	Helmets-Only	O	O				
Buckland	S	Helmets-plus-Modeling	O	O	O	O	O	
Kiana	M	Helmets-plus-Modeling	O	O	O	O		O
Kotzebue	L	Helmets-plus-Modeling	O	O	O	O	O	

KEY: Village Strata: S = Small Village, M = Medium Village, L = Large Village
O = Observation

Table 30

Summary of Rider Observations

		Weeks												
Village Type	**Village**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total Riders**
C	Ambler	86	61	110	89									346
C	Shungnak	118	84	60	75	75	65	13						490
C	Selawik	333	473											806
H	Deering	60	66	55	60	68	67	95	66	62	105	16		720
H	Noatak	154	153	121	100	58	82	84	143	115				1,010
H	Noorvik	137	184	151										472
M	Buckland	84	120	110	103	105	131	107	136	98	151			1,145
M	Kiana	87	124	107	140	42	75	130	139				165	1,009
M	Kotzebue	260	215	199	207	186	160	164	269	201		208		2,069

Table 31

Summary of Rider Observations in the Helmets-Only Villages

	Weeks												Totals
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Total Riders	351	403	327	160	126	149	179	209	177	121	ND	ND	2,202
Helmeted Riders	0	0	0	0	0	0	4	1	1	2	0	0	8
Percentage of Riders with Helmets	0	0	0	0	0	0	2.23	0.48	0.56	0.95	0	0	0.36

Table 32

Summary of Rider Observations in the Modeling-Plus-Helmets Villages

	Weeks												Totals
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Total Riders	431	459	416	450	333	366	401	544	201	98	359	165	4,223
Helmeted Riders	0	2	3	2	3	5	14	12	12		14	5	72
Percentage of Riders with Helmets	0	0.4	0.7	0.4	0.9	1.3	3.49	2.21	5.97	0	3.9	3.03	1.7

Table 33

Summary of Rider Observations in All Experimental Villages

	Weeks												Totals
	1	2	3	4	5	6	7	8	9	10	11	12	
Total Riders	782	862	743	610	459	515	580	753	378	219	359	165	6,425
Helmeted Riders	0	2	3	2	3	5	18	13	13	2	14	5	80
Percentage of Riders with Helmets	0	0.2	0.4	0.3	0.6	0.9	3.1	1.73	3.44	0.91	3.9	3.03	1.25

Table 34

Summary of Rider Observations in the Control Villages

	Weeks												Totals
	1	2	3	4	5	6	7	8	9	10	11	12	
Total Riders	537	618	170	164	75	65	13	ND	ND	ND	ND	ND	1,642
Helmeted Riders	0	0	0	0	0	0	0						0
Percentage of Riders with Helmets	0	0	0	0	0	0	0						0

Limitations of the Study

It must be acknowledged that this study attempted to introduce behavior which was essentially nonexistent in the region at the time. Riders of off-road vehicles did not wear helmets except during the annual snowmachine races when they were mandatory. Therefore, helmet wearing was unusual, and the number of helmeted riders reported during the study was small. Data collected represents documentation of a rare phenomenon, rather than common behavior which can be readily described by a normative distribution.

The number of curbside interviews obtained was likewise small, coming to just 99. The village observers, who were also asked to administer the questionnaires, consistently found that the indigenous Eskimos were reluctant to participate, and those who did provided little information beyond the multiple choice responses. From this experience, it appeared that the

curbside interview was a poor fit with the culture. In light of the small number of respondents and their reticence, the results must be viewed as limited and will be relegated to a secondary status behind the observational data.

On the other hand, the rich detail obtained from the qualitative interviews and the depth of the insights stood in shining contrast to the abbreviated information obtained through the curbside interviews, making the data collected through this method a significant contribution to the study as a whole.

A final caution must be advanced in terms of the observational data itself. Riders were counted once each day as they passed through the checkpoint. If a rider passed through the observation area several times on the same day, he or she was still counted only once. However, if the same rider passed through on subsequent days, a second statistic for a helmeted rider was generated. This resulted in a daily count of helmeted riders, but not an individual count. The research assistant estimated that approximately 50% of the helmeted riders were counted more than once. Therefore, the statistics must be viewed with caution in terms of judging the number of individuals who adopted the helmet-wearing habit. However, the fact that 50% of the helmeted riders wore the helmet on more than one occasion should be taken as an indicator that they formed a new habit—helmet-wearing. The formation of this habit was a central goal of the study, making this a positive finding in terms of the lasting effects of the treatment.

Results of the Hypotheses

The earliest theoretical attempts to describe and explain the universe
involved the idea that events and natural phenomena
were controlled by spirits with human emotions
who acted in a very humanlike and unpredictable manner . . .
Gradually, however, it must have been noticed that there were certain regularities:
the sun always rose in the east . . .
the planets followed precise paths across the sky that could be predicted in
advance with considerable accuracy.

Stephen Hawking

Thirteen hypotheses were tested using one or more of the data types collected during the study. The hypotheses evaluated the impact of the quasi-experimental design on helmet use and sales and investigated the effects of village size, demographic characteristics, and a personal history of injury on both helmet use and attitudes toward helmet use. The results of each hypothesis are discussed below.

Hypothesis 1

Hypothesis: Helmet purchase and use will increase in villages where the barriers to helmet purchase are removed.

Method of Analysis:

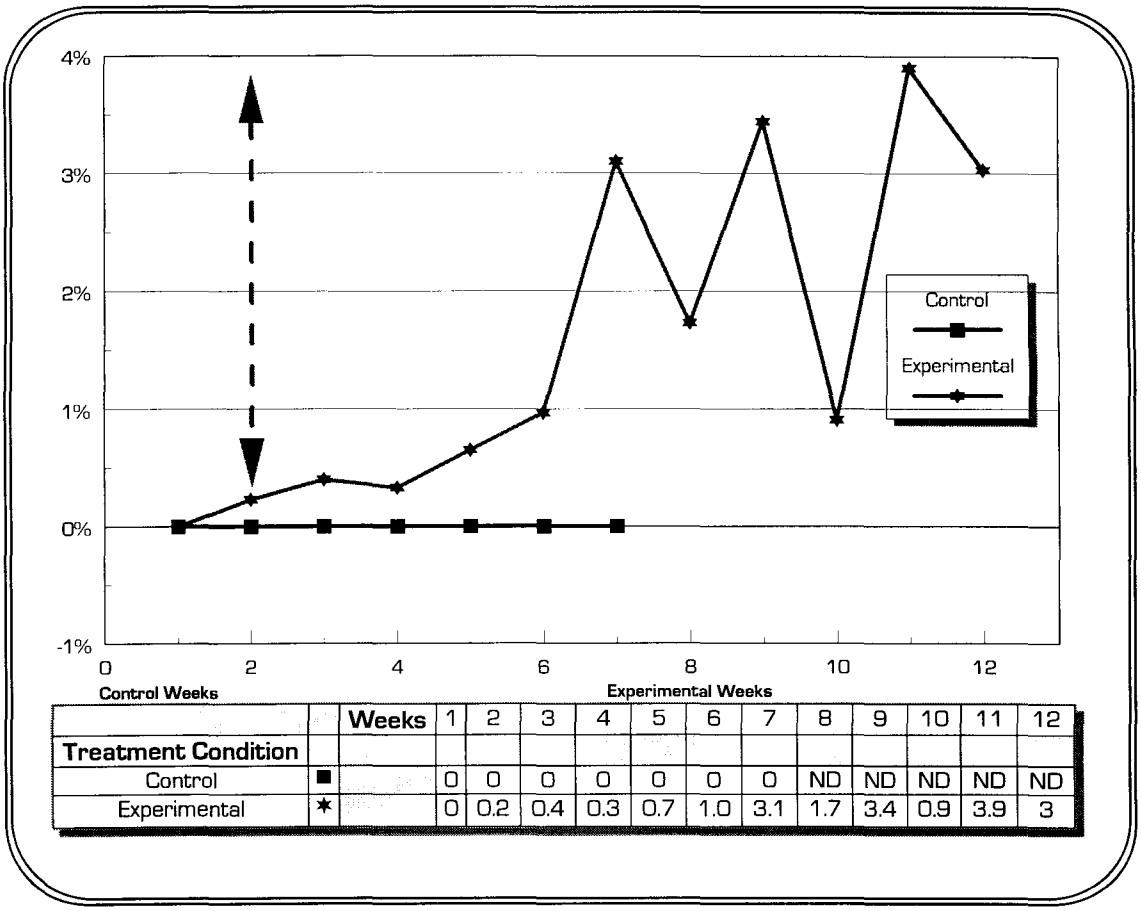
1.a. Helmet use observation in the control villages and experimental villages

1.b. Sales records from the experimental villages

1.c. Time series data

This hypothesis evaluated the impact of the quasi-experimental design on helmet acquisition and helmet wearing. Barriers were reduced in both treatment conditions via the sale of helmets at discounted prices in the village clinics.

Tables 33 and 34 summarize helmet use observations over the 12-week study period. (See Appendix S for greater detail.) Figure 38 displays this information graphically.



		Weeks	1	2	3	4	5	6	7	8	9	10	11	12
Treatment Condition														
Control	■		0	0	0	0	0	0	0	ND	ND	ND	ND	ND
Experimental	✶		0	0.2	0.4	0.3	0.7	1.0	3.1	1.7	3.4	0.9	3.9	3

Figure 38. Percentage of helmeted riders: comparison between control and experimental villages by week.

A Wilcoxon Rank Sum W Test was performed comparing treatment and control conditions by study week. A nonparametric comparison of means test was chosen because, due to the small sample size, it was not possible to determine if there was a normal distribution. The percentage of helmeted riders was chosen as the most precise measure because it controlled for differences in the sample size. Table 35 presents the results.

Table 35

Hypothesis 1.a.: Wilcoxon Rank Sum W Test

Hypothesis 1.a.	Wilcoxon Rank Sum	
	Experimental	Control
Mean rank	13.2	4.5
Number of samples	12	7
Confidence level	95%	
P-Value (one-tail)	0	
Support hypothesis	Yes	

The hypothesis was accepted based on the probability value of 0.

Helmet sales were compared between the two treatment conditions: villages receiving only helmets in the clinics ("helmets-only"), and villages treated with both increased access to helmets and modeling ("modeling-plus-helmets"). Table 36 displays the data and Figure 39 depicts per capita weekly helmet sales by treatment condition. (See Appendix T for greater detail.)

Table 36

The Percentage of Per Capita Helmet Sales by Treatment Condition

	Weeks	3	4	5	6	7	8	9	10	11	12
Treatment Condition											
Helmets-Only		0	0	0	0.1	0.1	0.2	0.49	0.39	0.2	0.2
Modeling-Plus-Helmets		0	0.05	0.14	0.09	0.07	0.05	0.57	0.26	0.02	0.14

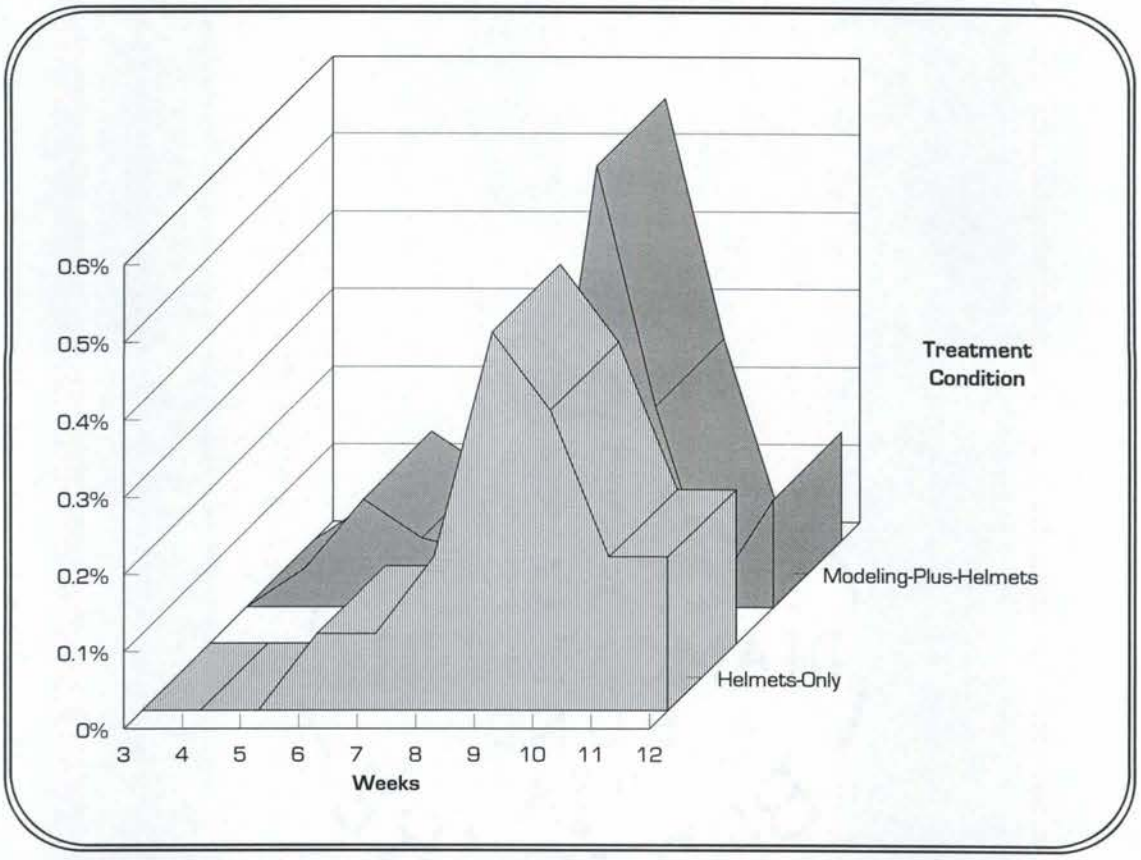


Figure 39. **Percentage of per capita helmet sales by week and treatment condition.**

A Wilcoxon Rank Sum W Test was employed to compare the two treatment conditions because helmet sales were not normally distributed. The results are found in Table 37.

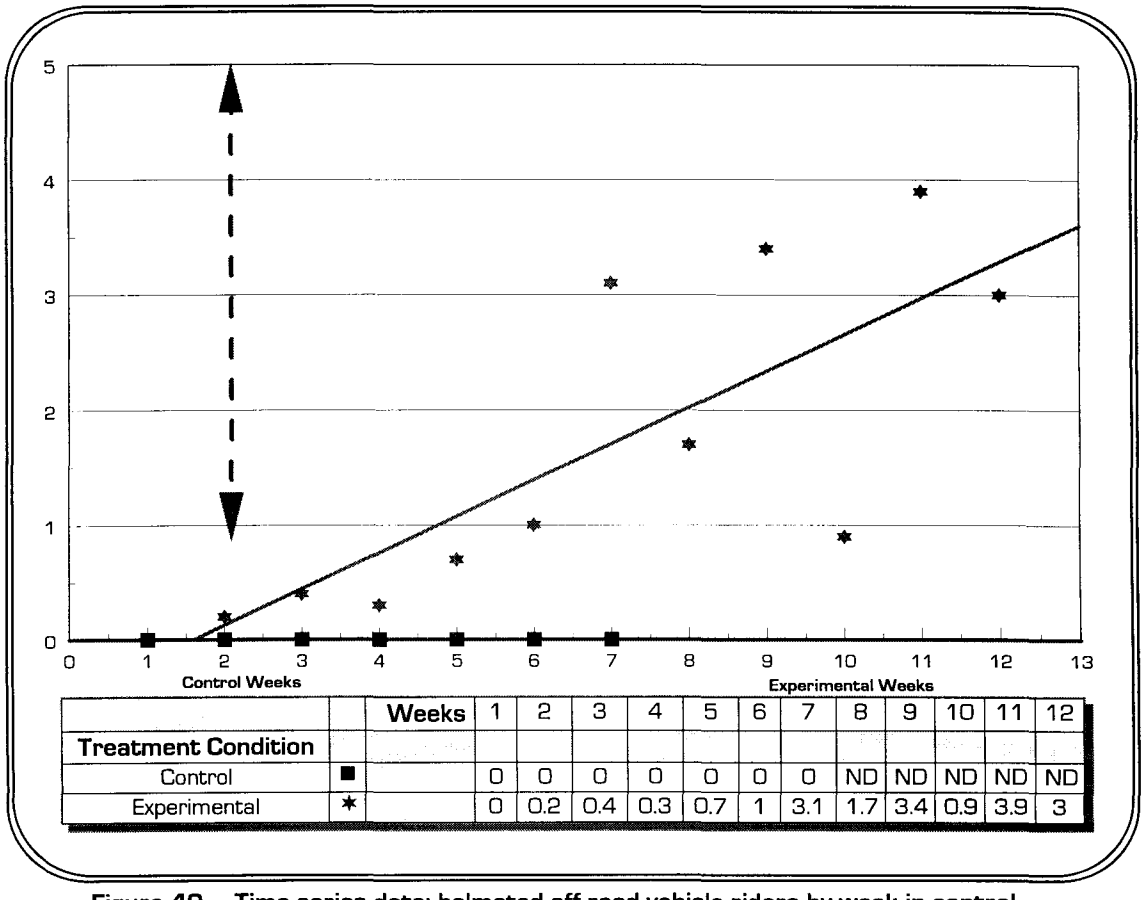
Table 37

Hypothesis 1.b.: Wilcoxon Rank Sum W Test Results

Hypothesis 1.b.	Wilcoxon Rank Sum	
	Helmets-Only	Modeling-Plus-Helmets
Mean rank	11.05	9.95
Number of samples	10	10
Confidence level	95%	
P-Value (one-tail)	0.342	
Support hypothesis	No	

Based on a probability value of 0.342, the percentage of helmets sold in the modeling-plus-helmets condition was not significantly greater than the percentage of helmets sold in the helmets-only condition. However, because the helmets were not distributed on a per capita basis and because two of the six villages ran out of helmets before the end of the study, no interpretation of the data is possible. The hypothesis cannot be accepted or rejected. Further research in this area would be valuable.

Weekly observations of helmeted riders were plotted over time for both the control and treatment conditions (see Figure 40). The end of week two marks the beginning of the experiment, as designated by the vertical line.



		Weeks	1	2	3	4	5	6	7	8	9	10	11	12
Treatment Condition														
Control	■		0	0	0	0	0	0	0	ND	ND	ND	ND	ND
Experimental	✱		0	0.2	0.4	0.3	0.7	1	3.1	1.7	3.4	0.9	3.9	3

Figure 40. Time series data: helmeted off-road vehicle riders by week in control and experimental villages.

A Simple Linear Regression was used to determine if the slope of the line for the experimental villages exceeded 0 at the 95% confidence level (see Table 38).

Table 38

Hypothesis 1.c.: Simple Linear Regression

Hypothesis 1.c.	**Simple Linear Regression**
Slope of the line (B)	0.316
T-value	4.296
Confidence level	95%
Significance T	0.0016
Support hypothesis	Yes

The T-Value of 4.296 was significant at the 0.5 confidence level, and the hypothesis was supported.

The findings from Hypothesis 1 can be summarized as follows:

1.a. Helmet use increased more in the experimental villages than in the controls.

1.b. There was no difference in helmet sales between the two treatment conditions. However, based on the method of distribution (by strata, not per capita,) and the fact that two of the six villages ran out of helmets before the end of the study, the hypothesis can neither be rejected nor supported.

1.c. Time series data demonstrated that helmet use increased more in experimental villages than in control villages.

Discussion:

No helmeted riders were observed in the control villages, whereas 80 were reported in the experimental villages. This was approximately 1.25% of all riders counted. As demonstrated by the time series analysis, helmet use increased over the 12 weeks of the study in response to the treatment. Although 80 is a very small number, it is important to remember that helmeted riders were rare in the region prior to the study, and expert witnesses described them as being seen most frequently either outside city *limits or during*

organized sporting events. The helmeted riders documented by this study rode through a checkpoint in the center of the village, making their helmet-wearing behavior different from historical patterns.

Comparison of helmet sales between the two treatment conditions indicated there was no statistically significant difference. However, it should be recognized that the lack of compliance to the study guidelines in Buckland possibly created a differential effect, and that both the recent fatality crash and the prior sale of bicycle helmets in Noatak were extraneous variables. Hypothesis 9 was built from a theoretical base which supported a relationship between prior history of personal injury on an off-road vehicle and increased helmet use. This researcher suggests a similar mechanism may have occurred at the village level in Noatak, motivating the CHAPs to do an outstanding job of managing the project and instigating helmet sales which were primarily to parents, concerned about a similar serious head injury striking their own children.

Several factors may have contributed to the lack of compliance in Buckland. First, the clinic has experienced a higher turnover of Health Aides than others in the region, leading to some problems with organization and continuity. Also, as a small village with a 100% Inupiat population, Buckland has a reputation for insularity, as compared in particular with Kotzebue, which is more cosmopolitan and has a non-Inupiat census of 26%. Although Kiana is officially listed as 100% Inupiat, this researcher found Caucasians in several prominent positions including magistrate, store owner, VPSO, school principal, and teachers, suggesting a more diverse community. It is also less physically isolated than Buckland, with a geographic setting that makes it a favorite tourist destination in the summer, thus increasing its contact with the world outside. Because of this, Kiana has more similarities to Kotzebue than to Buckland.

Like most bush village populations, Buckland citizens are life-long residents, families are extended ("everybody is related to everybody" is the common observation), and those not

related have known each other since birth. The role model in Buckland suggested during his debriefing that he did not want to stand out from the community in any way, offering this as an explanation for his refusal to promote a helmet law before the city council.

This researcher believes this phenomenon may be explained in part as a response to the perceived expectations of other important groups and individuals as described in the Theory of Reasoned Action, and that the reaction may have been magnified by the small microcosm of an isolated community of just over 100 people. The influence of culture on social change and the diffusion of information was not included in the review of literature or in the hypotheses, but results from this study suggest it may have had an effect. Conversely, the greater diversity in Kotzebue and Kiana may have played a role in the willingness of some residents to stand out from the crowd by wearing a helmet.

Helmet sales were also limited due to the number of sets of helmets and goggles available for sale. The up-front funding for the study came from grants. A total of 94 helmets was on hand when the study started. The region's population is 6,727, so there was a helmet available for approximately 1 out of every 72 residents. Reports were received from both Kotzebue and Kiana, which both sold 100% of their helmets, that customers continued to come in and try to buy helmets after the supplies were exhausted. Therefore, it is likely that two of the three modeling villages could have sold more than 100% of the original distribution had supplies been immediately available in the region.

Hypothesis 2

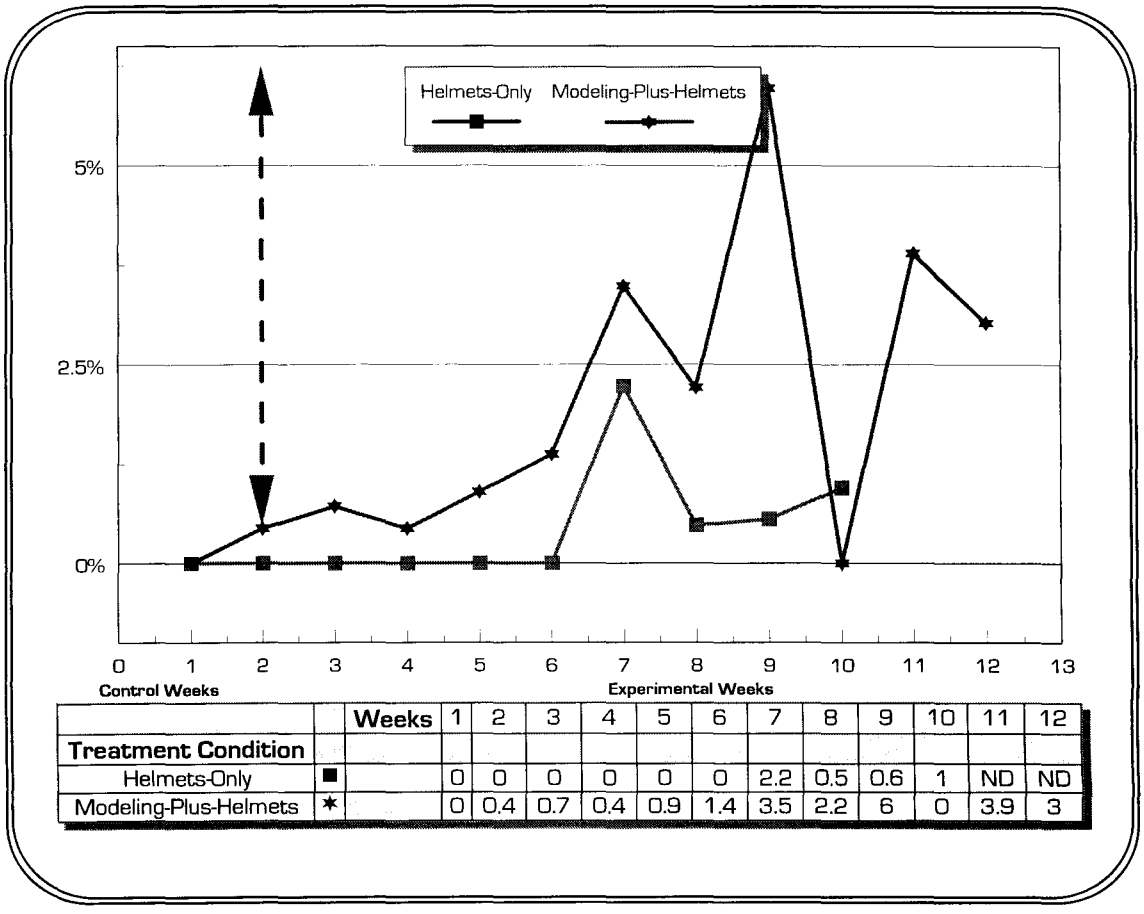
Hypothesis: Helmet use will increase more in villages exposed to modeling behaviors than in villages exposed to increased access alone.

Method of Analysis:

2.a. Comparison of helmet use between villages with increased access and villages with increased access plus modeling

2.b. Time series data

This hypothesis examined the differential impact of the two treatments on helmet wearing. Figure 41 contrasts the percentage of helmeted riders in each condition by week.



		Weeks	1	2	3	4	5	6	7	8	9	10	11	12
Treatment Condition														
Helmets-Only	■		0	0	0	0	0	0	2.2	0.5	0.6	1	ND	ND
Modeling-Plus-Helmets	✶		0	0.4	0.7	0.4	0.9	1.4	3.5	2.2	6	0	3.9	3

Figure 41. **Percentage of helmeted riders by treatment condition and week.**

To control for differences between the two samples, percentages were used instead of raw numbers.

A Wilcoxon Matched-Pairs Signed Ranks Test was employed to determine if helmet use increased more in the modeling-plus-helmets condition than in the helmets-only treatment. Table 39 reports the findings.

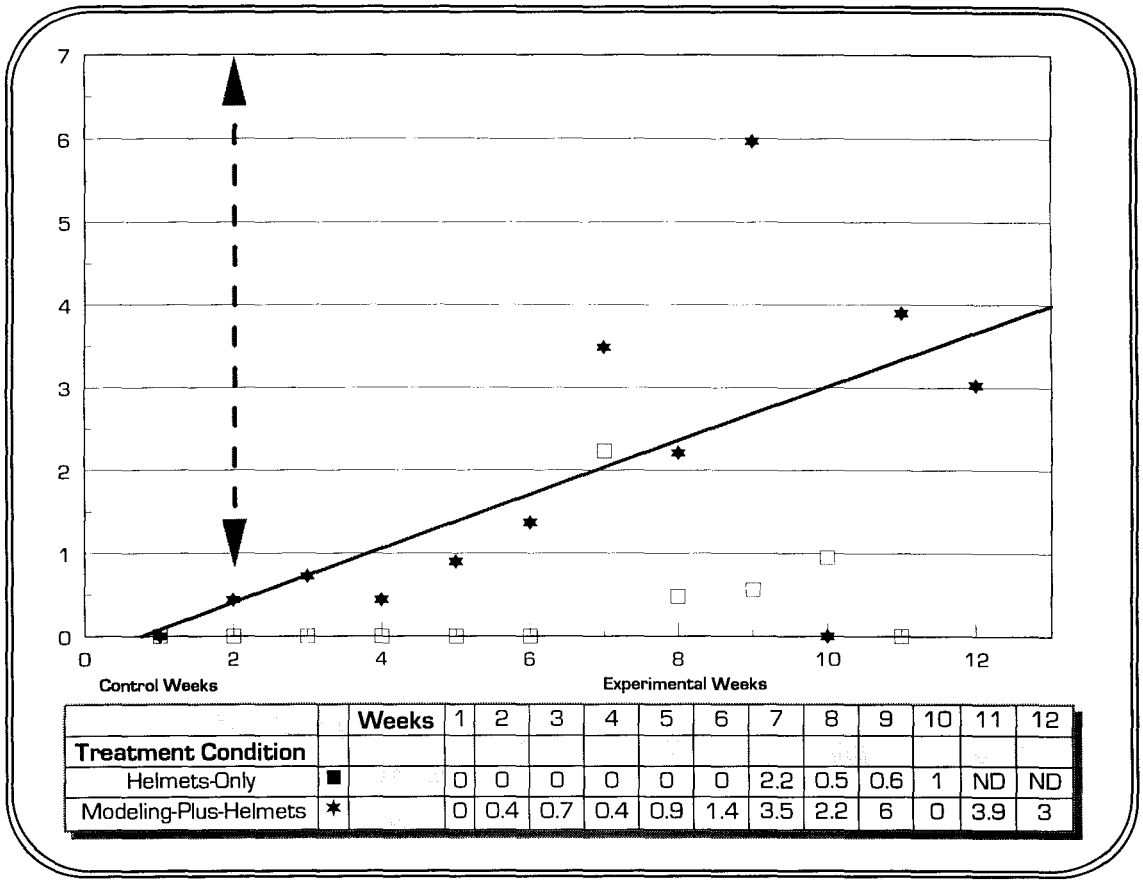
Table 39

Hypothesis 2.a.: Wilcoxon Matched-Pairs Signed Ranks Test

Hypothesis 2.a.	Wilcoxon Matched-Pairs	
	Modeling-plus-helmets	Helmets-only
Mean rank	14.21	8.25
Number of samples	10	12
Confidence level	95%	
P-Value (one-tail)	0.015	
Support hypothesis	Yes	

Based on a probability value of 0.015, the hypothesis was accepted.

A time series was plotted for both the helmets-only and modeling-plus-helmets conditions (see Figure 42). As in previous figures, the vertical line represents the beginning of the experiment at the end of week two.



		Weeks	1	2	3	4	5	6	7	8	9	10	11	12
Treatment Condition														
Helmets-Only	■		0	0	0	0	0	0	2.2	0.5	0.6	1	ND	ND
Modeling-Plus-Helmets	✱		0	0.4	0.7	0.4	0.9	1.4	3.5	2.2	6	0	3.9	3

Figure 42. Time series data: percentage of helmeted riders by week and treatment condition.

A Simple Linear Regression was used to determine if the slope of the line for the experimental villages exceeded 0 at the 95% confidence level (see Table 40).

Table 40

Hypothesis 2.b.: Simple Linear Regression

Hypothesis 2.b.	Simple Linear Regression	
	Modeling-Plus-Helmets	Helmets-Only
Slope of the line (B)	0.3363	0.0479
T-Value	2.51	0.846
Confidence level	95%	95%
Significance T	0.0309	0.4172

Only the modeling-plus-helmets lines was significantly different from zero at the 95%

confidence level, based on a T-Value of 2.51. Because of this, the time series data was judged to demonstrate that there was a significant difference between the two conditions, and the hypothesis was supported.

The conclusions for Hypothesis 2 are:

2.a. Based on the percentage of helmeted riders observed, helmet use increased more in the modeling-plus-helmets villages than in the helmets-only villages.

2.b. The slope of the modeling-plus-helmets time series line was statistically significant from zero, whereas the helmets-only line was not. Therefore, the hypothesis was supported.

Discussion:

The conduct of the study in the Deering clinic also presented a relatively unique situation. During that time the clinic was staffed by two CHAPs, although volumes required only one. The senior Health Aide had allowed her certifications to lapse, and in order to maintain credentialed staff, a certified Health Aide was brought in from outside the village. This individual was a Caucasian male. According to the Native Health Aide, they each "did their own thing" as a means of avoiding open conflict.

The male CHAP took the lead role in interacting with the world outside the clinic and was therefore recruited to help with the study when it began. He set up an excellent display in the lobby and purchased one of the two helmets sold for himself. Later in the study he accounted for two of the six observations of helmeted riders. He was the only Health Aide in any of the clinics to purchase a helmet for his own use and later wear it. In some key ways he acted as a role model, influencing Deering's statistics in a positive direction.

The slope of the time series line in the modeling-plus-helmets condition was statistically different from zero, indicating a significant effect from the modeling treatment. It is also interesting to note the relatively long lead time it took before helmet sales started to take off, and the associated late increase in helmet use during that same time period. This study was designed to run over a short time frame, but reports from the literature point to

helmet-wearing behaviors changing over a span of years or decades. The implications of the delayed effect will be discussed in Chapter 5.

Hypothesis 3

Hypothesis: Repeated cues to action will increase helmet use.

Method of Analysis:

3.a. Observation of helmet use during the "post-cue" phase

2.b. Time series data

This hypothesis evaluated the effect of the cue to action on helmet use. Table 41 condenses data from weeks five and six, the cue-to-action phase, and weeks seven and eight, the post-cue-to-action phase. The percentage of helmeted riders was chosen as the best measurement to control for differences in sample size.

Table 41

Helmet Use Observations: Cue-to-Action and Post-Cue-to-Action Phase by Treatment Condition

		Weeks				
		Cue		Post-cue		
Villages	Observations	5	6	7	8	Totals
Helmets-Only	Off-road vehicle riders	126	149	179	209	663
	Riders with helmets	0	0	4	1	5
	Percentage of riders with helmets	0%	0%	2.24%	0.48%	
Modeling-Plus-Helmets	Off-road vehicle riders	333	366	401	544	1,644
	Riders with helmets	3	5	14	12	34
	Percentage of riders with helmets	0.9%	1.37%	3.49%	2.21%	

A Wilcoxon Rank Sum W Test was chosen to compare the percentage of helmet use during weeks five and six with helmet use during weeks seven and eight (see Table 42).

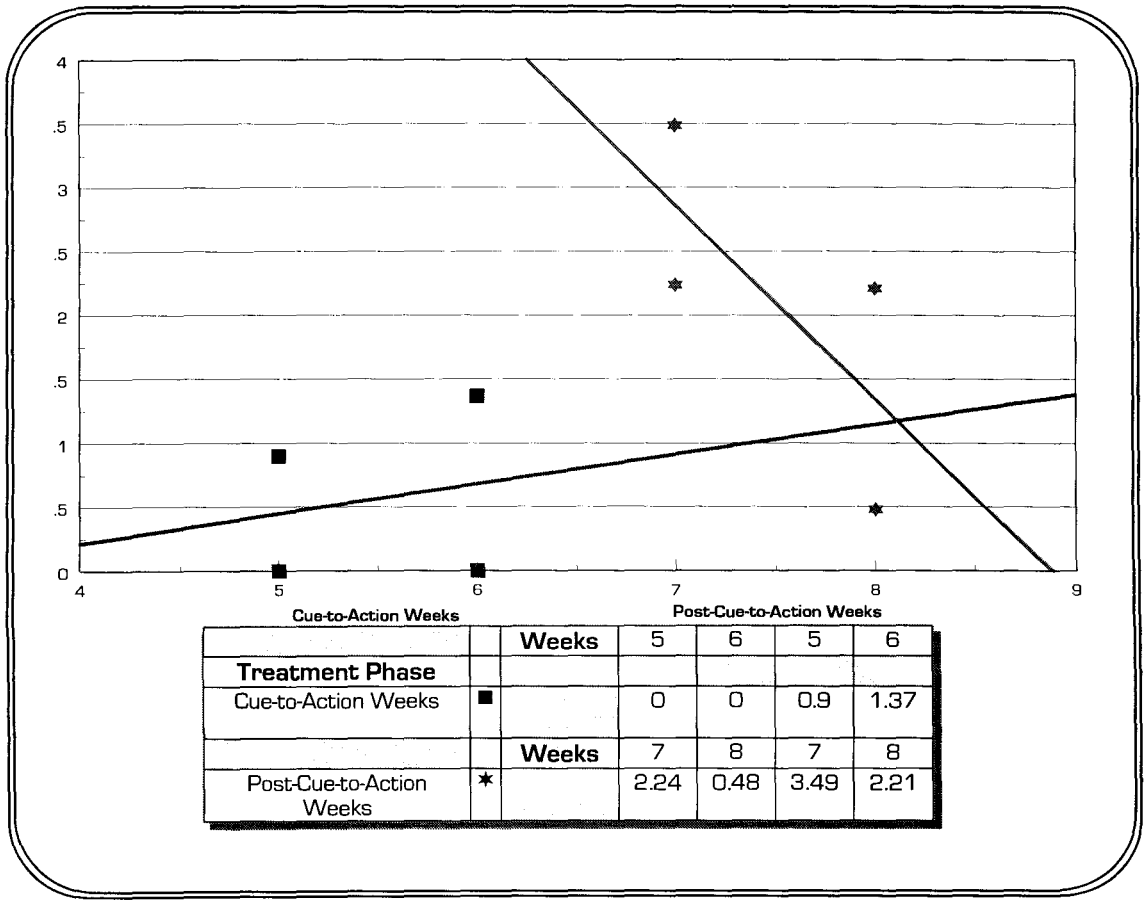
Table 42

Hypothesis 3.a.: Wilcoxon Rank Sum W Test Results

Hypothesis 3.a.	Wilcoxon Rank Sum	
	Cue-to-action weeks	Post-cue-to-action weeks
Mean rank	3	6
Number of samples	4	4
Confidence level	95%	
P-Value (one-tail)	0.05715	
Support hypothesis	No	

Based on a probability value of 0.05715, the hypothesis was rejected.

As in previous time series reports, the percentage of helmeted riders was chosen to control for differences in sample size (see Figure 43).



		Weeks	5	6	5	6
Treatment Phase						
Cue-to-Action Weeks	■		0	0	0.9	1.37
		Weeks	7	8	7	8
Post-Cue-to-Action Weeks	✱		2.24	0.48	3.49	2.21

Figure 43. Time series data: percentage of helmeted riders in the cue-to-action and post-cue-to-action phases.

Each line was evaluated by using a Simple Linear Regression to determine whether its slope exceeded 0 at the 95% confidence level (see Table 43).

Table 43

Hypothesis 3.b.: Simple Linear Regression

Hypothesis 3.b.	Simple Linear Regression	
	Cue-to-Action Weeks	Post-Cue-to-Action Weeks
Slope of the line (B)	0.235	-1.52
T-value	0.287	-1.424
Confidence level	95%	95%
Significance T	0.8013	0.2904

The T-Values of 0.287 and -1.424 were not significant at the 95% confidence level, and the hypothesis was rejected.

The findings for Hypothesis 3 are:

3.a. Cues to action did not increase helmet use.

3.b. The slope of the time series data line was not significantly different from zero.

Discussion:

Cues to action were verbal reminders delivered by the observers during the daily data collection period of weeks five and six. It was hypothesized that cues to action delivered in this environment would be persuasive enough to lead to helmet purchase and to initiation of a helmet-wearing habit. Cues to action are necessary to disrupt habitual behavior and to activate the decision-making process described by the Health Belief Model.

It is unclear why the cues to action failed to have the hypothesized effect. It may be that helmet wearing was such a unique behavior that the number of cues delivered to each person was insufficient. Another possibility is that the content of the cue was in some way not persuasive. However, what can be said is that, delivered in this manner, the cue to action did not achieve the desired outcome.

Hypothesis 4

Hypothesis: Small and medium-sized villages will experience a greater percentage increase in helmet use than large villages.

Method of Analysis:

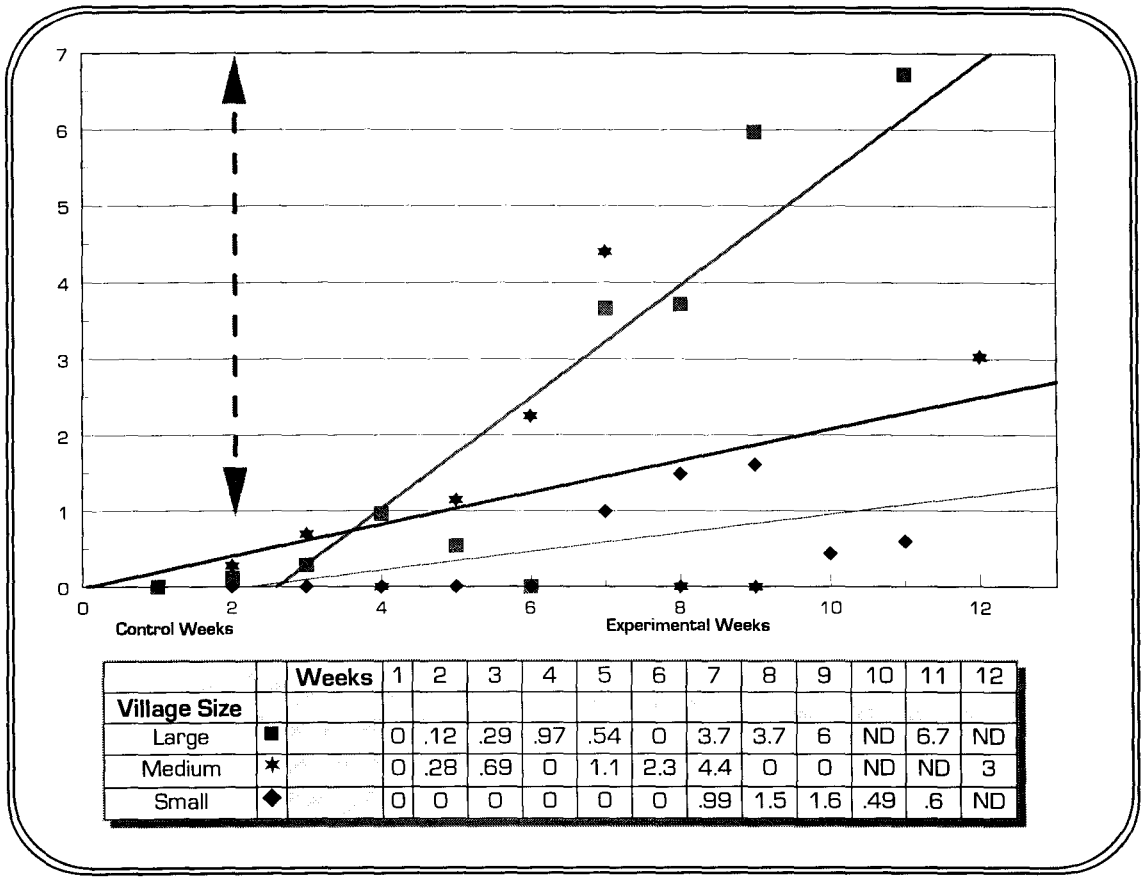
4.a. Comparison between time series data from small, medium, and large villages.

This hypothesis considered the differential effect of village size on the adoption of helmet use. Table 44 displays the data by village size over weeks 1 through 12 of the study. Figure 44 graphs the percentage of helmeted riders by village size over time.

Table 44

Helmet Use Observations by Village Size

		Weeks											
Villages	**Riders**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Large	Off-road vehicle riders	730	872	350	207	186	160	164	269	201	ND	208	ND
	Riders with helmets	0	1	1	2	1	0	6	10	12	ND	14	ND
	% of riders with helmets	0	0.12	0.29	0.97	0.54	0	3.7	3.7	6	ND	6.7	ND
Medium	Off-road vehicle riders	359	361	288	315	175	222	227	282	115	ND	ND	165
	Riders with helmets	0	1	2	0	2	5	10	0	0	ND	ND	5
	% of riders with helmets	0	0.28	0.69	0	1.1	2.3	4.4	0	0	ND	ND	3
Small	Off-road vehicle riders	230	247	275	252	173	198	202	202	62	105	167	ND
	Riders with helmets	0	0	0	0	0	0	2	3	1	1	1	ND
	% of riders with helmets	0	0	0	0	0	0	0.99	1.5	1.6	0.49	0.6	ND



		Weeks	1	2	3	4	5	6	7	8	9	10	11	12
Village Size														
Large	■		0	.12	.29	.97	.54	0	3.7	3.7	6	ND	6.7	ND
Medium	✶		0	.28	.69	0	1.1	2.3	4.4	0	0	ND	ND	3
Small	◆		0	0	0	0	0	0	.99	1.5	1.6	.49	.6	ND

Figure 44. Time series data: percentage of helmeted riders by village size.

The percentage of helmeted riders observed weekly was determined to be the best measure to control for differences in sample size. Following the analytical approach used with previous time series data, a Simple Linear Regression was performed on each line (see Table 45).

Table 45

Hypothesis 4.: Simple Linear Regression

Hypothesis 4	Simple Linear Regression		
	Large	**Medium**	**Small**
Slope of the line (B)	0.7314	0.2054	0.125
T-value	5.816	1.486	2.632
Confidence level	95%	95%	95%
Significance T	0.0004	0.1757	0.0272

The T-Value of 1.486 for medium-sized villages was not significant at the 95% confidence level. The T-Value of 5.816 for large-sized villages was significant at the 0.05 level, as was the T-value of 2.632 for small-sized villages. The slope of the line for the large villages was nearly six times the slope of the line in the small-sized villages. For this reason, it was determined there was a significant difference between the two sizes of villages but not in the direction projected. Therefore, the hypothesis was rejected.

The results from Hypothesis 4 can be summarized as follows:

4.a. Small and medium-sized villages did not experience a greater percentage increase in helmet use than large villages. Large villages experienced the greatest increase in helmet use.

Discussion:

The greatest percentage increase in helmet use occurred in large villages. This outcome was in contradiction to the hypothesis which projected that change would occur more rapidly in small groups because information would diffuse more rapidly, and group members would more quickly develop a perception of the revised consensus. This hypothesis considered the entire community as one group.

As discussed under Hypothesis 1, this researcher believes that change occurred less rapidly in communities where the existing group norms were the most homogenous and where, as a result, group members perceived themselves to be the most constrained by community standards. Kotzebue, the large village which contributed most of the statistics, is a relatively heterogeneous town with more than a quarter non-Inupiat residents. As demonstrated by the slope of the line, its residents most readily adopted the new behavior of wearing helmets.

Hypothesis 5

Hypothesis: There is no relationship between gender or ethnicity and helmet use.

Method of Analysis:

5.a. Cross-tabulation between helmet use and gender

5.b. Cross-tabulation between helmet use and ethnicity

5.c. Cross-tabulation for walkers between previous helmet use, gender, and ethnicity

This hypothesis evaluated the impact of two demographic characteristics, gender and ethnicity, on helmet use. Data came from two sources: observations and the curbside interview responses. The information on gender is presented first. Table 46 combines the raw data from the observations with the results of the Chi Square and Cramer's V Tests (as do subsequent tables). (See Appendix U for greater detail.) Table 47 addresses the same question using responses from the curbside interview. (See Appendixes V and W for greater detail.)

Table 46

Cross-Tabulation Between Helmet Use and Gender: Observations

Gender	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
Male	5,309	74	5,383
Female	2,680	6	2,686
Total	7,989	80	8,069

	Chi Square	P-Value
Pearson	24.2	0.0000009
Mantel-Haneszel	24.19	0.0000009
Yates corrected	23.04	0.0000016

	Value	Approximate Significance
Cramer's V	0.05476	0
Reject Null Hypothesis	Yes	

Table 47

Cross-Tabulation Between Helmet Use and Gender: Curbside Interview Responses

Gender	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
Male	33	4	37
Female	32	1	33
Total	65	5	70

	Chi Square	P-Value
Pearson	1.59	0.20703897
Mantel-Haneszel	1.57	0.21031327
Yates corrected	0.64	0.42551238
Fisher Exact: 1-tailed P-value		0.2160934
Fisher Exact: 2-tailed P-value		0.3607992
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approximate Significance
Cramer's V	0.15081	0.20704
Reject Null Hypothesis	No	

Results indicate that the data sources disagree on the impact of gender on helmet use. Based on more than 8,000 observations, the Chi Square of 24.2 was significant at the 95% confidence level, demonstrating a relationship between gender and helmet use and that males wore helmets more than females. However, data from the curbside interview yielded a Chi Square of 1.59 and a significance level less than 0.05. The null hypothesis was not rejected based on the results from the curbside interview. As previously stated, this researcher believes the curbside interview proved to be a poor fit with the indigenous culture due to the natural reticence of the populace. The small number of interviews collected and the limited information received both shed doubt on the value of the results.

Table 48 displays data on the relationship between ethnicity and helmet use obtained from the observations, and Table 49 presents findings from the curbside interview.

Table 48

Cross-Tabulation Between Helmet Use and Ethnicity: Observations

Ethnicity	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
Native	7,463	51	7,514
Non-Native	526	29	555
Total	7,989	80	8,069

	Chi Square	P-Value
Pearson	108.83	0
Mantel-Haneszel	108.82	0
Yates corrected	104.25	0

	Value	Approximate Significance
Cramer's V	0.11614	0
Reject Null Hypothesis	Yes	

Table 49

Cross-Tabulation Between Helmet Use and Ethnicity: Curbside Interview Responses

Ethnicity	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
Native	57	2	59
Non-Native	7	3	10
Total	64	5	69

	Chi Square	P-Value
Pearson	9.01	0.00268745
Mantel-Haneszel	8.88	0.00288656
Yates corrected	5.48	0.01918827
Fisher Exact: 1-tailed P-value		0.0193942
Fisher Exact: 2-tailed P-value		0.0193942
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approximate Significance
Cramer's V	0.36133	0.00269
Reject Null Hypothesis	Yes	

The null hypothesis was rejected based on a Chi Square of 108.83 at the 95% confidence level from observer reports and a Chi Square of 9.01, also at the 0.05 level, from the curbside interviews. Therefore, according to these findings, a relationship does exist between ethnicity and helmet use, and non-Natives wore helmets more often than Natives.

Responses from walkers and auto-riders to the curbside interview were also examined for a relationship between gender and ethnicity. Table 50 presents the findings related to gender, and Table 51 contains data on ethnicity. Both calculations were based on a sample size of nine respondents. (Limited to those respondents who owned or had access to a helmet.)

Table 50

Cross-Tabulation For Walkers and Auto Riders Between Gender and Previous Helmet Use: Curbside Interview Responses

Gender	Helmet Use		Total
	Did not wear last time	Did wear last time	
Female	4	0	4
Male	3	2	5
Total	7	2	9

	Chi Square	P-Value
Pearson	2.06	0.15149399
Mantel-Haneszel	1.83	0.17629637
Yates corrected	0.39	0.5303348
Fisher Exact: 1-tailed P-value		0.277778
Fisher Exact: 2-tailed P-value		0.444444
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approximate Significance
Cramer's V	0.47809	0.15149
Reject Null Hypothesis	No	

Table 51

Cross-Tabulation For Walkers and Auto Riders Between Ethnicity and Previous Helmet Use: Curbside Interview Responses

Ethnicity	Helmet Use		Total
	Did not wear last time	Did wear last time	
Native	5	2	7
Non-Native	2	0	2
Total	7	2	9

	Chi Square	P-Value
Pearson	0.73	0.39136594
Mantel-Haneszel	0.65	0.41902033
Yates corrected	0.01	0.91467565
Fisher Exact: 1-tailed P-value		0.583333
Fisher Exact: 2-tailed P-value		1
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approximate Significance
Cramer's V	0.28571	0.39137
Reject Null Hypothesis	No	

The Chi Square which evaluated the relationship between gender and helmet use for walkers and auto-riders was calculated to be 2.06. Using Fisher Exact 1-Tailed results, this was not significant at the 0.05 level. Likewise, the Chi Square which tested the relationship between ethnicity and helmet use for this group, 0.73, was not significant at the 95% confidence level by Fisher Exact 1-Tailed results. Therefore, the hypothesis was not supported.

To summarize the conclusions for Hypothesis 5:

5.a. There is a significant relationship between gender and helmet use based on the observations, demonstrating that males wore helmets more frequently than females. Due to the low number of curbside interviews, the value of this data will be relegated to a secondary position behind the observational reports.

5.b. There is a significant relationship between ethnicity and helmet use. *Non-Natives*

wore helmets more frequently than Natives.

5.c. Considering the population which walked or rode an auto through the checkpoint and responded to the curbside interview, there is no relationship between helmet use and gender or ethnicity.

Discussion:

Results from the observations and the curbside interviews disagree. Based on the sample size of 8,069 observations versus 99 questionnaires, this researcher believes the findings from the observations are the most valid. Therefore, there is a significant relationship between helmet use and gender and ethnicity. Males and non-Natives were more prone to wear helmets than females and Natives.

Hypothesis 6

Hypothesis: Helmet use will be more prevalent in youth than in adult age groups.

Method of Analysis:

6.a. Cross-tabulation between age and helmet use

6.b. Cross-tabulation between age and previous helmet use

This hypothesis examined the relationship between age and helmet use. Two categories were established for the analysis, youth (18 and under) and adult, in order to simplify data collection in the field. Table 52 reports the results from the observations, and Table 53 documents the findings from the curbside interviews. A Z Score was used to determine the direction of the relationship between age and helmet use.

Table 52

Cross-Tabulation Between Helmet Use and Age: Observations

Age	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
Adult	5,654	67	5,721
Youth	2,335	13	2,348
Total	7,989	80	8,069

	Chi Square	P-Value
Pearson	6.47	0.0109966
Mantel-Haneszel	6.47	0.0110016
Yates corrected	5.85	0.0155581

	Value	Approximate Significance
Cramer's V	0.02831	0.011

	Z Score	P-Value
Z Test: *p* helmeted riders who are youth > *p* helmeted riders who are adults	-2.98	0.99856
Support Hypothesis	No	

Table 53

Cross-Tabulation Between Helmet Use and Age: Curbside Interview Responses

Age	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
Adult	48	4	52
Youth	17	1	18
Total	65	5	70

	Chi Square	P-Value
Pearson	0.09	0.76159365
Mantel-Haneszel	0.09	0.76325143
Yates corrected	0.05	0.82000268
Fisher Exact: 1-tailed P-value		0.6173677
Fisher Exact: 2-tailed P-value		1
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approximate Significance
Cramer's V	0.03626	0.76159

	Z Score	P-Value
Z Test: *p* helmeted riders who are youth > *p* helmeted riders who are adults	-1.49	0.932
Support Hypothesis	No	

Based on observations, the Chi Square of 6.47, significant at the 95% confidence level, demonstrated a relationship between age and helmet use. However, the Z Score, -2.98, did not support the hypothesis that helmet use was more prevalent among youth than adults. The findings support the conclusion that helmet use is more common among adults than youth. The Chi Square of 0.09, obtained from responses to the curbside interviews, was not significant at the 0.05 level. Due to the small sample size, this finding will be discounted in favor of the observational data.

Table 54 reports the findings from the responses of walkers and auto riders. A significant relationship was not demonstrated at the 95% confidence level, with a Chi Square

of 0.66, and as a result the hypothesis was not supported.

Table 54

Cross-Tabulation Between Age and Previous Helmet Use: Curbside Interview Responses

Age	Helmet Use Last Time		Total
	No	Yes	
Adult	9	6	15
Youth	4	1	5
Total	13	7	20

	Chi Square	P-Value
Pearson	0.66	0.41679281
Mantel-Haneszel	0.63	0.42868862
Yates corrected	0.07	0.78664794
Fisher Exact: 1-tailed P-value		0.4058308
Fisher Exact: 2-tailed P-value		0.6126161
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approximate Significance
Cramer's V	0.18157	0.41679

	Z Score	P-Value
Z Test: *p* helmeted riders who are youth > *p* helmeted riders who are adults	-0.912871	0.819
Support Hypothesis	No	

Hypothesis 6 can be summarized as follows:

6.a. Based on the observational reports, there is a significant relationship between age and helmet use. Adults wore helmets more commonly than youth.

6.b. Responses from walkers and auto riders report helmet use is not more prevalent among youth than adults.

Discussion:

Data collection created just two categories for analysis: youth and adult, with youth

being defined as under 18. This hypothesis was based on the finding that elementary school students had the healthiest habits, whereas the habits of junior and senior high students were consistent with those of adults (Cohen, et al., 1990). Reports from the first year of implementation of the bicycle helmet law in Victoria, Australia mirrored these findings. During that time, helmet use by adults and young children rose to 90%, but teenagers were noted to be less compliant (Cameron, et al., 1994).

Results from this study may indicate that the age grouping, which included both younger children and teenagers, was too broad to reflect the healthier behavior of younger children. Further research in this area would be appropriate.

Hypothesis 7

Hypothesis: Helmet use will be more prevalent among riders who use off-road vehicles less frequently.

Method of Analysis:

7.a. Cross-tabulation between helmet use and off-road vehicle riding frequency

7.b. Qualitative interviews

This hypothesis evaluated the relationship between helmet use and off-road vehicle riding patterns, specifically the frequency of the use of this means of transportation as reported by the respondents. Table 55 displays the results and statistical analysis.

Table 55

Cross-Tabulation Between Helmet Use and Off-Road Vehicle Riding Frequency

Riding Frequency	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
0 - 3 Days/Week	19	2	21
4 - 7 Days/Week	46	3	49
Total	65	5	70

	Chi Square	P-Value
Pearson	0.26	0.61259715
Mantel-Haneszel	0.25	0.61514726
Yates corrected	0	1
Fisher Exact: 1-tailed P-value		0.4747184
Fisher Exact: 2-tailed P-value		0.6323729
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approx. Significance
Cramer's V	0.06052	0.6126

	Z Score	P-Value
Z Test: p helmeted riders who are infrequent riders > p helmeted riders who are frequent riders	0.4679822	0.32
Support Hypothesis	No	

Responses to this question produced a Chi Square of 0.26, which was not significant at the 95% confidence level. As a result, the hypothesis was rejected.

Qualitative interviews were conducted with 12 Community Health Aide Practitioners from the villages involved with the study. Their responses also failed to support a relationship between riding frequency and helmet use. Virtually none of the Health Aides interviewed reported wearing helmets themselves. Eleven of the twelve stated they rode an off-road vehicle frequently, within the 4- to 7-day-a-week category, and just one Health Aide used this means of transportation within the 1- to 3-day-a-week range.

The summary for Hypothesis 7 is:

7.a. Helmet use is not more prevalent among riders who use off-road vehicles less frequently.

7.b. The hypothesis was also rejected based on the qualitative interviews.

Discussion:

Off-road vehicles are the major means of transportation in the NWAB. Approximately one-third of the curbside interview respondents reported that they rode three days a week or less. One of the twelve Health Aides also rode this infrequently. The hypothesis was not supported by either means of analysis.

The theoretical basis for the hypothesis came from a study which described self-reports of the future intention to wear a seat belt. Subjects who rode in an auto the least reported the greatest intention to wear a seat belt the next time. The findings were further supported by the Theory of Reasoned Action which states that the sole determinant of behavior is the intention to perform it.

Data from this study reported actual behavior, not intention. Also, there were only five helmeted riders interviewed, making the sample size exceedingly small. A larger group of subjects is needed to adequately test this hypothesis.

The use of off-road vehicles may be so great in this region that a distinction between frequent and infrequent riding may not exist. Although the question asked how many days a week the respondent rode an off-road vehicle, it did not address how many times each day a subject used that means of transportation. This researcher observed multiple trips, perhaps even a dozen or more, up and down the roads of the village by the same individuals, making exposure to the risk factors high.

Hypothesis 8

Hypothesis: Knowledge regarding helmet effectiveness in a crash does not increase helmet use.

Method of Analysis:

8.a. Cross-tabulation between helmet use and knowledge regarding helmet effectiveness

8.b. Qualitative interviews

This hypothesis examined the relationship between behavior and knowledge by looking at the connection between the respondents' helmet-wearing habits and their awareness of the effectiveness of a helmet in preventing head injuries in a crash. Table 56 presents responses from riders of off-road vehicles who participated in the Curbside Interview.

Table 56

Cross-Tabulation Between Helmet Use and Knowledge Regarding Helmet Effectiveness

Knowledge: Helmets Prevent Injury	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
No/No Opinion	7	0	7
Yes	58	5	63
Total	65	5	70

	Chi Square	P-Value
Pearson	0.6	0.439231
Mantel-Haneszel	0.59	0.4425183
Yates corrected	0	1
Fisher Exact: 1-tailed P-value		0.5807518
Fisher Exact: 2-tailed P-value		1
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approximate Significance
Cramer's V	0.09245	0.43923
Reject Null Hypothesis	No	

A Chi Square of 0.6 was calculated from these figures, which failed to produce a significance level of 0.05. Therefore, the null hypothesis was not rejected.

Throughout the qualitative interviews, the Health Aides uniformly responded they believed a helmet "would definitely help" to prevent head injuries in a crash, but on a personal level none of them reported helmet use the last time they rode an off-road vehicle. Their answers supported the null hypothesis—that there is no relationship between the knowledge of a helmet's effectiveness in a crash and helmet use.

The conclusions to Hypothesis 8 are:

8.a. There is no relationship between knowledge regarding helmet effectiveness and helmet use, based on the curbside interviews.

8.b. Qualitative responses also support the null hypothesis.

Discussion:

The gradient-of-reinforcement concept from instrumental learning theory describes the finding that immediate consequences exert greater control over behavior than delayed ones. Both the Health Belief Model and the Theory of Reasoned Action are based on conscious decision-making processes and have limitations in regards to habitual behavior. Study results supported the hypothesis, meaning that failure to wear a helmet is in itself a habitual behavior and that the delayed consequences of a head injury provide little incentive to adopt helmet-wearing behaviors.

Hypothesis 9

Hypothesis: Helmet use increases when there is a history of personal injury on an off-road vehicle.

Method of Analysis:

9.a. Cross-tabulation between helmet use and history of injury on an off-road vehicle

9.b. Qualitative interviews

This hypothesis investigated the relationship between a history of personal injury on an off-road vehicle and helmet use. Table 57 presents the responses and the statistical analysis.

Table 57

Cross-Tabulation Between Helmet Use and a History of Personal Injury

History of Personal Injury	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
No	44	4	48
Yes	21	1	22
Total	65	5	70

	Chi Square	P-Value
Pearson	0.33	0.56782202
Mantel-Haneszel	0.32	0.57060078
Yates corrected	0.01	0.94307324
Fisher Exact: 1-tailed P-value		0.4951712
Fisher Exact: 2-tailed P-value		1
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approx. Significance
Cramer's V	0.06828	0.56782

	Z Score	P-Value
Z Test: *p* helmeted riders with a history of injury > *p* helmeted riders without a history of injury	-0.5091127	0.695
Support Hypothesis	No	

A Chi Square of 0.33 resulted from these responses, which was not significant at the 0.05 level. Therefore, the hypothesis was rejected.

Qualitative interviews produced recollections of several serious injuries either to the Health Aide herself or to a close family member. In Kiana, one of the two CHAPs reported experiencing a knee injury during a snowmachine race. Deering's Health Aide recalled an ATV crash which frightened her so much she decided to stop driving off-road vehicles herself, instead leaving their operation to family members. She also shared the tragic story of her

son's death which occurred as the result of a head injury sustained in a snowmachine crash.

Selawik's Health Aide described a neck injury from many years ago which resulted in arthritis—a condition very sensitive to the region's windy, cold conditions. Fractures to both hands were reported by Ambler's Health Aide. The injury occurred when she started her ATV. Apparently the throttle had been adjusted to a higher range without her knowledge, and she headed abruptly into a tree. The trauma was serious enough for her to be treated at the medical center in Kotzebue.

Despite graphic evidence of the sudden and unexpected nature of these injuries, as well as their seriousness, none of the affected Health Aides reported wearing a helmet during her last off-road vehicle trip. It is also noteworthy that 4 of the 12 Health Aides had sustained injuries from an off-road crash, for a frequency rate of 33%. This exceeds the figures identified by respondents to the curbside interview of approximately one in four. Therefore, the qualitative reports also fail to support the hypothesis.

The findings from the analysis of Hypothesis 9 are:

9.a. There is no relationship between the history of a serious injury and helmet use.

9.b. Despite a 33% injury rate among the 12 Health Aides interviewed, there was no reported helmet use, and therefore no relationship between injuries and helmet-wearing behavior.

Discussion:

More than 25% of the respondents to the curbside survey reported a history of some type of injury on an off-road vehicle. The injury rate among the CHAPs was even higher at 33%. However, none of the Health Aides had sustained a head injury, and this question was not asked directly during the curbside interview. All the injuries described by the CHAPs were orthopedic and just one required treatment outside the village. This researcher can only speculate as to whether the subjects connected orthopedic injuries, the potential for a more

serious head injury, and travel on an off-road vehicle.

Hypothesis 10

Hypothesis: Habit is the predominant reason for subjects not wearing a helmet when one is available to them.

Method of Analysis:

10.a. Frequencies of response to the survey question inquiring why a helmet was not used when one was available

10.b. Qualitative interviews

This hypothesis evaluated reasons why off-road vehicle riders might not wear a helmet when one was available. Approximately a quarter of the respondents to the curbside interviews acknowledged having access to a helmet which was not worn during the last off-road vehicle ride. Table 58 reports the frequencies of these comments, which were grouped into four general categories due to the small sample size.

Table 58

Frequencies for Reasons for Not Wearing a Helmet When One Is Available

Reason for Not Wearing a Helmet	Frequency	Percent
Other - unspecified	9	37.5%
Helmet: comfort, style, color, limits vision, friends don't wear	6	25%
Never thought of It	6	25%
It's not needed	3	12.5%
TOTALS	23	100%

The response "never thought of it" was chosen during questionnaire development as the one which most closely reported habitual behaviors. As identified in Table 58, this category tied for second place with reasons related to the helmet itself, but fell behind

"other—unspecified."

Two of the CHAPs interviewed during the qualitative portion of the study reported having access to a helmet but also acknowledged they did not wear it the last time they rode an off-road vehicle. A Kiana Health Aide identified her husband and son as both owning helmets. When asked why she had not worn one of them, she responded, "I just never think to use one, I guess," a response which closely parallels the curbside interview item chosen to represent habitual behavior.

In Noorvik, a Health Aide also reported helmet ownership by adult males in her household, specifically her grown sons. Reasons given for not wearing the helmet herself focused on a belief it was not needed due to safe driving habits, "I don't usually drive that fast when I'm riding. My family, except when they take me out on emergencies . . . they don't go too fast." She also commented on the time it took to put on the helmet, saying "I don't have time to look for a helmet, and if it's there, ready to go, I probably would learn to pick it up and put it on." These responses touch on a variety of reasons for not wearing a helmet, including (a) a sense of safety related to personal driving habits ("it's not needed"), and (b) the lack of smooth, sequenced, efficient behavior—in other words, habit.

The conclusions from Hypothesis 10 are:

10.a. Responses to the curbside interview ranked habit as the second of four possible answers. Therefore, it was not the predominant reason for not wearing a helmet.

10.b. Both Health Aides responded in ways which strongly alluded to the lack of habitual helmet-wearing behaviors. However, in both cases "access" may have been relatively restricted because male family members owned the helmets and apparently wore them from time to time. Also, the concept that the helmet was not needed due to safe driving was the primary reason given by one of the two Health Aides. Therefore, although habit came to the fore more prominently than it did in the curbside interview responses, it did not assume a

preeminent position.

Discussion:

Both habit and attributes of the helmet itself were the most clearly articulated reasons for not wearing a helmet, with both factors listed by 25% of the respondents. Therefore, these two issues appear to be equally important to overcome. Helmets which do not satisfy basic comfort and convenience issues will not be worn. However, even if helmets become user-friendly, they still have to be worn to be effective, and this will not happen until the wearer builds their use into a new routine. There were also nine responses, making up a third of the total, which did not fit into any of the categories and were listed as "other." Further research in this area would appear to be helpful.

Hypothesis 11

Hypothesis: Positive perceptions of helmet wearers will increase personal helmet use.

Method of Analysis:

11.a. Cross-tabulation between helmet use and perceptions of other helmet wearers

11.b. Qualitative interviews

This hypothesis tested the assumption that people are more apt to wear helmets if they harbor a positive perception of helmet wearers in general. Due to the low number of respondents, answers were consolidated into two categories which represented either positive or negative attitudes. Table 59 reports the responses and the statistical analysis.

Table 59

Cross-Tabulation Between Helmet Use and the Perception of How Others Look in a Helmet

Perceptions of How Others Look	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
Odd/Strange/Other	13	0	13
Safe/Smart	52	5	57
Total	65	5	70

	Chi Square	P-Value
Pearson	1.23	0.26778267
Mantel-Haneszel	1.21	0.27122791
Yates corrected	0.26	0.60902255
Fisher Exact: 1-tailed P-value		0.3459556
Fisher Exact: 2-tailed P-value		0.5757148
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approx. Significance
Cramer's V	0.13245	0.26778

	Z Score	P-Value
Z Test: *p* helmeted riders with positive perceptions > *p* helmeted riders with negative perceptions	2.34106	0.01
Support Hypothesis	No	

The Chi Square of 1.23 was not significant at the 95% confidence level, demonstrating there is no relationship between perception and helmet use. Therefore, the hypothesis was not supported. The Z Score of 2.34106 was significant at the 0.05 level, indicating that the proportion of helmet users with positive perceptions of other helmet users was greater than the proportion of helmet users with negative perceptions.

Although no Health Aides reported wearing helmets themselves, their perceptions of helmeted riders were overwhelmingly positive. Seven of the twelve used the word "safe" as a descriptor, offering comments such as they "look like they're wearing it for *their safety*" and "it means they want to be on the safe side." One Health Aide pictured helmet wearers as

"perfect," saying helmets "look perfect to me on young people. Some kids have it now today. And (they look) safe too." "Good" was a third positive adjective employed by two Health Aides, one of whom went on to say "I just think they're thinking of safety." Only one Health Aide described helmet wearers as "OK," offering no further comment, and a final interviewee could not answer the question.

Summary of the findings for Hypothesis 11:

11.a. There was no relationship between perception and helmet use. Therefore, the hypothesis was not supported.

11.b. The Health Aides reported positive images of helmeted riders, focusing on the safety aspects of the behavior. Those who at first mentioned another adjective such as "good" and "perfect" expanded their comments to include safety as the predominant reason for wearing a helmet. Despite the presence of these positive attitudes toward helmeted riders, no Health Aides reported wearing helmets themselves. Therefore, the hypothesis was not supported by the qualitative testimony.

Discussion:

All the helmeted riders had positive perceptions of other helmeted riders. However, this did not in and of itself increase helmet wearing, which suggests that another mechanism activated the behavior. However, the positive perception was essential to making the change. Also, approximately 80% of the survey respondents and 100% of the Health Aides had an affirmative attitude toward helmeted riders, indicating how widespread these beliefs are in the region.

Hypothesis 12

Hypothesis: More subjects who are exposed to the modeling behavior will begin wearing a helmet or will state an intention to wear a helmet the next time they ride than those not exposed to the modeling behavior.

Method of Analysis:

12.a. Cross-tabulation between treatment condition and future intention to wear a helmet

12.b. Cross-tabulation between exposure to safety messages and future intention to wear a helmet

12.c. Frequencies of responses to reasons for wearing a helmet

12.d. Qualitative interviews

Hypothesis 12 evaluated the differential effect of the modeling-plus-helmets treatment versus the helmets-only treatment on the subject's intention to wear a helmet in the future. A second cross-tabulation assessed the relationship within the modeling condition between exposure to safety messages and plans to wear a helmet in the future. Comments from both the curbside survey and the qualitative interviews were also evaluated. Table 60 reports the results of the cross-tabulation between treatment conditions.

Table 60

Cross-Tabulation Between Intention to Wear a Helmet Next Time and Treatment Condition

Treatment Condition	Intention to Wear a Helmet the Next Time		Total
	No	Yes	
Modeling	12	8	20
Helmets-only	4	4	8
Total	16	12	28

	Chi Square	P-Value
Pearson	0.23	0.62906315
Mantel-Haneszel	0.23	0.6353563
Yates corrected	0	0.9518524
Fisher Exact: 1-tailed P-value		0.4724638
Fisher Exact: 2-tailed P-value		0.6908213
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approx. Significance
Cramer's V	0.09129	0.62906

	Z Score	P-Value
Z Test: *p* who intend to wear a helmet in modeling > *p* who intend to wear a helmet in helmets-only	-0.4808471	0.685
Support Hypothesis	No	

The Chi Square of 0.23 was not significant at the 95% confidence level, and the hypothesis was not supported.

The cross-tabulation between exposure to safety messages within the modeling condition and intention to wear a helmet in the future is found in Table 61.

Table 61

Cross-Tabulation Between Intention to Wear a Helmet Next Time and Exposure to Safety Messages

Exposure to Safety Messages	Intention to Wear a Helmet the Next Time		Total
	No	Yes	
No	11	3	14
Yes	1	5	6
Total	14	8	20

	Chi Square	P-Value
Pearson	6.71	0.00960702
Mantel-Haneszel	6.37	0.01159981
Yates corrected	4.38	0.03646983
Fisher Exact: 1-tailed P-value		0.0180599
Fisher Exact: 2-tailed P-value		0.0180599
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approximate Significance
Cramer's V	0.57907	0.00961

	Z Score	P-Value
Z Test: *p* who intend to wear a helmet who saw the safety message > *p* who intend to wear a helmet who did not see the safe message	3.3007638	0
Support Hypothesis	Yes	

The Chi Square of 6.71 was significant at the 0.05 level, and Cramer's V demonstrated a relatively strong relationship with a value of 0.57907, also significant at the 95% confidence level. The Z Score supported a positive relationship between exposure to safety messages and the intention to wear a helmet. Therefore, the hypothesis was supported.

Table 62 presents the reasons cited by helmet wearers for their decision to wear a helmet. Answers closely parallel perceptions reported by the Health Aides of how they viewed

helmet wearers, with "safety" topping the list. One person acknowledged the importance of being able to purchase the helmet in town as the deciding factor in wearing one. However, no one selected responses which were developed to portray reactions to the modeling treatment, such as saw "more people wearing helmets recently," "attend(ed) the recent class on ATV safety," and saw "the safety messages around town about wearing helmets." Therefore, the frequencies reported did not support the hypothesis.

Table 62

Frequencies for Reasons for Wearing a Helmet

Reason for Wearing a Helmet	Frequency	Percent
Other - Safety	3	60%
Could buy it in the village	1	20%
Other - unspecified	1	20%
TOTALS	5	100%

Although helmets were available for sale in the clinics, giving the Health Aides easy access to their purchase, and although in the modeling villages the Health Aides were constantly exposed to the safety posters, none of them purchased a helmet for themselves. However, both Kiana (a modeling village) Health Aides bought helmets for male family members, as did the Health Aide in Deering (helmets-only village). In all three cases, the dynamic was reported to be "mothers . . . thinking about the safety of their children," according to a Kiana Health Aide. In Deering, the demise of a son years before in a snowmachine crash prompted recognition of the value of a helmet and played a key role in its purchase. In Kotzebue, another modeling village, the individual responsible for helmet sales at the Medical Center purchased a helmet for her son. She herself was already a helmet wearer, but took the opportunity to provide a helmet to a family member as well.

In conclusion, although Health Aides in the modeling villages were constantly exposed to the safety messages, they did not embark on wearing helmets themselves. Rather,

purchases were made for male family members who were perceived to be at greater risk for injury. The decision to buy and wear a helmet appeared to be mediated by the concept that females traveling at low speed within the city limits were not in danger, whereas males who tended to drive fast and who were also involved in travel outside the village were at much greater risk.

The conclusions to Hypothesis 12 are:

12.a. There was no significant difference in the intention to wear a helmet in the future between treatment conditions.

12.b. Exposure to safety messages within the modeling condition significantly influenced the intention to wear a helmet in the future.

12.c. Reasons cited by helmet wearers for making the decision to wear a helmet focused on safety and did not include responses which were linked to features of the modeling intervention.

12.d. The Health Aides themselves, who were constantly exposed to the modeling messages, did not become helmet wearers. However, in three instances helmets were purchased for male family members who were perceived to be at risk for a head injury.

Discussion:

Great care was taken in the creation of the community announcements. Regional scenes were photographed, then faithfully reproduced in pen and ink drawings. The modeling messages were woven in with themes from the Iñupiaq traditional values. The Injury Prevention Specialist received many positive comments about the posters, and one was requested more often than others. It (Appendix L) had the largest and simplest picture, with one rider on an ATV. It also most clearly incorporated indigenous philosophy.

However, caution must be used when interpreting these results due to the small number of respondents to the curbside interview and the tool's lack of fit with the indigenous culture.

Hypothesis 13

Hypothesis: Knowledge regarding the effectiveness of a helmet in a crash will increase support for a law.

Method of Analysis:

13.a. Cross-tabulation between history of personal injury on an off-road vehicle and support for a law

13.b. Qualitative interviews

This hypothesis proposed that knowledge of a helmet's effectiveness had a direct influence on the attitude of support for a law requiring helmet use. Table 63 contains survey responses and the statistical analysis.

Table 63

Cross-Tabulation Between Knowledge of a Helmet's Effectiveness in a Crash and Support for a Law

Knowledge: Helmets Prevent Injury	Support For A Law		Total
	No	Yes	
No	3	5	8
Yes	40	49	89
Total	54	43	97

	Chi Square	P-Values
Pearson	0.16	0.68476692
Mantel-Haneszel	0.16	0.68630915
Yates corrected	0	0.97250325
Fisher Exact: 1-tailed P-value		0.4913241
Fisher Exact: 2-tailed P-value		1
An expected cell value is less than 5. Fisher Exact results recommended.		

	Value	Approx. Significance
Cramer's V	0.04122	0.68477

	Z Score	P-Value
Z Test: *p* who believe helmets prevent injury that support a law > *p* who don't believe helmets prevent injury that support a law	-0.415623	0.661
Support Hypothesis	No	

With a Chi Square of 0.16, significance did not achieve the 95% confidence level. Therefore the hypothesis was not supported.

With only one exception, the Health Aides supported enactment of a law requiring helmet use. This coincided with their universal agreement that helmets definitely help prevent head injuries. On the other hand, the role models and the observer (who also all agreed that helmets prevent head injuries) were split in this regard, with two role models and the observer

stating their opposition to a law and a third role model supporting a law limited to youth only. The discussion of a regulation requiring helmet use engendered many comments which will be reviewed in greater detail in the next section.

The findings from Hypothesis 13 can be summarized as follows:

13.a. Knowledge regarding the effectiveness of a helmet does not increase support for a law, based on responses from the curbside survey.

13.b. Although 11 of the 12 Health Aides supported enactment of a helmet regulation, the models and observer were split, with 3 of 5 stating their opposition for a variety of reasons. Therefore, the results from the qualitative interviews were mixed.

Discussion:

More than 50% of the respondents to the curbside survey supported a law. However, more than 90% agreed that a helmet can definitely prevent head injuries from a crash. Although their knowledge of the effectiveness of the helmet did not have a statistically significant effect on attitudes, the information that more than half support regulations may be encouraging. Reasons why the subjects either did or did not support a law were not explored in the curbside interview.

Although 11 of the 12 Health Aides supported a law, only two of the five other subjects interviewed voiced the same opinion, for an overall figure of approximately 75%. Reasons for this response were complex and are discussed under findings from the qualitative portion of the study.

The theoretical bases for this hypothesis were the Health Belief Model and the Theory of Reasoned Action which both link the potential consequences of an action to attitudes. It was presumed that residents in the region were aware of the high percentage of off-road vehicle crashes and serious head injuries and that this would motivate their support for a law. In the context of the curbside interviews this was an untested assumption because the only "knowledge" question focused on helmet effectiveness. Also, results from the inquiry about why

helmets are not worn when available indicated that more than 12% of the respondents thought a helmet was not needed and that more than 37% of the answers could not be categorized, leaving their exact thoughts unknown. This indicates the need for further research.

This hypothesis also assumes a cause-and-effect relationship between perception of consequences and attitude. The importance of intervening factors such as culture, the political climate, the state and context of law enforcement, and the underlying frequency of helmet wearing were not considered. Comments surrounding all these issues came out in the qualitative portion of the study and will be expanded upon later.

Summary of Key Quantitative Findings

1. Helmet use increased in villages where the barriers to helmet purchase were removed.

2. Helmet use increased more in villages exposed to modeling behaviors than in villages exposed to increased access alone.

4. Helmet use increased significantly in large and small villages. Large villages experienced a greater increase in helmet use.

5.a. There is a significant relationship between gender and helmet use based on the observations. Males wore helmets more than females.

5.b. There is a significant relationship between ethnicity and helmet use. Non-Natives wore helmets more than Natives.

6. There was a significant relationship between age and helmet use, although not in the direction hypothesized. Adults wore helmets more often than youth.

8. Knowledge regarding helmet effectiveness in a crash did not increase helmet use.

12.b. Exposure to safety messages within the modeling condition significantly influenced the intention to wear a helmet in the future.

Unhypothesized Findings

The whole of science is nothing more than
a refinement of everyday thinking.

Albert Einstein

Helmet-Wearing Differences Between ATV and Snowgo Riders

Because there were no reports in the literature which described helmet-wearing patterns in a population which uses off-road vehicles as its major mode of transportation, no hypotheses were created to allow for an evaluation of differences between the riders of ATVs and snowmachines. However, observations made during the qualitative interviews suggested such a distinction.

A Health Aide in Noorvik noted, "I don't see people wearing helmets riding the four-wheelers or three-wheelers. It's mostly in the wintertime." Noatak's Health Aide followed up that report by confirming the viewpoint that "snowmachines are more dangerous than Hondas." She went on to describe two deaths in the village caused by snowmobiles. One occurred during the annual race, but the second involved two children skylarking on a snowgo at over 80 miles an hour. They lost control of the vehicle, and it crashed through the skirting underneath the school. One child died instantly, and the second sustained injuries serious enough to require surgery and many weeks of recuperation in Anchorage.

Data collected during the study identified the type of vehicle in use. Table 64 displays the figures and the statistical analysis.

Table 64

Cross-Tabulation Between Helmet Use and Vehicle Type

Vehicle	Helmet Use		Total
	Riders without Helmets	Riders with Helmets	
ATV	2,719	15	2,734
Snowgo	5,270	65	5,335
Total	7,989	80	8,069

	Chi Square	P-Values
Pearson	8.26	0.0040537
Mentel-Haneszel	8.26	0.0040559
Yates corrected	7.59	0.0058646

	Value	Approximate Significance
Cramer's V	0.03199	0.00405

	Z Score	P-Value
Z Test: *p* snowgo riders who wear helmets > *p* ATV riders who wear helmets	3.30403	0

The Chi Square of 8.26 was significant at the 95% confidence level. Cramer's V portrayed a relatively weak association between the two variables. A Z Score was used to test the hypothesis that a greater proportion of snowmachine riders wore helmets than ATV riders. The results supported this hypothesis.

Therefore, the data indicate that there is a significant relationship between helmet use and vehicle type and that snowmachine riders wear helmets more frequently than ATV riders. The dynamic underlying this behavior appears to be at least two-fold: (a) snowmachines are perceived to be more dangerous than ATVs, and (b) winter weather requires head protection of some type—a helmet with the appropriate support pieces such as a thermal face shield and goggles serves just as well as the more traditional beaver hat.

Conversely, there were many reports, as well as numerous field *observations* by this

researcher, which suggested a pervasive attitude that ATVs are safe at any speed with almost any configuration of riders. In response to a question about four-wheeler safety, the Health Aide in Noorvik[5] stated, "You see a lot of little kids in front (on the four-wheeler front bumper). A lot of little kids on the back just sitting on the four-wheelers. Especially when they're going to school and in the mornings." Scenes common in all villages included: (a) four-wheelers with two to five teenage riders, in addition to the driver, (b) mothers with two to five young children on both the front and back bumpers, and (c) a four-wheeler with two adults on the back bumper, as well as the driver. As such, no "seats" exist on the vehicle other than for the driver, and passengers are forced to hang on to bars originally affixed for purposes of carrying cargo.

In conclusion, qualitative reports and the quantitative data collected during the study confirm that snowgo riders wear helmets more often than do those on ATVs. A pervasive belief that snowmachines are more dangerous than four-wheelers has apparently influenced helmet-wearing behavior. Also, the arctic winter requires head protection, and the seasonal nature of snowgo driving has naturally linked helmets with that mode of transportation.

Village Versus Wilderness Helmet-Wearing Behavior

Numerous reports were received during the qualitative portion of the study which suggested that helmets were used more often during trips between communities than on quick runs around town. Although the Kotzebue observer and the Health Aide in Shungnak believed people were just as likely to wear a helmet in town as outside the village, and Health Aides in Buckland and Noatak could not recall helmeted riders in any location, the remainder of the interviewees offered overwhelming testimony in this regard.

Kiana's Health Aide described a typical trip out of town:

[5] All Health Aides speak either English as a second language or a regional patois.

> I know when they go down to Noorvik, they always put their helmets on. My boys do. Fast trips like that, I guess longer trips, that's when they wear them. I guess around town they don't drive that fast, you know. Not supposed to anyway.

The speed of the trip and its associated sense of risk was also mentioned by the Deering Health Aide, who commented that people might be more apt to wear a helmet outside town because "maybe they don't speed too much in the village, but maybe out of town they speed." Noorvik's Health Aide echoed this sense of risk when she said, "Seems like when they go outside to another village they are more inclined to wear them . . . because they go faster . . . even though it seems to me they be riskier of having an accident running around town."

Although Noorvik's Health Aide questioned the safety of driving in the village, the predominant theme was one of a sense of security and low risk inside city limits. The second Health Aide in Noorvik described a typical run around town by saying, "When you're just going to a store or to the post office, they don't bother wearing a helmet." The same patterns were reported in Noatak, "In the village, if they're just going a little ways like from here to the store, they wouldn't even think of putting it on."

The theme of a helmet not being needed was repeated again in Ambler.

> I mean people wear it mostly on long drive like going to other village or take a trip a fast day when they think . . . but they just make a short like one five minutes to store and between houses, I think they can't do that for that short trip.

In town the helmet was not only not needed, it presented too much effort. "Not enough time or not available just yet," summed up the issue for Noorvik's Health Aide. Kiana's role model agreed by saying, "They don't think of it, they're in a hurry . . . they don't take time to put it on."

To summarize, a distinct picture of helmet-wearing behaviors in the region emerged from the interviews. Snowmachine trips between villages were universally viewed as risky endeavors. Both the speed of the vehicle and the treacherousness of the terrain itself

contributed to the danger, and many observers reported helmeted riders in this environment. However, travel within the city limits seemed to have just the opposite effect. Short distances and low speeds combined to create a sense of safety. Without the dangers of the trip to act as a goad, helmet wearing quickly became too much effort and was abandoned.

Driving Habits In Town

Although the village was almost universally viewed as a safe haven from off-road vehicle crashes, role models and Health Aides alike were quick to describe both serious injuries and reckless driving which occurred on city streets. Kiana's role model, who was also the city's VPSO, provided a first-hand picture of the situation.

> I see 'em two to a machine, they'll be racing around, playing follow the leader, hide and seek. Some of these kids that are 14 and 15 are allowed to drive, are kinda of careless, reckless. I've had to talk to a few of 'em about having 5 or 6 set of kids on the machines and just whipping around corners, you hear 'em screaming and hollering, flying half off the machine and stuff.

Kotzebue's Native role model supported the idea that more injuries occur in town than outside with pertinent observations and examples.

> They don't understand the stopping distance required with machines that are traveling that fast. There's a lot of obstacles. Last winter in Selawik there was a young man who was riding a snowmachine in town kinda high and ran into four people, killing two of them. Noatak last winter had a death occur with a very young boy, lost control of his machine, hit the school building, killing him instantly.

Noatak's Health Aide recalled the event, saying, "they were going fast. The speedometer was stuck on 100, that's how fast they were going."

Other observers focused on both the lack of regulations and lack of enforcement for

ordinances which do exist. Ambler's Health Aide reported an effort to post signs warning children under "14 years old . . . not supposed to driving, but they're driving younger than that" in the absence of a VPSO in the community. Both Selawik and Noatak Health Aides described grassroots efforts to police roadways through use of a Citizen's Band (CB) Radio. In Noatak, the Health Aide reported "We get on the CB sometimes and tell the people that they shouldn't let their kids be driving if they're going fast. That's what we do. Just like try to enforce it." Started on the subject, Selawik's Health Aide went on to acknowledge the dangers, "You know if somebody is drinking and drive out around they'll call somebody right away because all these years we've had so many accidents. Everybody always be alert around here."

Despite the presence of several police officers in Kotzebue, both the Native role model and the observer found that traffic regulations were not enforced. According to the Native role model:

> They don't cite anybody here, they don't stop anybody on the street and make 'em show licenses. They did at one time try to get the kids off the street, but a month later they were right back and no one really cared. It has to start somewhere, the safety, and if our police and city council isn't doing it then you know where does it start?

Three Health Aides described how the presence of alcohol in the region's legally "dry" villages was influencing driving. Kiana's Health Aide cited this as a justification for implementing a universal helmet law, "cause you know the older ones they like to drink and drive once in a while." In Selawik, a long history of alcohol-related crashes was described as the motivator for the community-watch system. "If they know if somebody is drinking and drive out around they'll you know they'll call somebody right away because all these years we've had so many accidents." Shungnak's Health Aide identified alcohol as a cause of off-road vehicle crashes, saying that a helmet would prevent injuries, "If that's the reason, if there is no alcohol in town

that could prevent it, and we don't have any VPSO in the village so it's getting worse and worse (alcohol importation and use) in our town." She went on to identify the geographic area suffering from the bootlegging activity.

> So, these small villages are close together and everyone at Kobuk, Shungnak, and Ambler knows what's going on in the villages like if there is someone bringing in booze to Ambler, people from Kobuk and Shungnak would know 'so and so' is bringing in 'so and so' and everybody would go there.

To summarize, throughout the region, the sense of personal safety reported by the Health Aides in village driving conditions contrasted to their descriptions of the rash behavior of other drivers, primarily the youth. Study participants from at least three of the nine villages spontaneously offered testimony about the effects drinking had on off-road vehicle driving. The lack of VPSOs in four of the nine study villages, as well as the limited policing in the remainder, has left law enforcement in the hands of the citizenry, and by all accounts the city streets, far from being a safety zone, are more often a playground for the young and reckless.

Cultural Influences on Adolescent Discipline

Talk of stopping dangerous driving behavior in Noatak ended with the phrase, "Try to enforce it." Expanding on that comment, the Health Aide described the full extent of the enforcement attempted as "a (CB) broadcast and then our village Elder gets on sometimes and tell 'em the Council should go and stop 'em or something. Like the parents. That's about all they do." Her description emphasized the limitations of the effort.

Kotzebue's Native role model offered insight into the cultural implications of discipline. In discussing the recent fatalities in Noatak and Selawik, he commented:

> Now that should be driving the point home, but they don't. I think Native parents as a whole are a lot more lenient with their kids. And it's kinda inbred into society

> to not punish your kids but to let them go. Although it's slowly changing. There are parents like myself who clamp down when there is a need.

As Western society and technology have permeated even the furthermost reaches of the northwest Arctic, the social institutions of the Inupiat have been challenged to the core. The need for discipline to maintain juvenile safety, at least as it relates to modes of transportation, is relatively new. Selawik's Health Aide described the situation eloquently, "You know long time ago people used to drive mostly with dogs and it takes the whole day to travel, to go someplace, and there is no accidents." The introduction of off-road vehicles into the culture has brought along with it new challenges to the family and to society. Commenting on the liberality of some parents, the Native role model from Kotzebue went on to say,

> You'd be surprised how many kids have $6,000 and $7,000 snowmachines . . . kids 8, 10 years old. Their parents trust them with a new machine that's capable of doing 100 miles an hour easy . . . They encourage their kids to use [racing machines] because they want them to be racers.

The risks in the situation are apparent. Powerful machines, capable of 100 miles an hour, are placed in the hands of children. Fathers and mothers with a cultural predilection to laissez-faire discipline are being challenged to learn new parenting skills which will help their children survive adolescence. The collision of Western culture and ancient Iñupiaq heritage is being played out against the backdrop of off-road vehicle use in the Northwest Arctic Borough.

The Culture of Off-Road Vehicles

Henry Ford is credited with introducing the "culture of the automobile" to America because this mode of transportation became so all pervasive that it changed innumerable aspects of daily life. Due to the lack of a road system in the NWAB, the auto is not a significant factor in society. Off-road vehicles have taken their place, filling all the basic needs from in-town

shopping and commuting to inter-village travel and subsistence survival activities. This was witnessed by this researcher repeatedly over the entire course of the study.

Reflecting on his cultural heritage, the Native role model in Kotzebue described contact with off-road vehicles beginning at a young age:

> I have a granddaughter now, and we plan to buy her a snowmachine as soon as she's big enough to sit on one. They have 'em nowadays for kids that small, so (I have) the same mentality as the rest of the people.

He went on to describe how his granddaughter would be following family traditions: "They've (all my children) had machines, every one of them, either mine or their own." He believed also that introducing his children to off-road vehicles was following the community norm:

> This place probably has more racing machines than anywhere else in the country. People use them. They encourage their kids to because they want them to be racers . . . They're going to be on the machines no matter what anybody says, and . . . I think a lot of their heroes are people who win the races.

In conclusion, off-road vehicles touch nearly every aspect of life for residents in the NWAB from basic everyday transport to subsistence activities to recreating and organized sports. Children are introduced to them at the tenderest age and look forward with great anticipation to both driving and racing as young adults. Parents and adults model driving behaviors, either safe or unsafe, and imprint this information on the next generation. Attempts to introduce helmets must therefore take into account the multiplicity of situations in which off-road vehicles are used, the cultural and economic importance of the vehicle in NWAB society, and the existence of nonhelmeted role models throughout the region.

Gender- and Age-Related Factors

The qualitative interviews expanded the knowledge already obtained from the quantitative data about the relationship between helmet use and demographic characteristics such as age and gender. Subjects readily volunteered descriptions of both who purchased and who wore helmets—with a richness of detail which added new insight.

Parents buying helmets for their children was a common theme. In Kiana, the Health Aide purchased two helmets, one each for her husband and son. Noorvik's Health Aide also reported "parents buying helmets for their kids. Or, it's mostly for the boys." She went on to describe the subsequent pressure parents put on their children to wear helmets: "Maybe the parents always worry about their kids and make sure they wear helmets when they're driving or the kids know they have to wear it if they're driving." Recalling the death of one son as a result of a head injury sustained in a snowmachine crash, the Health Aide in Deering purchased a helmet "for my younger son and his girlfriend so they could have one because they ride a lot."

In Noatak the decision to buy a helmet extended down to elementary-age children: "They bought these helmets mostly for the little kids because they have the 'Kiddy Kats' now." The season for the study also offered a natural tie-in for gift-giving: "Parents came in and bought (helmets), some people bought 'em for Christmas presents." However, a "few, not a whole lot" also went on to buy helmets for themselves. The Kotzebue observer reported a similar pattern of helmet sales.

> I found that as Christmas came closer, several of them were purchased for Christmas gifts, so I think the season definitely figured into the picture. There were a lot of people who were buying them for their children, their youngsters 10 to 18.

Young children were also the recipients of helmets in Kotzebue, where parents were

again noted to buy for their offspring. However, their rationale was reported to extend beyond safety to the concept of forming health habits at a tender age. According to the Kotzebue observer, "I think some of the families were thinking that if they started their children when they were first starting to ride an ATV that it would become an automatic."

Males were reported to buy helmets more often than females or to more often be the recipient of a helmet purchased by a female. A second Health Aide in Noatak reported that "most of the guys here (own helmets), the ones they bought from here." Health Aides in Noorvik, Kiana, and Shungnak reported that their sons owned helmets. Shungnak's Health Aide also observed that "those young guys mostly they wear helmets."

Age was another factor commonly associated with helmet-wearing patterns. Asked what age group most often wore helmets, the Health Aide in Selawik replied: "Just mostly like between 25 to younger. I don't see older people wearing." Asked to speculate on the reasons for younger people wearing helmets, she answered, "Older people drive slower than younger maybe . . . (who) really go full blast sometimes." Similar reasons were cited by Shungnak's Health Aide for why her son owned a helmet and she did not. Asked to explore this subject, she responded, "Well, because I drive only in daytime maybe and I don't go speeding around town. He like to go fast." The age range most commonly observed in Shungnak was "young, like 15 to 20, 15 to 25 maybe, or 15 to 30." Ambler's Health Aide also commented on the age range for helmeted riders, saying "I see quite a few on some young people . . . age range like 12, 14." The theme of youth was repeated in Noorvik where the Health Aide described helmet-wearers as "especially the younger people, they're more aware of the helmets, more used to wearing the helmets."

To summarize, helmets were purchased most often for use by males. Also, parents were reported buying helmets for their children, who ranged from grade-school age to young adulthood. Two observers found helmeted riders to be between 15 and 30, commenting that youth wore helmets in recognition of their own "full blast" driving habits. Also, the concept of

wearing a helmet was reported to have penetrated this younger age group, whereas older adults were perceived to be more resistant to such a change.

The qualitative information supports the conclusion that youth wear helmets more often than adults, whereas the quantitative data found that adults wore helmets more often than youth. Age ranges cited by the key informants varied from those used during the observations. The qualitative findings must therefore be interpreted with caution. This area would be a fruitful one for further research.

Group Activities

Helmet wearing was frequently reported in conjunction with organized activities, especially snowgo racing. Each year the annual inter-village race goes through Noorvik, and the Health Aide there recalled the event:

> They go from Kotzebue to two other villages or three others as fast as they can. There's about I don't know how many hundred young men that try to (win) . . . and everyone of them has a helmet on, and during that time you will see young men that you never seen wear a helmet before but during that weekend or that week they all wear their helmets. Maybe just to get themselves used to training with the helmet or just trying to look cool or snazzy or racy or whatever.

The event's uniqueness was also emphasized by Buckland's Health Aide who noted "I know some guys put one on during a race, for their safety if there's a crash. That's the only time I see them wearing them here." The social importance of the race was further highlighted by Kotzebue's role model when he suggested using it to promote helmet use.

> I think our most effective course . . . would be to have the race sponsors stress helmets because a lot of the kids are starting to race . . . I think a lot of their heroes are people who win the races, and if it was coming from them, then

there might be more conscious effort to wear and buy helmets.

The Northwest Arctic Borough is noted for its residents' enthusiasm for the newly introduced sport of basketball. High schools complete with gymnasiums have been constructed throughout the region over the past 20 years, and the development of an almost fanatical intramural league was an unexpected consequence. The second description of a group activity which involved helmet-wearing came from Kiana where the Health Aide reported "I guess it is safety for those basketball players you know on their fast trips. All of 'em seem like they dress up with helmets. I think that is for their safety." She went on to relate that several basketball players came in together to buy helmets, during which time she overheard them express the goal that team members arrive at their destination without injury so the game would not be disrupted. The role model in Kiana confirmed her observation when he spoke of groups that wore helmets: "That's just the players, they travel from village to village." However, when the same individuals engaged in other activities, "When they go out hunting or cutting wood or something like that, they don't wear helmets."

A group of people wearing helmets was also reported in Kotzebue, although this time the association was through work, not through sports. The observer there reported "We had one dentist that purchased a helmet for himself and for his wife and within two days the entire dental department, either girlfriends and dentists, had one. . . They rode together on weekends."

Joy riding, an activity village youth pursue to dispel the boredom of life in the bush, was the fourth group exercise which typically involved helmets. Shungnak's Health Aide reported seeing helmeted young people "just riding around." Kiana's role model described groups of "the younger kids that like to get out and just take off. They go across country or just out and back."

Suggestions for increasing the use of helmets in the region also focused on organized group activities. In Noorvik, the Health Aide responded to a question about ways to promote

helmets by saying,

> It might be good to really push the idea with the Search and Rescue and them as a group, they could use helmets, or the VPSO. He realizes he is a role model, so he tries to do things the right way to show the younger people.

Search and Rescue was mentioned again in Selawik, but more in the context of a group which could fund the purchase: "Like . . . Search and Rescue . . . they always got money."

In conclusion, organized sporting events such as snowgo racing and basketball, as well as the more informal recreational riding, most frequently set the stage for helmet wearing. Also, both formal activities required their participants to wear helmets as a safety measure. Although there were some reports of helmet wearing surrounding the race, in general neither racers nor basketball players wore helmets beyond the events themselves. Suggestions were made that another group, Search and Rescue, be targeted to adopt helmets and that racers be solicited to act as role models for youth, again reinforcing the importance of organized activities as the most appropriate stage for increasing the use of helmets.

Reasons for Not Wearing a Helmet

Estimates on the percentage of village residents who owned helmets varied widely, from " the lowest percentage" to more than 30%. However, despite the fact that many people had helmets available, few wore them. Reasons for not taking advantage of this safety device fell into several general categories.

The comment repeated most often focused on the helmet not being needed. The Health Aide in Kiana reported that "a short ride (around town). . . I don't know think they . . . need them." In Deering, the Health Aide believed she kept herself safe by dictating driving habits from the back bumper: "Because if they speed or anything, I'm going to stop them . . . I say, 'Hey, slow down." Noorvik's' Health Aide described using the same strategy *with family*

members who drive her around town.

Feeling silly or different was also brought up frequently as a reason for not wearing the helmet. Kiana's Health Aide reported "Some people think they look silly in helmets." The same word, "silly," was also used in Buckland. In Noatak, the Health Aide observed that some people don't wear helmets because "maybe it looks funny on them. Make 'em feel different or something, and that's why they wouldn't wear 'em."

Although only one Health Aide mentioned the comfort of the helmet itself as an issue, factors related to the habit of wearing the helmet arose twice. Ambler's Health Aide cited the time it took to put on the helmet as a reason for not wearing it: "I don't know why (they don't wear it), maybe when they hurry." The Health Aide in Noorvik found that "what's convenient for (people) to do" most often dictated decisions related to health, speculating, "Maybe they think they still have time. Maybe they think, I'll just do it tomorrow."

In Selawik, the influence of the traditional head covering, the beaver hat, was reported to conflict with helmet wearing. According to the Health Aide,

> I know I just never get used to it like whenever I go fishing I should wear it 'cause I always drive real fast too—like springtime and fall time, I should always wear it, but you know that you've got to wear your hood and when it's cold and just never get used to wearing it (the helmet) . . . you can't wear it when you don't get used to it.

In conclusion, the predominant reason cited for not wearing a helmet was the perception that it was not needed, that the danger of a head injury or crash was remote. The perception of others or the feeling that a helmeted rider might stand out, was the second most common factor cited in not wearing the helmet. The lack of a helmet-wearing habit and the comfort of the helmet were mentioned less often.

The Potential For a Law Requiring Helmet Use

Helmet laws have had a dramatic impact on head injury mortality and morbidity among motorcyclists in the lower 48 states. However, regulations requiring helmet use by the riders of off-road vehicles are not reported in the literature nor do they currently exist in the state of Alaska. All the qualitative interviews contained questions on whether a helmet law should be implemented, and if so what age group it should cover, youth or adult. Follow-up questions included how a law might be enacted and who would enforce it.

Eleven of the twelve Health Aides voiced their support for a helmet law. CHAPs in Kiana and Noatak supported a law because they saw it as the only way to increase helmet use. Kiana's Health Aide commented "A certain age down I think they could be forced by the law. That's the only way I guess." Her sentiments were echoed in Noatak: "Maybe if they just had to, they would wear 'em. But, other than that, they would just go without 'em."

Although the Health Aides almost universally supported a law, seeing it as the only means to increase helmet use, the role models, the Kotzebue observer, and the Noorvik Health Aide, who also works as a Health Educator, voiced mixed support. Reasons given were complex. In Noorvik, concerns expressed included helmet cost, the impact on family life when a mother has to outfit many children in helmets before leaving the house, and the dollar figure for a fine.

Difficulties enforcing such a law were cited by both the Kotzebue observer and one role model as reasons they would not support one. "What most people would wear 'em for is when you're going to camp or inter-village travel . . . so I don't know who would have jurisdiction . . . it would be outside of all city boundaries" commented the role model. In-town enforcement was also an issue for the observer: "We have a limited police force . . . they don't even need a license to ride a vehicle . . . I just don't think it would be enforceable here." Buckland's role model offered ambivalent support, stating, "It should be your choice if you're old enough. The

law should be for younger people . . . the law should not cover me."

Kotzebue's second role model, a Native of the region, provided particular insight into the situation:

> It'd be like the seat belt law. Small communities tend to ignore laws up here that really don't pertain to them. I think you'll find if you now stopped every person in his vehicle, half the vehicles on the road aren't registered, most of 'em aren't licensed, our drivers drive all over without licenses. We see children at the age of 8 and under driving snowmachines that are capable of doing 110 miles an hour. Now these people are required by law to have a license. They don't. Nobody enforces it. I think the laws are there to protect the people, but if the people choose not to adhere to the law, which is the case here . . . because we are so removed from the ordinary run-of-the-mill laws . . there's just no enforcement here.

Lack of police manpower was also commonly cited as a reason that helmet laws would not be enforced. Four of the nine villages in the study were without a VPSO, leaving the law enforcement to the Elders and other citizens. Noorvik's Health Aide reported that for "a big village like this, one VPSO is not enough even to go after people without helmets and catch them."

Although both the data and eye-witness reports have identified that injuries and high-risk driving behavior predominate in youth and young adults, seven of the eleven Health Aides who supported a law believed it should apply to all age groups. Several reasons were identified for extending the law to everyone. Kiana's Health Aide commented, "Maybe all age groups 'cause you know the older ones they like to drink and drive." Driving behavior was cited most often as the reason for requiring adults as well as youth to wear helmets. "I see a lot of older people that don't have much sense either," observed Noorvik's Health Aide. Thinking of

wilderness travel, Selawik's Health Aide remarked, "People are not safe . . .(the law should be) for everybody . . . cause older people go hunt . . . and when they are chasing like wolf or wolverine, they don't watch." Drawing on years of experience, Shungnak's Health Aide reported, "I've seen elders too, I've seen accident too on the older people in years past."

Based on her experience as a Health Educator, the second Health Aide in Noorvik also preferred a law which included both adults and youth (although she was ambivalent in her overall support for a law). She commented:

> It seems to me when there is a law or when there is a behavior change for the parents, it automatically goes to the children as well. Like I'm thinking of tooth decay. When we educate the parent, and the parent starts to brush their teeth every day, then it's just a domino, the children will all start to brush their teeth as well. And then with the jackets too, I notice that when the parents start to wear their jackets, and when they look stylish too is a big consideration because we have these jackets that look really nice and people have even started to wear life jackets when they're not in the boat. And, so if there was a law it might be better to consider the adults too because the children would just want to model after their parents.

The reckless driving habits of youth were found to be the most compelling reason for limiting the law to the younger population. Deering's Health Aide believed, "The youth . . . think they're so young they can do anything." In Kiana, the Health Aide targeted youthful riders because "they're the ones that ride downhill too fast, like 30 some years down." Ambler's Health Aide found, "Today our young peoples can't even listen and they drive real fast."

On the other hand, being able to adopt the helmet-wearing habit in later adulthood was viewed by some as being nearly impossible. The habit of wearing fur caps seemed to be a significant barrier to the Health Aide in Ambler: "(The law) would be good [for] all age groups,

like from the late 40s or all the way down . . . (the people over 50) are used to protecting themselves with warm hats . . . they're used to that."

Questions about how to move such a regulation forward in these small, isolated communities drew a variety of responses. Kiana's role model immediately responded, "It'd have to be a state requirement . . . I don't know if they would do it (enact a helmet law) theirself or not." Shungnak's Health Aide also placed the locus of change outside the community, suggesting that "somebody would write a letter to the Borough or to the EMS in Kotzebue." Buckland's role model thought the city council might pass a helmet law, but believed the Maniilaq Injury Prevention Specialist and the VPSO should approach the council; he emphasized his own unwillingness to do so, saying it fell within their jobs to take the council's criticisms. Kotzebue's role model commented that a helmet law would "probably get a lot of opposition" in the Northwest Arctic Borough.

However, Health Aides in Buckland and Deering both believed their city councils would support a helmet law. In Shungnak, the Health Aide speculated that the village would "have a public meeting and you know talk about it . . . what would be on the safe side for them." Ambler's Health Aide also thought safety would be the focus for the city council. "They got to (pass a helmet law.) When they putting driving what ages not supposed to and being safe, if it's added to the law, policies, if they put these safe helmets and those driving safers would be better."

In conclusion, implementation of a helmet law faces numerous challenges in this area of the world. Even in Kotzebue, basic traffic laws are not enforced, and community norms appear to promote behavior which does not conform to the law. Neither the role models (with the exception of the VPSO) nor the observer, who were all Caucasians or highly westernized Natives, supported a helmet law, citing complex reasons for their positions. Also, the only Health Aide who had lived outside the village environment opposed a law.

On the other hand, Health Aides born and raised in the area universally voiced their

support for a law although many of them believed it could not be enforced. In three communities, there were suggestions that such a regulation would need to be sponsored by someone from outside the community due to the fractious nature of village politics. However, all the villages in the region have laws which prescribe safe off-road vehicle driving behavior, including a minimum age limit. Therefore, a precedent exists, as well as an awareness that, when enforced, regulations can make a difference for the health of the community.

Helmet Sales and Features

Prior to the study, several helmets were piloted to determine which one might be the most appropriate for the Arctic environment. As a result, an open-faced helmet with wind visor was selected. However, because so few NWAB residents wore helmets at the time of the study, questions were posed during the qualitative interviews to determine what features of the helmet appeared to work well and what might need to be modified for the future.

The color of the helmet was reported to be an important factor in the purchase decision. Advice from the Native role model in Kotzebue, who was known for his hunting prowess, narrowed the colors ordered:

> I encouraged . . . colors that don't clash with hunting because that's one of the main reasons why a lot of people will not buy helmets is they come in bright red and you know outrageous colors, patterns, and that scares animals when you're hunting. Black and white are two colors that the animals have a hard time distinguishing because they blend in to the countryside so well.

In Kiana, color made a difference to the buyer: "A lot of them asked for black . . . the white ones . . . sold all right . . . (but) they would have chosen black more than those." The same color preference was reported in Kotzebue where the observer, who also sold helmets, commented:

> I could have sold more if I had more black. I'd say three-quarters of them should probably be black because that goes with a red snowgo or a blue one. White seems to be a color that people thought blended a little bit too much with the snow for winter.

The fit of the helmet over ski masks was another important factor. The Kiana Health Aide described the situation:

> They've been asking for extra large because the riders around here always put a face mask . . . (with) the helmet over that. Sometimes when they're traveling long distance they even double the mask. So extra large is good for the villages I guess . . . they've been asking for the extra large.

The role model in Kiana discovered firsthand that an extra large was the size he needed. He found the size large was "too tight on the temples. It was about 40 or 50 below when I tried to take my glasses off—it snapped 'em on the lens."

Goggles were sold with the helmet, based on the idea of a "starter set." Adding the goggles to the package also seemed to increase its value in the customer's eyes. The Deering Health Aide reported: "To me . . . it was a good deal because the goggles I think went with it." Kotzebue's observer reported, "I think that was a very good selling point. I had several people comment that the goggles alone were almost worth the value of the package."

The helmet and goggle package itself was also found to be a "good deal" for the price. A Kiana Health Aide suggested the way to increase helmet use was to "sell some more . . . at good prices . . . 'cause they sure went fast when they you know sell them helmets." The Kotzebue observer described the price as "very reasonable" and a selling point.

Prior to the study, the helmet's warmth in the Arctic winter was a concern. However, the helmet itself turned out to be very warm. The observer in Kotzebue described her personal experience wearing the helmet in extreme conditions:

> We went on a ride, it was a 162-mile ride on a Sunday afternoon just before Christmas, it was in November sometime. It was all the way to Kiana, and we were in some temperatures that were probably minus 50 and it was dark of course and pretty windy. And the only thing that appeared to be close to cold were my feet, and my head never got cold, and I had my helmet on the entire time.

During the winter, frostbite is a constant danger in this region. Selawik's Health Aide described how the speed of off-road vehicles has increased the risk of cold injuries: "I don't usually see frostbite long time ago because you know they travel easy and nowadays when it gets cold, there's a lot you see their face starts having frostbite." Beaver hats were described as the traditional method for keeping the head and face warm in the winter. Again in Selwaik, the Health Aide described the residents' reluctance to give up their tried and true solution. "They would rather wear their beaver hat because you know the neck part (around the helmet) is . . . really cold. . . can't go without it around here." Shungnak's' Health Aide reported that beaver hats cannot be worn with helmets. "There are a number of people that wear beaver caps around here everyday because it's just so cold . . . they don't wear beaver hat along with the helmet."

Adapting ski masks, knit caps, face shields, and other accessories to maintain warmth proved to be crucial to the success of the helmet. The Kotzebue observer suggested:

> adding a full face mask to the package. They have one now that goes up over your forehead . . . that leaves just a one-hole opening for both eyes. I think if you added that, the possibility of frostbite on the sides would go away.

Neoprene face shields were reported to be widely available at snowmachine shops and sports outlets for under $15. Also, various solutions were suggested for accommodating goggles to eye wear including goggles with corrective lenses, low profile sports glasses, and contact

lenses.

Taking the helmet on and off during daily activities proved somewhat challenging. Kotzebue's role model reported ". . . Cutting Christmas trees, we'd drive up there, we'd look for a tree, take off your helmet, cut a tree, then you'd end up putting it back on, or you'd have to take it off, put on another hat, then cut trees." Shopping in town presented its own difficulties. The Kotzebue observer found that:

> I tended to just wear mine around the store. It was too inconvenient. I could pull my face mask down so that was under my chin and actually communicate with the person at the cash register, but I would just leave it strapped on when I was, you know, just picking up four or five items on the way home from work. It just became standard that I didn't even take mine off. I did get warm and it was annoying, but the opposite end of that was that I didn't want the inconvenience of strapping it over my arm or taking it off and what to do with it? Because often times I'd just grab a little basket to carry rather than push a cart. If you push a cart, you can just stick it in the cart.

Contrary to reports by other researchers, the Kotzebue role model who hunted was able to shoot without removing his helmet.

> The helmet was fine. I had to take the goggles off, but I shot with the helmet on. I didn't have a problem . . . I thought the side might hit my rifle, but it didn't, and I was able to shoot just fine.

He believed the open-face style was crucial to this success.

In conclusion, helmet features such as color, size, and the open-face style proved to be key selling points, as did the price and the combination kit of helmet and goggles. The most popular color was black, and the most requested adult size was extra large. The open-face

style accommodated goggles which were less prone to fogging in subzero conditions, and the addition of ski caps and neoprene face shields prevented frostbite. Riders attired with the appropriate helmet accessories found themselves to be very warm. Beaver caps, the region's traditional answer to Arctic weather, could not be worn in conjunction with the helmet. Incorporating the helmet in the activities of daily living such as chopping wood and shopping required some thought and did not always work smoothly. However, the fear that helmet-wearing prevented the use of a rifle was unfounded.

Village-Specific Findings

Travel to the various communities involved in the study revealed differences in the operation of the health clinics, the conduct of the Health Aides, and the compliance of the role models.

Buckland, the small-sized modeling village, reported lower helmet sales and helmeted-rider observations than the other two modeling villages. Differences in the operation of the Health Clinic were apparent to the researcher upon entering the building. The facility was neither well maintained nor clean, and the disorganization of medical supplies and patient records was apparent at every turn. The contrast to other clinics in the region, which were meticulously organized and immaculately clean, was marked. Through lack of preventative maintenance, the water heater had been non-functional for four months, as was the liquid waste disposal system. The box of helmets remaining from the study was found in the back room underneath a variety of supplies, including contaminated materials ready for disposal. This placement occurred despite an area in the waiting room adequate for the agreed-upon display. Inquiry of personnel on duty revealed steady turnover with several reporting they were new to the position and others describing periodic employment patterns.

Buckland's role model was also non-compliant with the conditions of the study. Health Aides queried as to his riding habits failed to report seeing him in a helmet at any time during

the study period. When asked this question directly, he acknowledged he seldom wore the helmet when riding an off-road vehicle, and then only in storms. Instead, he tried the helmet on and displayed it to people coming into the Washeteria and water plant, his place of employment and a central community gathering area. He described this activity as "modeling."

In contrast to the lack of interest and poor cooperation noticed in Buckland, Health Aides in Kiana and Noatak appeared to be excited about the project and made efforts to aid its success. In both communities, well-organized displays were prepared in the waiting room, as outlined in the clinic agreement.

Kiana Health Aides displayed the helmet and goggles on a wall rack just to the left of the entry. Clients entered the clinic through the double Arctic doors, coming into the combination waiting room, interview area, and central desk. They sat in this area to give their medical history, as well as to wait for relatives under treatment. Many people also just stopped by to chat, making this a constant high-traffic zone. During all these activities, the helmets were clearly in view.

A similar space arrangement existed in Noatak. Clients entered the clinic and walked past the exam rooms to a small reception area where they sat at a kitchenette table to give their medical history. Helmets were displayed here on shelves. Smaller than the receiving area in Kiana, Noatak's reception room did not have additional seating for casual traffic and relatives.

Noatak was distinguished from other experimental villages because a serious snowmachine crash occurred within its city limits in recent memory. The event happened within eyesight of the clinic, although the Health Aides were not on duty at the time. One child was killed, the other critically injured. Following the crash "parents wouldn't let their kids ride for a while after that and when things calm down, they start letting them ride again. And still they don't wear their helmets, not even the little kids."

Also unlike other villages, Noatak's Health Aides were involved in selling discounted

bicycle helmets the summer before the study. This effort was organized by the community's health educator, who works for Maniilaq, although under a different division than the Injury Prevention Specialist. Therefore, the concept was not new to the Health Aides, and clients were used to purchasing injury control items in the clinic. In fact, the display shelves were originally organized in support of this project.

Kiana and Noatak Health Aides also took steps to alert community residents to the availability of helmets in the clinic. In Noatak, the Health Aide "got on the CB and announced that we had them here, if anybody wanted to buy them." Kiana's Health Aides advertised helmets through the village's cable TV channel. They were able to insert a message which scrolled across the bottom of the screen, giving details about the helmets and their availability at the clinic.

Deering's Health Aides presented a contrast in responses to the study. When the helmets arrived, the male, Caucasian Health Aide became involved in setting up the clinic display and managing helmet sales. However, the female Native Health Aide distanced herself from the project, commenting "I didn't even know they were going to send some here until all of a sudden there were those big boxes . . . I don't even know how many he sold, and he never told me anything." Asked why this lack of communication occurred, she responded, "I've been in the clinic all the time . . . (but) we did our own thing." History on the situation provided by the Injury Control Specialist confirmed a pattern of rivalry and lack of teamwork based on the female Native Health Aide's resentment toward her co-worker. Even though volumes in the clinic did not require more than one provider, a second Health Aide was engaged when the incumbent failed to maintain required certifications.

In conclusion, the level of commitment and enthusiasm which the role models and Health Aides brought to the study varied between villages, and in one village negatively impacted compliance to the guidelines. In two villages, Kiana and Noatak, the study was fully supported and the displays and advertising methods both promoted helmet sales and spread

the word about the project. Study participants in Kotzebue, Noorvik, and Deering complied with all protocols. although one of the two Health Aides in Deering removed herself from the project due to the fractious nature of her relationship with her co-worker.

Among experimental villages, Noatak appeared to have been uniquely impacted by a fatality snowmachine crash which had at least temporarily increased safety awareness. Although Noorvik's Health Aide recalled a particularly dramatic snowgo fatality, this occurred to a racer. The community's response was to ask that the race course be redirected to a different route the following year, a reaction which appeared to isolate the race itself as the sole cause of the injury, not the use of snowmachines in general. Noatak's health clinic was also the only one which reported prior helmet sales, in support of a bicycle injury control effort.

Overview of the Unhypothesized Results

1. Snowmachine riders wear helmets far more often than riders of ATVs, at least in part due to the perception that snowgos are more dangerous than the other type of vehicle.

2. Trips between villages are more often the setting for helmet wearing than short-distance, low-speed runs around town because they are believed to be riskier.

3. Law enforcement practices related to driving are inconsistent between villages, and within jurisdictions traffic ordinances are not enforced strictly. The absence of VPSOs has had a profound effect on four villages in the NWAB.

4. Although in-town driving is believed to be relatively safe, there are numerous reports of reckless driving behavior associated with both youthful drivers and alcohol intake.

5. Inupiat cultural values have had the unintended consequence of increasing the risk associated with off-road vehicles riding because youthful riders have few limits set by their parents or by the community.

6. The relative safety of traditional modes of transportation has had the unexpected effect of increasing the danger experienced by off-road vehicle riders of all ages because the

societal norms have not incorporated an appreciation of the potential for injury created by motorized vehicles.

7. Areas of the world which have a road system have been described as having the culture of the automobile. Similar to this, NWAB can be viewed as having a culture of off-road vehicles.

8. Helmets are most often purchased for use by males and children. Women purchase helmets infrequently for themselves or for other adult women. These decisions are driven by the perceived sense of risk associated with the different populations.

9. Helmets appear to be worn more by youth and young adults, ages 15 to 30, because this group believes itself to be more at risk and because its members commonly participate in organized events which include helmet wearing. However, because these findings disagree with the observational data, and the age-ranges described were inconsistent, they must be viewed with caution.

10. Older adults may have more difficulty switching to helmets from the traditional beaver hat based on its habitual use.

11. Group activities most often provide the opportunity for wearing helmets, particularly in those groups organized in support of sporting events. Organized groups may offer the best forum in which to increase the use of helmets, either through internal policy changes, funding available only to the group, or role modeling by group members.

12. The predominant reason for not wearing a helmet was the perception that it was not needed. Fear of standing out from the group was the second most often cited reason.

13. The leading reason given for wearing a helmet was safety.

14. Enactment of a helmet law would be difficult due to the lack of existing enforcement patterns, the absence of a community norm supporting helmet wearing, and the volatile nature of village politics. However, an opportunity may exist through an appeal to safety and because regulations are already on the books which govern other driving behaviors such

as age and speed.

15. Price, color, size, style, and the availability of goggles in the package deal were all important selling points for the helmets.

16. Staying warm in the helmet was not a problem with the right combination of accessories. Unfortunately, traditional beaver caps cannot be combined with the helmet.

17. Buckland's role model and Health Aides gave the study marginal support.

18. Health Aides in Kiana and Noatak did an exceptional job of organizing the displays and informing the community of the helmets' availability.

19. Noatak was distinguished from other experimental communities due to the recent fatality snowmachine crash and due to the prior sale of bicycle helmets in the clinic.

Conclusion

Table 65 summarizes the conclusions from the hypotheses.

Table 65

Conclusions From the Hypotheses

Hypotheses	Summary of Conclusions
1. Helmet purchase and use will increase in villages where the barriers to helmet purchase are removed.	1.a. Helmet use increased more in the experimental villages than in the control villages. 1.b. There was no difference in the helmet sales between the two treatment conditions. However, based on the method of distribution (by strata, not per capita,) and the fact that two of the six villages ran out of helmets before the end of the study, the hypothesis can neither be rejected nor supported. 1.c. Time series data demonstrated that helmet use increased more in experimental villages than in control villages.
2. Helmet use will increase more in villages exposed to modeling behaviors than in villages exposed to increased access alone.	2.a. Based on the percentage of helmeted riders observed, helmet use increased more in the modeling-plus-helmets villages than in the helmets-only villages. 2.b. The slope of the modeling-plus-helmets time series line was statistically significant from zero, whereas the helmets-only line was not. Therefore, the hypothesis was supported.

Hypotheses	Summary of Conclusions
3. Repeated cues to action will increase helmet use.	3.a. Cues to action did not increase helmet use. 3.b. The slope of the time series data line was not significantly different from zero.
4. Small and medium-sized villages will experience a greater percentage increase in helmet use than large villages.	4. Small- and medium-sized villages did not experience a greater percentage increase in helmet use than large villages. Large villages experienced the greatest increase in helmet use.
5. There is no relationship between gender or ethnicity and helmet use.	5.a. There was a significant relationship between gender and helmet use based on observations from the curbside survey, demonstrating that males wear helmets more frequently than females. 5.b. There is a significant relationship between ethnicity and helmet use. Non-Natives wore helmets more frequently than Natives. 5c. Considering the population surveyed which either walked or rode through the checkpoint, there is no relationship between helmet use, gender, and ethnicity.
6. Helmet use will be more prevalent in youth than in adult age groups.	6.a. Based on the observational reports, there is a significant relationship between age and helmet use. Adults wore helmets more commonly than youth. 6.b. Responses from walkers and auto riders report helmet use is not more prevalent among youth than adults.
7. Helmet use will be more prevalent among riders who use ATVs less frequently.	7.a. Helmet use is not more prevalent among riders who use off-road vehicles less frequently. 7.b. The hypothesis was also rejected based on the results of the qualitative interviews.
8. Knowledge regarding helmet effectiveness in a crash does not increase helmet use.	8.a. There is no relationship between knowledge regarding helmet effectiveness and helmet use, based on the curbside interviews. 8.b. Qualitative responses also support the null hypothesis.
9. Helmet use increases when there is a history of personal injury on an ATV.	9.a. There is no relationship between the history of a serious injury and helmet use. 9.b. There was no relationship demonstrated between injuries and helmet-wearing behavior in the qualitative interviews.
10. Habit is the predominant reason for subjects not wearing a helmet when one is available to them.	10.a. Habit was not the predominant reason for not wearing a helmet as reported by the curbside interview subjects. 10.b. Although habit was mentioned as a reason for not wearing the helmet, it was not the preeminent issue mentioned.

Hypotheses	Summary of Conclusions
11. Positive perceptions of helmet wearers will increase personal helmet use.	11.a. There was no relationship between perception and helmet use. Therefore, the hypothesis was not supported. 11.b. Although the Health Aides all had positive attitudes toward helmeted riders, none of them wore helmets themselves. Therefore, the hypothesis was not supported.
12. More subjects who are exposed to the modeling behavior will begin wearing a helmet or will state an intention to wear a helmet the next time they ride than those not exposed to the modeling behavior.	12.a. There was no significant difference in the intention to wear a helmet in the future between treatment conditions. 12.b. Exposure to safety messages within the modeling condition significantly influenced the intention to wear a helmet in the future. 12.c. Reasons cited by helmet wearers for making the decision to wear a helmet focused on safety and did not include responses which were linked to features of the modeling intervention. 12.d. The Health Aides themselves, who were constantly exposed to the modeling messages, did not become helmet wearers. However, in three instances helmets were purchased for male family members who were perceived to be at risk for a head injury.
13. Knowledge regarding the effectiveness of a helmet in a crash will increase support for a law.	13.a. Knowledge regarding the effectiveness of a helmet does not increase support for law, based on responses from the curbside survey. 13.b. Although 11 of the 12 Health Aides supported enactment of a helmet regulation, the models and observer were split, with 3 of 5 stating their opposition for a variety of reasons. Therefore, the results from the qualitative interviews were mixed.

Unhypothesized findings drawn from the data and qualitative interviews include the following:

1. Helmets are worn more often by snowgo riders, both due to seasonal weather patterns and the pervasive belief that snowmachines are more dangerous than ATVs.

2. Helmets are worn more often on trips between villages which are perceived to be riskier than short-distance, low-speed travel in town.

3. Driving regulations are enforced inconsistently in the region, based both on the lack of a police force in four villages and the policies of some law enforcement *agencies.*

4. In-town driving behavior, primarily by the youth, is at times characterized by excessive speed and recklessness. Also alcohol has been involved in some dangerous driving situations, leading to crashes in some communities.

5. Inupiat cultural values toward discipline and the safety of traditional modes of transportation such as the dog team have had the effect of creating the opportunity for undisciplined and unsupervised off-road vehicle driving among the youth and an associated lack of recognition of the potential for serious consequences.

6. The use of off-road vehicles is so pervasive that NWAB can be described as having a culture of off-road vehicles, parallel to the culture of the auto experienced in areas served by a road system.

7. Helmets are purchased for use more often by males and children.

8. Helmeted riders are found most often in the 15- to 30-year-old age group. Adults may be more resistant to adopting the helmet-wearing habit based on their long-standing use of beaver caps. However, these reports disagree with the observational data.

9. Helmet use was most frequently reported in conjunction with group activities, particularly sporting events such as snowgo racing and basketball. Organized groups may offer the best opportunity for concerted efforts to increase the use of helmets, either through internal policy changes, funding available only to the group, or role modeling by group members.

10. The predominant reason for not wearing a helmet was the perception that it was not needed. Fear of standing out from the group was the second most often cited reason.

11. Implementation of a helmet law would face many challenges. These difficulties include lack of enforcement, absence of a community norm supporting helmet wearing, and the cantankerous nature of village politics. However, an opportunity may exist based on an appeal to safety and based on the existence of regulations which govern other driving behaviors such as age and speed.

12. Helmet features including price, color, size, style, and the add-on of goggles were key selling points.

13. Riders found they could stay warm in the helmet when they used the right combination of accessories, such as neoprene face masks and knit caps. However, the traditional beaver cap cannot be combined with the helmet and its use by many residents is habitual.

14. Both the role model and Health Aides in Buckland gave the study marginal support.

15. Health Aides in Kiana and Noatak did an exceptional job of organizing the displays and informing the community of the helmets' availability.

16. Noatak was distinguished from other experimental communities by the recent fatality snowmachine crash involving two young children which occurred in the center of town, and by the prior sale of bicycle helmets in the clinic.

Summary of the Reliability of the Results

Because the findings from this study originated from three different methods of data collection, their reliability varied. As has already been discussed, the curbside interview proved to be a poor fit with the indigenous culture, limiting the number of respondents and the depth of information collected. In some cases, the findings from the curbside interview contradicted those from the observations.

The observations reported a rare phenomena, helmet wearing, creating a relatively small data set for statistical analysis. Also, all riders, both helmeted and non-helmeted, were counted on a daily basis, resulting in some riders being counted more than once.

Conclusions from the qualitative data were developed through a content analysis. In some cases, multiple key informants offered the same insights, whereas in other situations, important observations came from just one observer. This method proved to be an excellent fit

with the Eskimo culture, yielding rich detail and powerful insights.

For these reasons, the findings will be summarized according to their relative reliability: (a) highly reliable, (b) partially reliable, and (c) doubtful or unreliable. These lists are a synthesis of quantitative and qualitative data.

Highly Reliable Findings

1. Geographic and economic access increased the sale and use of helmets in the experimental villages.

2. The modeling treatment increased the use of helmets.

3. Males and non-Natives wore helmets more than females and Natives.

4. Adults wore helmets more frequently than youth.

5. There is no relationship between knowledge regarding helmet effectiveness and helmet use.

6. Snowmobile riders wore helmets more often than ATV riders.

7. Helmets are worn more often on trips between villages than on trips around town.

8. Youth are more reckless and undisciplined than adults in their driving habits, both in town and in the wilderness.

9. Inupiat cultural values, the prevalence of bootlegging, the lack of effective law enforcement, a pervasive belief that safe driving prevents crashes (and therefore, injuries), and the historical safety of modes of transportation have all conspired to create a cultural norm of risk-taking on off-road vehicles.

10. The use of off-road vehicles is so pervasive that NWAB can be described as having a culture of off-road vehicles.

11. Group activities most often set the stage for helmet use.

12. When properly accessorized, helmets are warm and work well in the arctic environment. Helmets can be accepted and their use can become a habit in spite of the

preconceptions.

13. Villages which experience a significant tragedy such as a fatality snowmachine crash are more open to adopting a new behavior which promotes safety.

14. Implementation of a helmet law would face many challenges.

Partially Reliable Results

1. Large villages experienced a greater increase in helmet use than small- and medium-sized villages. However, this finding rests on data collected in Kotzebue, a village whose size and ethnic composition makes it significantly different from others in the region.

2. There is no relationship between the history of a serious injury and helmet use. Based on the qualitative interviews, it was discovered that the predominant pattern of injuries experienced on off-road vehicles were orthopedic, not neurological. Therefore, the connection in the mind of the respondents between an orthopedic injury and helmet use as an effective preventative measure may be tenuous at best, making analysis of these findings difficult.

3. Exposure to safety messages within the modeling condition significantly influenced the intention to wear a helmet in the future. This finding was based on only 20 interviews.

4. Knowledge regarding the effectiveness of the helmet does not increase support for a law. This finding was based on 97 curbside surveys. However, qualitative interviews produced mixed results with 11 of the 12 Health Aides supporting a law, and 3 of the 5 role models opposing a law.

5. Adults are more resistant to adopting the helmet-wearing habit based on their long-standing use of beaver caps. This qualitative finding disagrees with the observational data which reported higher helmet use among adults.

6. Helmets are purchased for use more often by males and children. These anecdotal observations by the Health Aides were not corroborated by sales records.

Doubtful Results

1. There was no difference in helmet sales between the two treatment conditions. Because the helmets were not distributed on a per capita basis and because two of the six villages ran out of helmets before the end of the study, the treatment's effect on helmet sales cannot be interpreted.

2. Habit was not the predominant reason for not wearing a helmet. This finding came from a total of 23 curbside interviews. Although 25% of respondents gave habit as a reason for not wearing a helmet, over a third gave no specific reason for not wearing a helmet, making it impossible to interpret their motivations. The Health Aides interviewed reported that the predominant reason for not wearing or owning a helmet was the belief that it was not needed, with fear of standing out from the group as the second most common reason. Therefore, the importance of habit is unclear.

3. Curbside interviews reported no relationship between helmet use, ethnicity, age, and gender. This finding contradicts observational results and therefore is considered doubtfully reliable.

4. Helmet use is not more prevalent among riders who use off-road vehicles less frequently. Only five helmeted riders were interviewed in the curbside survey, and only two of those reported riding off-road vehicles infrequently. Likewise, none of the Health Aides interviewed wore a helmet, making analysis of this hypothesis impossible.

5. There was no relationship between perception and helmet use. There were only five helmeted riders who were interviewed to obtain these results, placing the reliability of the findings in doubt.

6. Cues to action did not increase helmet use based on the percentage of helmeted riders. The cues were delivered during the weeks when the curbside survey was administered. As has previously stated, the curbside interview proved to be a poor fit with the indigenous culture, also calling into question the effectiveness of the cue to action in this environment.

CHAPTER FIVE

DISCUSSION

The most beautiful thing we can experience is the mysterious.
It is the source of all true art and science.

Albert Einstein

My head knocks against the stars.
My feet are on the hilltops.
My finger-tips are in the valleys and shores of universal life.
Down in the sounding foam of primal things
I reach my hands and play with pebbles of destiny.
My name is Truth and I am the most elusive captive in the universe.

Carl Sandburg

The only true wisdom lives far from mankind, out in the great loneliness.

Igjugarjuk, Caribou Eskimo Shaman

Overview of the Study

This study was designed to determine if health education strategies are effective in increasing the use of helmets by riders of off-road vehicles in rural Alaska, and to describe personal characteristics of both helmet users and nonusers.

The Northwest Arctic Borough of Alaska, an area noted for its remoteness, rugged wilderness, and fierce winter weather, provided the site for the study. No road systems exist in the region, either between the villages or to the world outside the area, making off-road vehicles the major means of ground transportation. In summer, ATVs roam the boggy tundra while snowmachines ski over ice-filled riverbeds and vast snow-covered steppes in winter. The 11 isolated villages of the NWAB are populated primarily by indigenous peoples of the Iñupiaq Eskimo culture.

A quasi-experimental design was employed to compare two treatments. Nine villages participated in the study with three in each treatment group and three acting as controls. Villages were stratified by size into small, medium, and large to control for potential extraneous variables created by population dynamics. Random selection then determined assignments to each group.

Barriers, the most predictive element of the Health Belief Model, guided selection of one of the study's major treatment strategies: increased access to helmets. Two tactics were devised to reduce the barriers to owning a helmet: placement for sale in village health clinics and reduction of the price from $275 to $40.

In the first group of three villages, low-cost helmets were made available, but no training occurred. The second group of three villages received helmets plus exposure to modeling, a training technique drawn from Bandura's Theory of Self-Efficacy. Control villages received neither helmets nor training.

Observation of helmet use by off-road vehicle riders occurred before, during, and at the conclusion of the experiment. The area in front of the U.S. Post Office was selected as the observation site in all villages because it was a high-traffic zone. Observers were also instructed to follow a uniform schedule, collecting their data one hour before the close of business. Reporting occurred 6 days a week for 30 minutes each day, and the study lasted 12 weeks.

A baseline was established prior to intervention over a 14-day period. During a second 2-week cycle, helmets were made available for sale in the clinics and, in the villages receiving training, the models began wearing their helmets and speaking with community residents about the advantages of helmet use. Also, posters were hung in prominent locations around town announcing helmet availability. Retail sales and modeling continued throughout the remainder of the study. Helmet sales were tracked by village and treatment condition.

Curbside interviews, using a standardized, short list of questions, were conducted

during the next two-week interval. Responses elicited information on: (a) perceptions of normative beliefs about helmet use (Theory of Reasoned Action), (b) social learning in response to off-road injuries, (c) attitudes toward helmet use in relation to components of the Health Belief Model (susceptibility, severity, benefits, and barriers), (d) helmet-wearing habits, (e) personal history of off-road vehicle injuries, and (f) response to the two treatment conditions.

Also, after the interview, all nonhelmeted riders and walkers were reminded of helmet availability and helmet use was encouraged (a "cue to action"). Although the interview was conducted only once per person, cues to action were repeated.

Another 14-day circuit of data collection followed the interview and cue-to-action phase. Four weeks after this, during week 12 of the study, final observations occurred over a seven-day period. From beginning to end, data collection spanned 12 weeks and was scheduled for a total of 61 days.

Observations were made by village residents who were closely supervised by staff from the Office of Environmental Health (OEH) in the Maniilaq Health Corporation. Qualitative interviews were conducted subsequent to the study using a standardized format which incorporated questions from the curbside interview and also elicited information about the community's health needs and response to the treatment. CHAPs from all study villages acted as key informants, and the role models were also debriefed.

Summary of Key Qualitative Findings

Susceptibility

Respondents described helmet-wearing behaviors in relation to situations where they perceived the risk of head injuries to be the highest. These included riding a *snowmachine*

versus an ATV, trips between villages, and organized sporting events in which a snowmachine was used. Driving at a high rate of speed was also perceived to be riskier in any location. In general, it was believed that males in the 15- to 30-year-old age group participated in this type of activity and therefore were in general at greater risk.

Conversely, the absence of helmet-wearing behavior was described under circumstances in which it was perceived that susceptibility to injury was relatively low. These included driving in town, low-speed driving situations, and use of an ATV. Also, women believed themselves to be less at risk than men and felt they could maintain their own safety by choosing to ride with safe drivers or by telling the driver to slow down.

Traditional modes of transportation were low-risk, based on the Inupiat's adaptation to the environment over the millennia. This sense of lack of susceptibility has transferred to motorized means of transport.

The predominant reason for not wearing a helmet was the belief that it was not needed, and the most important reason for wearing a helmet was safety.

Health Aides in Noatak responded with exceptional initiative to the study based on their perception of the community's susceptibility to serious snowmachine injuries.

Group Consensus

Helmet wearing was most often reported in the context of group activities. These included snowmachine racing, inter-village travel by basketball teams, and informal recreating by groups of friends, who were either in the same age group or were associated through work.

Conversely, fear of standing out from the group provided the second most often cited reason for not wearing a helmet.

The lack of compliance with study guidelines demonstrated by Buckland's role model originated in his unwillingness to stand out from his peer group.

NWAB can be pictured as having a culture of off-road vehicles. Behavior patterns which surround the use of ATVs and snowmachines are pervasive, reflecting community norms.

Consequences

The lack of consequences of high-risk behavior has created an environment which offers the opportunity for high-speed in-town driving and alcohol consumption in conjunction with off-road vehicle use.

The community's lack of ability to enforce consequences for all types of illegal behavior means that implementation of a helmet law would be problematic and that its effects would be minimal.

The Inupiat cultural philosophy toward discipline has been described as "letting them go," meaning there are few definite restrictions or consequences for unsafe behavior. Youth who begin driving the family's off-road vehicles at age 14 appear to experience little supervision or consequences related to inappropriate driving decisions.

Habit

Use of the traditional beaver cap during the winter is habitual for all age groups and especially for older residents.

The absence of helmet use is habitual throughout the region.

Barriers

The reduction of barriers to helmet use through the appropriate selection color, size, and style, as well as a pricing and sales strategy, were all important selling points.

Staying warm in the helmet proved not to be a barrier to its use if the helmet was combined with other cold weather gear. Also, sighting a rifle proved feasible with the helmet

on, making helmets a workable solution for hunters.

Barriers to use were identified under circumstances when the helmet had to be taken on and off during the trip. These occurred when the rider went shopping and when the vehicle was used to travel to subsistence activities such as chopping wood.

Modeling

The widespread use of off-road vehicles means that role models currently exist who are demonstrating non-helmet-wearing behaviors. However, racers who are required to wear helmets during the event form an untapped pool of positive role models.

Implications of the Results and Findings

This section will present the implications of the results in five subsections: (a) theoretical implications, (b) relationship to regional injury statistics, (c) relationship to reports from the literature on injury control strategies, (d) implications for future research, and (e) implications for practice.

Theoretical Implications

Health Belief Model

The Health Belief Model assumes that decisions are made based on the individual's subjective reality rather than the objective environment (Rosenstock, 1974). The likelihood that a person will take action relative to a health condition is determined by perceptions of: (a) susceptibility to the health condition, (b) the severity of the consequences of contracting the condition, (c) the benefits of medical actions which may reduce either susceptibility or the severity of the disease, and (d) the barriers to taking action.

In 1984, an analysis of 29 HBM studies identified barriers to taking action as the most significant dimension of the model. Susceptibility and benefits were also consistently predictive. Severity, however, achieved significance in only about 50% of the studies (Janz & Becker, 1984).

This experiment reduced barriers to owning helmets by placing them for sale in six community health clinics and lowering the price from $275 to $40. Also, goggles were combined with the helmets to form a set which could be used as a "starter pack" for people new to helmet-wearing. The quantitative data reported a significant difference in helmet-wearing patterns between control and experimental villages, supporting the hypothesis that a reduction of barriers would have a significant role in increasing helmet use.

The qualitative reports also supported the success of the pricing strategy and other decisions surrounding the selection of the specific helmet including color, size, and style as being key to reducing the barriers to their use in the arctic environment. The inability to stay warm in the helmet was thought to be a barrier to its use prior to the study, but the role models found this not be the case.

The perception of susceptibility to injury came out repeatedly in the qualitative interviews as the predominant reason why people either chose to wear a helmet or not wear a helmet. The use of a snowmachine, the activity of driving between villages, and the situation of organized sporting events all created the perception of susceptibility to injury, whereas in-town driving at low speeds was believed to be so safe that helmets were not needed. Other perceptions of susceptibility affected helmet purchase and use by males in the 15-to 30-year-old age group. Historic perceptions of transportation modes as low-risk also impacted the overall perception of the safety of motorized means of transport.

In conclusion, the reduction of barriers to helmet acquisition proved to be a significant strategy in increasing their use. Also, qualitative reports stressed again and again that the perception of susceptibility drove decision-making about when helmets should be worn and

who should wear them. In one instance the communal, historical perception that modes of transportation are relatively safe was dislodged by a fatality crash, which increased the entire community's sense of susceptibility to off-road injuries and directly affected helmet sales.

Theory of Self-Efficacy

Originated by Albert Bandura (1977, 1982), the Theory of Self-Efficacy states behavior change and maintenance are a function of: (a) outcome expectations about what will occur from engaging in the behavior, and (b) efficacy expectations about one's own capabilities to successfully engage in the behavior. Perceptions about capabilities influence behavior, but are not necessarily reflective of "true" capacities. Self-efficacy beliefs are specific to a situation, and are not meant to be generalizable across a range of behaviors. Learning through observation of events or other people, also called "models" provides the second strongest impact on self-efficacy expectations.

Comparison of the two treatment conditions, helmets only and modeling plus helmets, found that helmet use increased more in the modeling villages. The slope of the time series line in the modeling condition was significantly greater than zero whereas the line in the helmets-only condition was not. Also, exposure to the safety messages which contained key points from modeling theory proved to significantly influence the intention to wear a helmet in the future. Therefore, two relatively simple approaches, incorporation of helmet wearing into the everyday activities of a community leader, and the posting of messages in key locations around town had a significant effect.

Because helmet wearing has been almost nonexistent in the NWAB prior to this study, role models had to in a sense be created, rather than being drawn from a population which had already adopted the behavior and mastered the skills. Models selected were community leaders who closely matched the population most at risk but were not themselves helmet wearers when the study began. Therefore, they were asked to adopt a new behavior which

they then championed in the community. In three of the four cases, this strategy was successful, and the role models displayed unexpected enthusiasm at the conclusion of the study. They seemed to be truly excited about their accomplishments and about the impact of the study on the health of the region. In the fourth case, the model was unable to dissociate himself from existing community norms and failed to follow study guidelines.

The recruitment of models who adopted a new behavior for purposes of the study made this experiment different from those described in the literature. However, the models' original motivation for making the change did not influence their conduct in the community. Ultimately it did not matter that the changed behavior was externally initiated because the three models who followed the study guidelines internalized the concepts.

Also, because NWAB can be described as having a culture of off-road vehicles which is characterized by risk-taking behavior, the use of role models is a particularly appropriate social learning strategy. The success of the approach is documented in statistically significant changes in helmet-wearing behavior between the treatment conditions.

Theory of Reasoned Action

The Theory of Reasoned Action (Ajzen & Fishbein, 1973; Ajzen & Madden, 1986) assumes that the immediate and sole determinant of behavior is the intention to perform it. Factors which affect intention are the individual's attitude toward performing the behavior, and the influence of significant others.

Attitudes toward behavior, called behavioral beliefs, are impacted by perceptions of the consequences of carrying them out. Normative beliefs, the second element influencing intention, are determined by perceived expectations of important groups or individuals. Actions are taken because the individual believes such behavior will lead to consequences more beneficial than harmful and/or because of the perception that significant others favor adoption of that behavior.

Normative beliefs played a significant role in increasing helmet wearing among groups organized for sporting events and recreation. Two structured groups established policies which required helmet use and one of the recreational groups was reported to both buy and wear helmets together.

Conversely, fear of standing out from the group was the second most often cited reason for not wearing a helmet. The role model in Buckland identified his lack of compliance with study guidelines in that context. Also, the slope of the line describing increased helmet-wearing in large villages was 6 times that of small ones, reflecting the strength of normative beliefs in small communities which argued against adopting helmet wearing. Small communities might be considered to constitute just a few groups, whereas larger communities encompass multiple, diverse groups.

The perception of the consequences of carrying out an action influences behavioral beliefs. The lack of consequences of high-speed driving in town and of alcohol consumption while driving have created a situation where these activities are given free reign. Also, the lack of consequences associated with a potential helmet law would mean its effect would be reduced.

Gradient of Reinforcement

The gradient-of-reinforcement concept from instrumental learning theory described how immediate consequences exert greater control over behavior than delayed ones. This is especially true when the immediate effects meet needs but after-effects are negative. Changing such habit patterns is particularly difficult (Stephens & Marlatt, 1987).

Immediate gratification occurs through riding an off-road vehicle. Delayed effects exert much less, if any, influence on habitual behavior. Both head injuries and legal fines come under the category of delayed consequences. Knowledge that a helmet prevents head injury was found to not impact helmet-wearing behavior—it was more desirable to jump on the vehicle

and go. Likewise, the community's potential lack of ability to enforce helmet wearing through the sanction of fines would be considered a delayed consequence. The fact that almost half of the villages studied do not presently have the ability to impose fines would make the timeline for consequences even more distant and uncertain.

Habit

Habit sequences can be changed, although with great difficulty. The individual's attention and conscious decision making must be restored to the activity via forces which disrupt the continued satisfaction of needs (Stephens & Marlatt, 1987). The use of beaver caps during the winter is the traditional response to the region's arctic winter weather. Their use was described in terms of habitual behavior. Therefore, helmet wearing would be considered a disruption of a habit. Also, lack of helmet use in and of itself is part of a habitual pattern whose sequences would need to be disrupted to allow for the inclusion of the helmet in the routine of getting ready to ride the off-road vehicle.

Habit formation is also effected by age. Dental hygiene practices (Cohen et al., 1990) and bicycle helmet wearing (Cameron et al., 1994) have both been reported to be more consistent among young children, with teenagers demonstrating a lack of compliance. In this study the age range chosen for the observations was too broad to allow for discrimination between these two groups of youth under 18. Qualitative reports highlighted reckless driving practices among teenagers and young adults, although there was also the suggestion that this group was more open to helmet use than older adults. Regardless of the possible greater openness to helmet use, teenagers are a population at risk as demonstrated by the qualitative findings and the injury statistics.

Denial

Dorpat (1983) described denial as a cognitive arrest process in which an individual actively excludes painful information from conscious awareness by developing a "*cover story*"

via fantasy, ideas, affects, or overt behavior. Denial can also be viewed within a framework of cognitive dissonance (Lawrence & Festinger, 1962). Cognition is defined as a belief or opinion about the environment. Dissonance occurs when there are inconsistencies or conflicts among an individual's ideas, which can be reduced by rejection or alteration of inconsistent concepts—in other words—by denial.

Denial occurred when residents of the NWAB rode an off-road vehicle without a helmet, knowing that helmets prevent head injuries, that medical care was far away, and that injuries associated with riding an off-road vehicle were common. An example of a "cover story" is the belief that low-speed driving in town will prevent any risk of a crash. The ability of the residents of Noatak to deny the possibility of harm was shattered with the fatality snowmachine crash which occurred in the middle of the village. Following the tragedy, the cognitive arrest which led to the creation of the "cover story" that riding off-road vehicles without a helmet was safe could no longer be sustained due to the intense pain caused by the event. This set the stage for a new openness to the purchase and use of helmets.

Relationship to Regional Injury Statistics

Demographic Factors

Quantitative findings documented a significant relationship between helmet use and the demographic factors of gender and age. Qualitative reports matched the statistics. Helmets were more often purchased for use by males and children (including teenage and adult children) and were worn most by young men, in the age range of 15 to 30. Buying and use patterns were connected to perceived risk factors associated with this group.

Injury statistics closely correlate with these findings. The decade group most affected was 20 to 29 for both ATV and snowgo injuries. Also, for both types of vehicles the 10- to 19-year-old age group recorded the second highest percentage of injuries. Trauma Registry

data reported the gender distribution of injured snowmachine riders was approximately three males to one female. For ATVs, there were two males injured for every one female. However, statistics from the Maniilaq Health Information System found that in snowmachine crashes four males were injured for every one female and that the ratio for ATV crashes was almost one to one. Also, head injuries sustained on an ATV occurred to females more often than to males by a ratio of approximately three to two.

Therefore, helmet use by males in the 15- to 30-year-old age group indicates the population most at risk for injuries is taking safety precautions. However, the perception by females that injuries do not occur to their gender is inaccurate because between a quarter and a half of injuries on both types of off-road vehicles strike women. The implications are that the population most at risk recognizes its vulnerability and a limited number have responded appropriately. This is a hopeful sign in terms of increasing the use of helmets within this group. However, the perception by females that they are not at risk is inconsistent with the injury statistics and opens opportunities for interventions.

Snowmachine versus ATV Injuries

Helmet use was more prevalent among snowmachine riders than among ATV riders, in part due to the perception of increased risk on a snowgo. Also, organized snowmachine activities were more often the context for helmet wearing than ATV-related events in response to the associated sense of risk with those occasions. Observations documented that fewer than 1 in 5 helmet wearers rode an ATV.

Data from the Trauma Registry documents that the injury and fatality numbers are higher for snowmachines than for ATVs. There were approximately three snowgo injuries for every two sustained on an ATV, and the fatality ratio of snowmachines to ATVs was five to one. However, Maniilaq figures, which include lower acuity patients, point to a ratio of three head injuries on an ATV for every two sustained on a snowgo.

Therefore, helmet use patterns mirror the higher-risk situation of snowmachine riding reported by the Trauma Registry. However, the risk on ATVs is not zero and Maniilaq statistics document a greater percentage of total head injuries to ATV riders. Although the observational reports collected during the study found a low level of helmet use among ATV riders, the interviews indicated an absence of such activity. ATV riders therefore represent a population in danger which is not taking precautions even to the limited extent demonstrated by snowmachine riders. As with female riders, this presents opportunities for change.

Wilderness versus Roadway Travel

Although the quantitative data on helmet observations was entirely derived from off-road vehicle traffic in town, the qualitative interviews strongly indicated that helmet use was more common when riders were traveling between villages. Conversely, even though roadways in town were thought to be safe, there were numerous reports of reckless driving and injuries sustained within city limits.

Data from the Trauma Registry reports injury locations, distinguishing roadway from wilderness. In the NWAB, streets were the site for one out of three snowmachine injuries and three out of five ATV injuries. Also, the percentage of injuries sustained in the wilderness is lower in the NWAB than the rest of the state: 17% of ATV injuries in the NWAB as opposed to 42% statewide, and 44% of snowmachine injuries versus 62% around the state.

These data clearly point to the existence of a significant number of injuries on roadways and also to a difference in injury locations between the NWAB and the rest of the state. The belief than in-town driving is relatively safe is not reflected in the statistics. This points to another area of opportunity in terms of community education. Also, the belief that helmet laws for off-road vehicles would have no effect because crashes occur outside village jurisdictions is challenged by the number of in-town victims. Clearly, interventions within city limits could significantly impact injury statistics.

Helmet-Use Rates

Baseline observations established helmet use in the NWAB as close to zero. Only two helmeted riders were observed in all nine villages before the study began, and no helmeted riders were recorded in the control villages. Trauma Registry data (1991-1993) reported that none of the NWAB victims of off-road vehicle crashes who sustained a head injury wore a helmet. This figure compares unfavorably to statewide helmet-use rates for head-injured off-road casualties: 12.8% for snowmachiners and 6.5% for ATV riders.

During the study, approximately 1% of all the riders observed wore a helmet. Although this figure is low, it roughly correlates to the fact that helmets were available for sale to 1.5% of the population based on funding limitations.

The lack of helmet use in NWAB is profound. However, results from the study demonstrate that change is possible.

High Injury Rates versus Low Actual Numbers of Injuries

Although the injury rate for off-road vehicles crashes in the NWAB is the second highest in Alaska, the actual numbers are relatively low with most villages reporting between two and three crashes per year over the last decade. Also, many of these injuries were minor in nature, requiring local treatment at the health clinic. This situation creates an environment in which the perception of risk is minimized by the juxtaposition of constant exposure to the low numbers of victims. Knowledge of serious injuries may spread through the region by word of mouth, but reports may not always be complete or accurate, further promoting the belief that off-road vehicles are safe. Therefore, the perception of risk is not appropriate to the actual risks associated with riding off-road vehicles in the NWAB.

Relationship to Injury Control Strategies

Findings from this experiment can be compared and contrasted to common themes described in the injury control literature.

Helmet Wearing by Groups

The qualitative reports spoke to helmet wearing by groups in several situations such as organized sports activities and more informal recreating. This phenomenon was also reported by researchers from around the continent. In Seattle, Rivara et al. (1994) documented helmet wearing by companions of the same age group or by children with adults. Considering all age groups, they found the strongest association occurred when companions both wore a helmet. Likewise, researchers in Florida (Liller et al., 1995) identified bicycle-riding pairs who wore helmets jointly. Parkin et al. (1995), writing from Canada on the results of the Be Bike Smart week, a school-based intervention, also noticed that children were more likely to wear helmets when riding with helmeted adults or with other helmeted children. Findings from Alaska's northwest Arctic are consistent with reports from throughout North America that groups tend to adopt helmet-wearing as a joint activity.

Locations for Wearing Helmets

This study found that residents of the NWAB tend to wear helmets more often when traveling between villages than around town due to the perception of increased susceptibility to injury on "fast trips" in the wilderness. DiGuiseppi et al. (1989) observed similar behavior in Seattle. They found that children riding bicycles in their own neighborhoods were less likely to wear a helmet than those using bike paths, reflecting the belief that helmets were not needed close to home. Therefore, in both situations riders selectively wore helmets based on their own rating of personal susceptibility to injury in those locations.

Strategies in Combination

A combination of strategies was employed in this design—the reduction of barriers and modeling—to increase the use of helmets. Other researchers have also reported on the effectiveness of using several tactics together. In Seattle, Rivara et al. (1994) found that the combination of the reduction of barriers to helmet ownership and community-wide education was effective in increasing helmet use. A combination of strategies was also recommended by

the team (Parkin et al., 1995) reporting on Be Bike Smart week in Canada. Their comparison of two interventions and a control yielded mixed results, leading to the conclusion that individual elements of a strategy might be less important than their combined effects over time.

Although Howard County is best known as the first site of a mandatory bicycle helmet law, authors (Dannenberg & Vernick, 1993) reporting on its effects believed increases in helmet use represented not only the impact of the ordinance, but also the results from school-based training, media coverage, and the public reaction to two local bicycle-related fatalities.

Dutch researchers (Seijts et al., 1995) also concluded that community-based interventions on multiple tracks including helmet re-design and public education to counteract negative attitudes was necessary to turn around the low helmet use in the Netherlands.

Finally Hatziandreu et al. (1995) recommended, based on their review of the three most commonly employed types of bicycle helmet campaigns, that a combination of strategies be used, since no single intervention had achieved the year 2000 health objective of helmet wearing by 50% of all bicyclists.

Barriers to Helmet Wearing

Features of the helmet itself were identified by curbside interview respondents as one of the most common reasons for not wearing a helmet when one was available. Also, information received during the qualitative interviews indicated that difficulties occurred when the helmet had to be taken off and put back on during the course of a trip. Specifically, shoppers said they had no place to put the helmet down in the store, men chopping wood reported trouble switching between fur cap and helmet, and hunters resisted putting the helmet back on after it had reached the arctic air temperature of minus 30 to minus 50 degrees below zero.

Respondents to a survey conducted in Seattle (Rivara et al., 1994) also cited factors related to the helmet itself, comfort and attractiveness, as being two of the five predominant reasons why they chose not to wear a helmet when one was available. In the Netherlands, two of three responses to the same question also focused on the helmet. Inability to avoid normalizing with the outdoor temperature was a problem, although heat, not cold, was the complaint. As in the NWAB, the lack of places to leave the helmet when shopping, swimming, or at other destinations also proved to be so problematic that respondents stopped wearing the helmet.

Motivators for Wearing a Helmet

This study found the reasons for wearing a helmet were not necessarily the mirror image of reasons for not wearing a helmet. Three of five respondents reported that safety was their main consideration in making the decision to wear a helmet. Also, the proportion of helmet-wearers with positive perceptions of other helmet wearers (normative beliefs) was significantly greater than the proportion of helmet wearers with negative perceptions of other helmet wearers, although there was no direct relationship between perception and helmet use. Factors which prevented helmet wearing focused on the helmet itself and on the lack of the helmet-wearing habit.

Subjects in the Netherlands (Seijts et al., 1995) who intended to wear a helmet also reported positive normative attitudes among peers and family members toward helmet wearing. Responses obtained in the Harborview study (Rivara et al., 1994) reflected reasons similar to those found in Alaska for not wearing a helmet—habit and the helmet itself. This researcher did not find reports in the literature documenting reasons for wearing a helmet, nor were there studies which combined questions about reasons for wearing and not wearing a helmet within the same population, making this project unique.

The Culture of Off-Road Vehicles

Researchers in the Netherlands wrote eloquently about the "bicycling culture" of their country which they believed rested on the bicycle's widespread, multiple uses for both transportation and recreation. They contrasted this to its use in other nations such as the United States and Australia where the bicycle is a recreational vehicle enjoyed by a much smaller segment of the population.

The importance of off-road vehicles in the NWAB holds many similarities to the bicycle's central role in the Netherlands. Off-road vehicles pervade all aspects of society from transportation to work to recreation, even creating some of the region's small pantheon of heroes. Also, like the Netherlands, helmet use in the NWAB is rare. Seijts et al. (1995) concluded that a combination of interventions which addressed negative cultural norms and which improved helmet construction were necessary to turn the tide in favor of helmet wearing.

Sustained Efforts Over Time

This study spanned 12 weeks. As a result, approximately 1% of the off-road vehicle riders were observed wearing helmets. This is a very small percentage. Sustained efforts over time are among the hallmarks of success for injury control strategies as a whole. This was also true of the specific bicycle helmet studies cited in the literature review.

At the five-year marker, 40.2% of school-age children in Seattle (Rivara et al., 1994) were found to be wearing helmets, up from 5% at the beginning of the campaign. Because the Be Bike Smart intervention yielded mixed results between the two conditions and the control, the authors (Parkin et al., 1995) concluded that the individual elements of a strategy might be less important than the cumulative effects of a long-term campaign. The need for sustained effort over time also summed up a major conclusion from the Dutch study (Seijts et al., 1995), where the focus was on changing the bicycling culture of an entire nation.

Implications for Future Research

Areas for future research are specific to the study of ways to increase the use of helmets in rural Alaska. Six general categories have been identified which will be discussed in detail in the following section: (a) experimental designs using pairs of models, (b) experimental designs using groups, (c) qualitative interviews with helmet wearers, (d) observations of groups of riders, (e) product research and development, and (f) a demonstration project which supports development of a model for off-road vehicle enforcement at the village level.

Experimental Designs Using Pairs of Models

The failure of Buckland's model to adhere to the study guidelines pointed out the difficulties of adopting new behavior in the isolation of a remote village. Numerous studies have documented helmet wearing by pairs of riders. Building this concept into a modeling design could offer a significant enhancement as well as preventing noncompliance.

This researcher recommends that the experimental design be repeated in another high-risk region in Alaska using only the modeling-plus-helmets treatment and employing the baseline observation as the control. Also, continuation of the study over more than 12 weeks would be highly desirable as neither helmet sales nor helmet wearing became active until the final month of this study. Distribution of helmets on a per capita basis would allow for analysis of the effects of modeling on helmets sales. An observation procedure which divides the population into at least four groups: children age 0 to 13, youth age 14 to 18, young adults age 19 to 28, and older adults age 29 and up, would help further define the effects of age on helmet use.

Experimental Designs Using Groups

This study identified several groups in the region which had adopted helmet wearing, in two cases requiring it for safety reasons. Other groups such as the VPSOs, village-based Search and Rescue organizations, and school children were identified *during the course of* the

project as possible candidates for extension of the program. The theoretical framework supporting such an effort comes from the Theory of Reasoned Action (Ajzen and Fishbein 1973,1986), Lewin (1958), and Pelz (1958).

This researcher proposes that a quasi-experimental design be employed using one of the types of groups listed above. The treatment would consist of education aimed at supporting a change in normative beliefs, development of a public group commitment to the behavior change as described by Lewin, and the reduction of barriers to helmet ownership.

Qualitative Interviews with Helmet Owners

Both this project and others have documented reasons why riders do not wear helmets. Much less is known about how and why people adopt helmet wearing or how they sustain this new behavior. Qualitative interviews with subjects on these topics could provide important information which would support the development of future community education programs.

Observations of Groups of Riders

The adoption of helmet wearing by groups was reported by this study. However, the information was qualitative and lacked documentation in the quantitative sense. Although this was considered at the beginning of the study, its implementation in the field with rural Alaskan observers was felt to be impractical. More focused observations in the villages where helmet wearing was most common, using specially trained personnel, would be an important addition to these findings.

Product Research and Development

Reducing the barriers to helmet use through careful selection of color, size, style, and accessories proved key to this project's success. Opportunities for further refinement in this area were identified by the role models.

One suggestion was a heated helmet which could be plugged into the off-road vehicle's

battery system and kept warm while its owner chopped wood, hunted, fished, or conducted other outdoor activities in the cold environment.

The relative lack of helmet use during low speed ATV driving brings up the question as to whether the heavy-duty helmet made for high speed motorcycle travel is required in this situation. Research into the types and severity of head injuries sustained in this environment could be combined with appropriate engineering to potentially create a lighter weight, more comfortable helmet.

Storage for helmets in stores and other communal locations is problematic both from the standpoint of the lack of a designated spot and due to lack of security for the unguarded helmet. Product design in Indonesia has created an inexpensive locking device for moped helmets. Similar efforts here might overcome the security issues. Local injury control specialists could work with retailers to create storage space in a convenient location close to the entrance.

Law Enforcement Demonstration Project

Enforcement of existing laws regulating the conduct of off-road vehicles is inconsistent. Reasons include lack of information on the laws themselves, lack of adequate staffing, and lack of community support for the regulations. As identified previously, enactment of a helmet regulation or its effective implementation would be highly questionable in an environment where the current ordinances are ignored. Therefore, this researcher recommends more fundamental work to develop consistent enforcement throughout the region and to train the VPSOs in ways to position themselves as role models. Such an effort could be conducted as a demonstration project, potentially with support from the Department of Public Safety, The University of Alaska Justice Center, the NWAB, and local city councils. Also, more qualitative research on why people both do and do not support a law would help shed light on this complex subject.

Implications for Practice

Items with implications for practice are also specific to the development of strategies aimed at increasing the use of helmets in rural Alaska. Specific recommendations which flow directly from the study will be listed and briefly discussed.

1. Helmet campaigns should always reduce the barriers to ownership, both through discounted pricing and retail availability within the village.

2. Modeling proved to be an effective strategy in increasing the use of helmets and should be incorporated in future projects.

3. Programs should be based in the community and should include a wide variety of agencies such as the school, the health clinic, and the city government whenever possible.

4. Campaigns should begin in the region's hub city where the more cosmopolitan population will more readily adopt new behaviors.

5. Campaigns which originate from the regional hub must incorporate a linking agent in each community to provide for information flow and to continuously champion the project. Health Aides proved ideal for this effort.

6. Village-based helmet retailers have an enormous impact on the project's success. They should be trained for this role by receiving information on helmet sizing and accessories. Also, helmet salespeople should be given a free helmet for their own use.

7. Lobby displays should be supported through the purchase of appropriate furniture when necessary.

8. Neoprene face shields should be added to the helmet package, along with the existing goggles.

9. There should be a method for sustaining an uninterrupted supply of helmets and accessories for sale.

10. The commitment of local participants is key and cannot be readily monitored

other than through on-site inspections. Project sites should be selected with this in mind and implementation should be deferred if reliable staff is not available.

11. Snowmachine racers should be recruited as role models.

12. The project should be sustained over time with at least a five-year plan.

13. Both the posters and the ads on cable TV were effective ways to spread the message. These were inexpensive to produce and should be incorporated in future programs.

14. Community education should segment and target various population groups including males, females, youth and young adults, and older adults to best address issues specific to each one. In particular the myths that injuries do not occur to women, riders of ATVs, and to riders running around in town should be dispelled.

15. Riders going between villages are particularly open to wearing helmets, and this should be promoted through both modeling and education.

16. Community education should also be used to improve the general image of helmets and their adaptability to the Arctic.

17. Helmet sales were concentrated in the weeks before Christmas with many purchases being made for gifts. Future campaigns should capitalize on this by linking helmet availability to Christmas and the purchase of the item for family members at risk.

18. Helmet sales were also linked to snowmachine riding. Community messages should be designed which use this theme, and, when ATV season arrives, a second message should be used which addresses carrying over the behavior to summer riding.

19. The cost of $40 for a helmet and goggle set proved to be an acceptable dollar figure to customers and did not represent a barrier to purchase. Future campaign should maintain a similar price structure.

20. Parents and other community leaders should be trained in ways to increase the safe driving behavior of their children. This may include basic approaches to parenting and discipline as well as information about the risks associated with off-road vehicles.

21. Teenagers are particularly vulnerable to off-road injuries based on their new-found freedom to drive an off-road vehicle, the lack of social control they experience, and their age-related denial of their own vulnerability. Strategies should be specifically targeted toward this group.

22. VPSOs are a key link in the effort to improve the safety of off-road vehicle riders and to increase the use of helmets. Their active participation should be sought in all community-based efforts.

23. Groups should be targeted for adopting helmet wearing. Ways to negate peer pressure should be sought, including incorporating helmet wearing as a standard or policy.

24. Communities which experience a tragedy such as the fatality snowmachine crash which occurred in Noatak should be singled out for a focused intervention based on their openness to behavior change. Strategies should be created which can be implemented quickly following such an event to capitalize on changing social norms.

Conclusion

This study evaluated ways to increase the use of helmets by riders of off-road vehicles in Alaska and demonstrated that the two techniques tested, reduction in barriers and modeling, were effective. Although project development required intense work by this researcher and staff from the Maniilaq Office of Environmental Health, its design is well documented and could readily be used throughout rural Alaska to support increased use of helmets by riders of off-road vehicles. This was a major commitment for the small staff at Maniilaq, but its repetition would be much less time consuming, positioning it as a strategy which can be supported over time. Also, dollars from helmet sales funded 50% of their cost, making future programs more feasible from a financial standpoint.

The ultimate success of programs such as this one is measured in years and decades, not the 12 weeks set aside for this project's implementation and data collection. Changing the

off-road vehicle culture of the NWAB will require sustained commitment over time. The Maniilaq Association is ideally positioned to lead such an effort, and in this way, improve not only the health of its own people, but demonstrate to the rest of rural Alaska that change is possible for this population and this type of high-risk behavior.

The northwest Arctic has been described as a "land which offers itself equally to all things—caribou and wolf, flower and man . . . (a land) which refuses our embrace, and then, when we are past love, hope, and even knowing, takes us in her arms after all" (Jans, 1995). In other words, it is at once unforgiving and nurturing, distant and dominating, foe and lover.

The land dominates Iñupiaq existence today as surely as it did 10,000 years ago when the hunt for mastodon and saber-tooth tigers swept ancient Eskimos across the Bering land bridge in to the New World. Their culture and everyday lives still dance to the seasons' rhythms. Off-road vehicles are part of the Inupiat world as surely as the song of the wolf, the west wind gusting off Kotzebue Sound, the gold-flecked sands strewn on Deering's beach, a sudden, magical rainbow over the Noatak Valley, or June's tinkling crescendo of ice flowing down to the Chukchi Sea from Kobuk Lake.

The Inupiat's continuing adaptation to the land must encompass an adaptation to off-road vehicles. The hunt goes on today just as it has for millennia, but now the hunters are borne through the wilderness on sleds of steel whose power was never imagined even by the shamans, and, to use the words of Selawik's Health Aide, "When they are chasing . . . wolf or wolverine, they don't watch." Generations past found ways to "travel easy . . . (when they) used to drive mostly with dogs . . . (it took) the whole day to travel, to go someplace, and there is no accidents." Modern Inupiat must overcome the same obstacles their ancestors faced—to find ways to "travel easy" through a land which is at once unmerciful and welcoming, which destroys and nurtures, which is both an enemy within the gates and soul mate. Taking up this challenge will significantly enhance their lives and the safety of future generations of Inupiat Eskimo.

Appendix A

Study Schedule

Week 1 & 2	Baseline Observation
Week 3 & 4	Training & Decreased Pricing
Week 5 & 6	Interview Form
Week 7 & 8	Observe
Week 9, 10, & 11	No observation, helmet sales continue
Week 12	Observation & end of study

HELMET OBSERVATION FORM VILLAGE: **<VILLAGE>** DATE _____

ADULT

	3/4 Wheeler				Sno-go			
	No Helmet		With Helmet		No Helmet		With Helmet	
Native	Male	Female	Male	Female	Male	Female	Male	Female
Non-Native	Male	Female	Male	Female	Male	Female	Male	Female

YOUTH

	3/4 Wheeler				Sno-go			
	No Helmet		With Helmet		No Helmet		With Helmet	
Native	Male	Female	Male	Female	Male	Female	Male	Female
Non-Native	Male	Female	Male	Female	Male	Female	Male	Female

Mail to the Injury Control Specialist when completed.

Appendix C

Observer Instructions

1. Count only people who **RIDE** by on three-wheelers, four-wheelers, or snowmachines. Count everybody on the machine. This includes the driver and the passengers.

2. Make a "hash mark" in the appropriate box while you are observing. Separate boxes will let you tell the difference between riders or three- or four-wheelers or snowgos, people with or without a helmet, men and women, adult and youth, and Native and non-Native[1].

   Hash marks are vertical (up and down) lines.

   Example: Two hash marks for two riders looks like: II

   Example: Four hash marks for four riders looks like: IIII

3. Count anyone of school age (18 and under) as a youth.

4. It is very important that you follow the observation schedule:

   TIME: The hour before the Post Office closes for 30 minutes
   PLACE: Outside the Post Office
   DAYS/WEEK: Six days/week

5. Use a new form every day. If weather conditions are so bad that nobody can travel on the roads, check the "weathered in/no traffic" line.

6. MAIL the completed forms to the Injury Control Specialist every Friday. Use the envelope provided. During the first two weeks of the project, mail the Monday and Tuesday forms on Tuesday afternoon and the Wednesday, Thursday, and Friday forms on Friday. This way the Injury Control Specialists can help right away if you have any questions about the forms.

7. CALL the Injury Control Specialist at 800-478-3312 x129 if you have any questions or problems.

---

[1] Definition of non-Native: All persons of non-Eskimo descent. Make the determination to the best of your ability.

Curbside Interview Form for Nonhelmet Wearers

CIRCLE ONE: NONHELMET WEARER WALKER AUTO RIDER

1. Sex — Male / Female

2. Age
   a. 9 and under
   b. 10 to 19
   c. 20 to 29
   d. 30 to 39
   e. 40 to 49
   f. 50 to 59
   g. 60 +

3. Ethnic Group
   a. Inupiat Eskimo
   b. Caucasian
   c. Other _____

4. How often do you drive or ride a three-wheeler, four-wheeler, or snowgo?
   a. 4 to 7 days a week
   b. 1 to 3 days a week
   c. Never
   d. Other _____

5. Do you think a helmet can help prevent serious injury from a three-wheeler, four-wheeler, or snowgo crash?
   a. Wouldn't help at all
   b. No opinion
   c. Would definitely help

6. Have you ever been injured in a three-wheeler, four-wheeler, or snowgo crash?
   a. Yes
   b. No

7. Do you own or have access to a helmet?
   a. Yes
   b. No

IF NO TO #7: GO TO #11.
IF YES, CONTINUE WITH EVERY QUESTION TO THE END.

8. Where was it purchased?
   a. Came with vehicle
   b. Kotzebue
   c. In the village
   d. Other

9. Do you intend to wear your helmet the next time you ride?
   a. Yes
   b. No

10. Why didn't you wear your helmet today?
    a. Never thought of it
    b. It's not needed
    c. Friends don't wear helmets
    d. Ugly color/style
    e. It fogs up
    f. It's uncomfortable
    g. It limits my vision
    h. Other reason _____

CONTINUE HERE FROM #7 IF NO.

11. When you see someone wearing a helmet, do you think they look:
    a. Odd
    b. Safe
    c. Smart
    d. Strange
    e. Other_____

12. Did you attend the recent class on ATV safety?
    a. Yes
    b. No

13. Have you seen the safety messages around town about wearing helmets?
    a. Yes
    b. No

14. Have you seen more people wearing helmets recently?
    a. Yes
    b. No

15. Do you think there should be a law requiring helmet use?
    a. Yes
    b. No

For Walkers and Auto Riders Only:

16. Did you wear your helmet the last time you rode?
    a. Yes
    b. No

Curbside Interview Form for Helmet Wearers

Helmet wearers will be asked:

1. Sex — Male / Female

2. Age
   a. 9 and under
   b. 10 to 19
   c. 20 to 29
   d. 30 to 39
   e. 40 to 49
   f. 50 to 59
   g. 60 +

3. Ethnic Group
   a. Inupiat Eskimo
   b. Caucasian
   c. Other _____

4. How often do you drive or ride a three-wheeler, four-wheeler, or snowgo?
   a. 4 to 7 days a week
   b. 1 to 3 days a week
   c. Never
   d. Other _____

5. Do you think a helmet can help prevent serious injury from a three-wheeler, four-wheeler or snowgo crash?
   a. Wouldn't help at all
   b. No opinion
   c. Would definitely help

6. Have you ever been injured in a three-wheeler, four-wheeler, or snowgo crash?
   a. Yes
   b. No

7. Where did you purchase your helmet?
   a. Came with vehicle
   b. Kotzebue
   c. In the village
   d. Other

8. Did you wear your helmet the last time you rode?
   a. Yes
   b. No

9. If not, why not?
   a. Never thought of it
   b. It's not needed
   c. Friends don't wear helmets
   d. Ugly color/style
   e. It fogs up
   f. It's uncomfortable
   g. It limits my vision
   h. Other reason _____

10. When you see someone wearing a helmet, do you think they look:
    a. Odd
    b. Safe
    c. Smart
    d. Strange
    e. Other_____

11. Did you attend the recent class on ATV safety?
    a. Yes
    b. No

12. Have you seen the safety messages around town about wearing helmets?
    a. Yes
    b. No

13. Have you seen more people wearing helmets recently?
    a. Yes
    b. No

14. Do you think there should be a law requiring helmet use?
    a. Yes
    b. No

15. Why are you wearing a helmet?
    a. Saw other people recently
    b. Went to the class
    c. Could buy a helmet in town
    d. Saw the poster
    e. Have been wearing one for a long time
    f. Other _____

Appendix F

Curbside Interview Instructions

1. Complete the Interview Form during weeks 5 and 6 of the project. These are the weeks of November 13 and November 20.

2. Interview everyone who passes through the observation area in front of the Post Office. This includes people who are riding three- or four-wheelers, snowgos, and those in trucks or autos (whenever possible), and walkers.

3. Ask them if they will participate. No one should be forced to take part unwillingly. The interview is voluntary.

4. Assure people that their answers are confidential. No one's name will be written on the interview form.

5. Interview people only once.

6. You may interview people inside or outside the Post Office.

7. Ask people the questions on the form. Do not hand them the form to fill out. Mark down their answers right away.

8. There are two different forms:
   - ☐ One for helmet wearers
   - ☐ A second form for everyone else

9. At the end of the interview, thank the individual and give them a "reminder" card to buy a helmet and goggles set (not available in Ambler, Shungnak, and Selawik.)

10. Mail the forms to the Injury Control Specialist twice a week on Tuesday and Friday. Use the envelope provided.

11. Call the Injury Control Specialist at 800-478-3312 x129 if you have any questions or problems.

Appendix G

Observer Agreement Form

DATE _____ ROLE MODEL _____
VILLAGE _____
==========

I AGREE TO:

1. Observer riders of three-wheelers, four-wheelers, and snowmachines in my village for:
   - ☐ Six days a week
   - ☐ 30 minutes a day
   - ☐ Over a period of 12 weeks:
   - Observe for the first 4 weeks (Weeks 1, 2, 3 &4)
   - Observe and complete the interview form over the next 2 weeks (Weeks 5 & 6)
   - Observe for the next 2 weeks (Weeks 7 & 8)
   - No activity for the next 3 weeks (Weeks 9, 10, & 11)
   - Observe one last week (Week 12)

Time of Day: The hour before the Post Office closes for 30 minutes
Place: Outside the Post Office

2. Complete the Helmet Observation Form.

3. Mail the Helmet Observation Form to the Injury Control Specialist every Friday, and twice during the first two weeks on Tuesday and Friday.

4. Interview all people who walk or ride through the observation area during Week 5 and 6, using the Interview Form provided and give them a reminder notice to buy a helmet and goggles.

5. Mail the Interview Forms to the Injury Control Specialist twice a week on Tuesday and Friday.

6. Participate in a training session which will be videotaped.

7. Call the Injury Control Specialist at 800-478-3312 x129 for any questions or problems.

I understand that I will be paid:
$150 at the end of the second week of observation.
$150 at the end of the project (Week 12).
I understand that I may keep the notebook and clipboard.

_____ _____
Observer & Social Security # Injury Control Specialist

Appendix H

Role Model Agreement Form

DATE _____ ROLE MODEL _____
VILLAGE _____

==========

I AGREE TO:

1. Wear my helmet and goggles every time I ride a three-wheeler, four-wheeler, or snowmachine for the 10 weeks of the study.

2. Speak to at least three community groups during the first two weeks that I am wearing the helmet.

   When I speak to them, I will tell them:
   - I believe it is important to wear a helmet all the time to prevent head injuries.
   - To "do as I do."
   - How I remember to wear the helmet.
   - How I stay warm and comfortable with the helmet and goggles on.
   - How I had to work to change my own habits in order to wear the helmet.
   - The importance of the end result of safety.

3. Mail a description of the community groups to John Spriggs by the end of the third week of the study.

4. Encourage people I know to wear a helmet and goggles and tell them I am wearing a helmet to stay safe, for the reasons listed above.

5. Participate in a training sessions which will be videotaped.

6. Call John Spriggs at 800-478-3312 x 129 for questions or problems.

I understand that I will be able to keep the helmet and goggles provided.

_____ _____

Role Model Injury Control Specialist

Appendix I

Helmet Sales Tracking Form

VILLAGE: **<VILLAGE>**

Numbers of Helmets Sold

	Small	Large	X-Large
Week of October 31	_____	_____	_____
Week of November 7	_____	_____	_____
Week of November14	_____	_____	_____
Week of November 21	_____	_____	_____
Week of November 28	_____	_____	_____
Week of December 5	_____	_____	_____
Week of December 12	_____	_____	_____
Week of December 19	_____	_____	_____
Week of December 26	_____	_____	_____
Week of January 1	_____	_____	_____

Mail to the Injury Control Specialist when complete.

Appendix J

Health Clinic Agreement Form

DATE _____ Health Aide _____

VILLAGE _____

==========

I AGREE TO:

1. Display the helmets, goggles, and poster in the waiting area of the clinic beginning on October 31, 1994.

2. Sell the helmet and goggle combination at $40 a set between October 31, 1994 and January 7, 1995.

3. Record the sales on the form provided.

   - ☐ Make a "hash mark" on the approrpiate line when you sell the helmet and goggles. Hash marks are vertical (up and down) lines.
     Example: Two hash marks for two helmet & gogles sets looks like: II.
   - ☐ There are separate columns for the three sizes of helmet which will be sold: small, large, and extra large.
   - ☐ There are separate lines for each of the ten weeks you will sell helmets.
   - ☐ Accuracy is very important.

4. Mail every Friday afternoon (in the envelope provided) to the Injury Control Specialist:

   - ☐ The cash or checks collected that week.
   - ☐ The form completed that week.

I understand that the Clinic will be paid $4 for every helmet and goggles set sold during the project period.

_____ Health Aide

_____ Injury Control Specialist

Appendix K

Community Announcement A

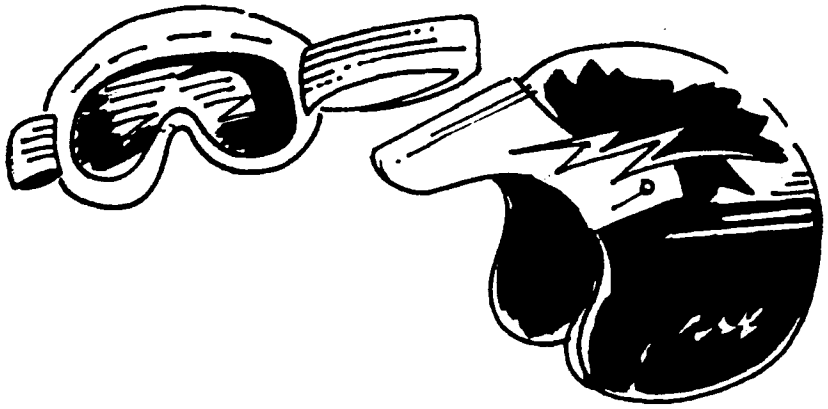
HELMETS
AVAILABLE!

GET THEM WHILE THE SUPPLY LASTS

OCTOBER 30, 1994
THROUGH
JANUARY 6, 1995

$300 VALUE FOR $40 WITH GOGGLES!

LOCAL HEALTH CLINICS



Appendix L

Community Announcement B

I'M RESPONSIBLE
to
MY FAMILY
and
MY TRIBE
for
MY OWN SAFETY.

I
HAVE THE POWER
TO
IMPROVE
THE HEALTH
OF
MY PEOPLE.

I ALWAYS WEAR MY HELMET!

HELMETS AVAILABLE
OCTOBER 30, 1994
THROUGH
JANUARY 6, 1995
OR UNTIL THEY ARE GONE

$300 VALUE FOR $40
WITH
GOGGLES!

MANIILAQ MEDICAL CENTER
OUTPATIENT DEPARTMENT
MANIILAQ ASSOCIATION OFFICES
AND
LOCAL HEALTH CLINICS

Appendix M

Community Announcement C-1

WE HANG OUR
HELMETS
BY THE DOOR.

WE SEE THEM
AND
REMEMBER
TO WEAR THEM.

IT'S WORTH IT
BECAUSE
WE FEEL SAFE.

**WE ALWAYS
WEAR OUR
HELMETS!**

HELMETS AVAILABLE

OCTOBER 30, 1994
THROUGH
JANUARY 6, 1995
OR UNTIL THEY ARE GONE

**$300 VALUE FOR $40
WITH
GOGGLES!**

**MANIILAQ MEDICAL CENTER
OUTPATIENT DEPARTMENT
MANIILAQ ASSOCIATION OFFICES
AND
LOCAL HEALTH CLINICS**

Appendix N

Community Announcement C-2

WE HANG OUR
HELMETS
BY THE DOOR.

WE SEE THEM
AND
REMEMBER
TO WEAR THEM.

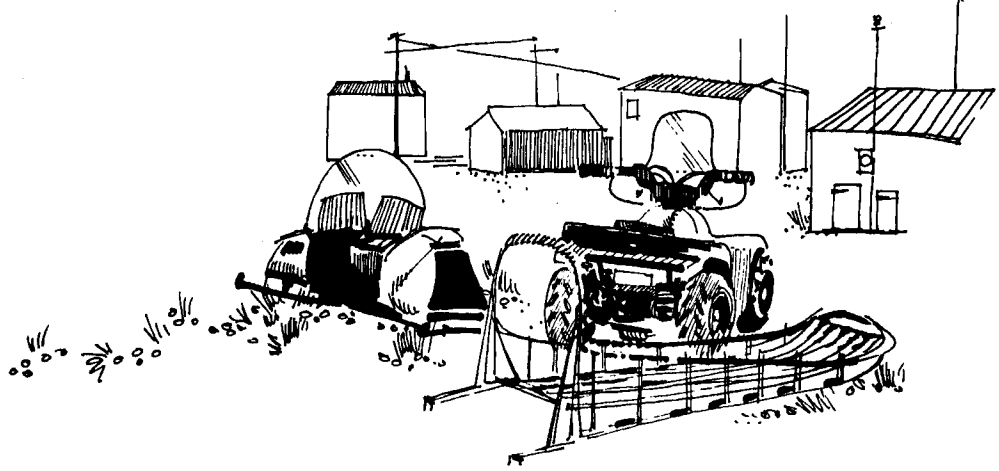
IT'S WORTH IT
BECAUSE
WE FEEL SAFE.

WE ALWAYS WEAR OUR HELMETS!

HELMETS AVAILABLE

OCTOBER 30, 1994
THROUGH
JANUARY 6, 1995
OR UNTIL THEY ARE GONE

$300 VALUE FOR $40
WITH
GOGGLES!
MANIILAQ MEDICAL CENTER
OUTPATIENT DEPARTMENT
MANIILAQ ASSOCIATION OFFICES
AND
LOCAL HEALTH CLINICS



Appendix O

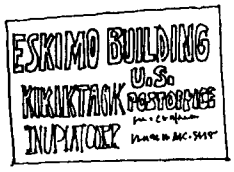
Community Announcement D

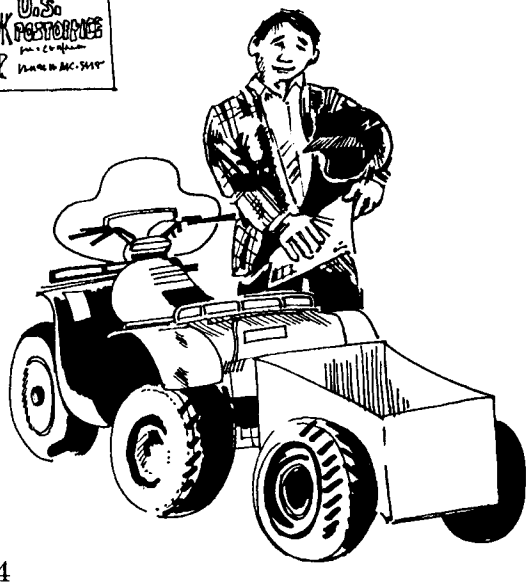
IT WAS
HARD WORK
TO
REMEMBER
TO
WEAR A HELMET,

BUT

IT
WAS WORTH IT!

$300 VALUE FOR $40
WITH
GOGGLES!
MANIILAQ MEDICAL CENTER
OUTPATIENT DEPARTMENT
MANIILAQ ASSOCIATION OFFICES
AND
LOCAL HEALTH CLINICS





I ALWAYS
WEAR MY
HELMET!

HELMETS AVAILABLE

OCTOBER 30, 1994
THROUGH
JANUARY 6, 1995
OR UNTIL THEY ARE GONE

Appendix P

Community Announcement E

I CAN STAY
WARM
IN MY HELMET.

I CAN BE
WARM
AND SAFE.

I *ALWAYS*
WEAR MY
HELMET!

HELMETS AVAILABLE

OCTOBER 30, 1994
THROUGH
JANUARY 6, 1995
OR UNTIL THEY ARE GONE

$300 VALUE FOR $40
WITH
GOGGLES!
MANILAQ MEDICAL CENTER
OUTPATIENT DEPARTMENT
MANILAQ ASSOCIATION OFFICES
AND
LOCAL HEALTH CLINICS

Appendix Q

Interview Guide

Case Number: _____

At the start of the interview, the participant will be:

a) Verbally introduced to the project;
b) Given a consent form to sign; and,
c) Asked a set of demographic questions.

Check off when completed:

_____ Introduction to the project
_____ Consent form
_____ Demographics

Introduction to the Project:

Over the past several months, Maniilaq Association has been studying ways to increase the use of helmets by riders of three-wheelers, four-wheelers, and snowmachines in the villages of the Northwest Arctic Borough. Your village has taken part in the project.

We are also interested in learning more about why people might choose to wear or not wear a helmet. As a health aide, you may have some special insight into the choices people make about their health. Can you take about 30 minutes to answer some questions on this subject?

Demographics:

1. Village _____

2. Sex — Male Female

3. Age
   a. 20 to 29
   b. 30 to 39
   c. 40 to 49
   d. 50 to 59
   e. 60 +

4. Ethnic Group
   a. Inupiat Eskimo
   b. Caucasian
   c. Other

5. Number of Years as a Health Aide
   a. 2 or less
   b. 3 to 5
   c. 5 to 9
   d. 10 or more

Interview Questions

Personal Information

1. How often do you drive or ride a three-wheeler, four-wheeler, or snowgo?
   a. 4 to 7 days a week
   b. 1 to 3 days a week
   c. Other _____

2. Do you think a helmet can help prevent serious injury from a crash?
   a. Wouldn't help at all
   b. No opinion
   c. Would definitely help

3. Have you ever been injured in a crash?
   a. Yes
   b. No

4. Do you own or have access to a helmet?
   a. Yes
   b. No

5. Did you wear your helmet the last time you rode a snowgo, three-wheeler, or four-wheeler?
   a. Yes
   b. No

6. If not, why not?
   a. Never thought of it
   b. It's not needed
   c. Friends don't wear helmets
   d. Ugly color/style
   e. It fogs up
   f. It's uncomfortable
   g. It limits my vision
   h. Other _____

7. If yes, why?
   a. Saw the model wearing one
   b. Went to the class
   c. Could buy a helmet in town
   d. Saw a friend wearing one
   e. Saw the poster
   f. Have been wearing one for a long time
   g. Other _____

8. When you see someone wearing a helmet, do you think they look:
   a. Odd
   b. Safe
   c. Smart
   d. Strange
   e. Other _____

9. Do you think there should be a law requiring helmet use?
   a. Yes
   b. No

For the villages of Deering, Noatak, Noorvik, Buckland, Kiana, and Kotzebue:

10. Have you seen the safety messages around town about wearing helmets?
    a. Yes
    b. No

For the villages of Buckland, Kiana, and Kotzebue:

11. Did you attend the recent class on ATV safety?
    a. Yes
    b. No

12. Have you seen the model wearing his/her helmet while riding?
    a. Yes
    b. No

Key Informant Questions

For all villages:

There are many factors which affect the decision to buy and wear a helmet.

13. Thinking of people in this village, what factors do you think impact the decision to buy a helmet?

14. What percentage of village residents do you think own a helmet?

15. In your opinion, what factors do you think impact the decision to wear a helmet?

16. In your opinion, what factors prevent people from wearing helmets?

17. Do you think people are more inclined to wear helmets in the village or when they go on a trip outside the village?

18. What do you think would be the most effective way to increase the use of helmets by riders of three-wheelers, four-wheelers, and snowgos?

19. Do you think a law would increase the number of people wearing helmets?

If yes, should the law cover all age groups, or should it cover just youth?

20. Thinking of the health care received by people in this village, what factors do you think people consider when they make decisions about their health?

Are these factors different or the same from the factors that impact the decision to wear a helmet?

<u>For the villages of Deering, Noatak, Noorvik, Buckland, Kiana, and Kotzebue:</u>

Helmets were sold here in the clinic during the study. You have had the opportunity to talk with people about helmets. You may have heard discussions about helmet use in general and why people were making the decision to buy a helmet.

21. What factors did you hear people talk about related to buying a helmet?

22. In your experience, why did the people who bought a helmet do so?

a. Pricing
b. Available in the village
c. Safety
d. Saw the posters
e. Other _____

For the villages of Buckland, Kiana, and Kotzebue:

23. During the past three months someone from your village has acted as a role model, wearing the helmet and encouraging other people to do the same.

Do you know who the model was?

Where did you see him riding?

What was he doing?

How often did he wear the helmet? Did he wear it every time he rode the snowgo or three-wheeler, four-wheeler, or snowgo?

Did he encourage people to wear helmets? How often did he talk about the importance of wearing a helmet?

What impact do you think this has had on helmet use in your village?

General:

24. Do you have any other comments you would like to share on the subject? Is there anything important about the subject of helmet purchase and wearing that I have not asked?

Thank you very much for your time.

Appendix R

Interview Consent Form

Purpose of the Research

Head and spinal cord injuries are a significant health problem for the people of the Northwest Arctic Borough. An off-road vehicle crash is the most common cause. Helmets can prevent the vast majority of these injuries. However, we know that few people wear helmets. We are trying to understand why people choose to buy and wear helmets, and also why they avoid helmets.

Interview Duration

This interview should take about 30 minutes.

Procedure

With your permission, this interview will be taped. This will allow me to listen to your answers better while we are talking. If you feel uncomfortable with the tape recorder, I will take notes instead. ☐

Please initial in the box at the right if you agree to have the interview taped.

Nature of Data

You will be asked standard questions. Some are open-ended, but many have a choice of responses. The first section of questions deals with your own attitudes towards helmets. The second section asks you to use your knowledge as a health aide to talk about why people in your village make decisions about health care issues, especially the use of helmets.

Risks or Discomforts

None are anticipated. The interview will be conducted in the clinic and should take only about 30 minutes.

Benefits

This research will help us learn more about why people choose to buy and wear helmets or why they avoid them. We hope to use this information to find ways to increase helmet use in Northwest Arctic Borough. As a result, head and spinal cord injuries from off-road vehicle crashes will decrease, and the health of the people of the region will be enhanced.

Confidentiality

Your name and the name of your village will not be tied to the comments you make during the interview. All findings will be reported as a group. No one will be able to trace your remarks back to you as an individual.

Questions

If you have questions after we leave, you can contact John Spriggs at the Maniilaq Association, 1-800-478-3312, x129.

Voluntary Participation

Your participation is voluntary. If any of the questions make you uncomfortable you may choose not to answer, and you may even stop the interview if needed.

Agreement to be Interviewed

I have read and understood the information provided on the Consent Form.

I agree to be interviewed.

I have received a copy of the Consent Form.

_____

Signature of Participant

Appendix S

Helmet Observations

Weekly Observations of Helmet Use by Treatment Condition and Village

Control Villages

Selawik		Large Village	
Weeks	Observations	No Helmets	Helmets
1	333	333	0
2	473	473	0
Totals	806	806	0

Shungnak		Medium Village	
Weeks	Observations	No Helmets	Helmets
1	118	118	0
2	84	84	0
3	60	60	0
4	75	75	0
5	75	75	0
6	65	65	0
7	13	13	0
Totals	490	490	0

Ambler		Small Village	
Weeks	Observations	No Helmets	Helmets
1	86	86	0
2	61	61	0
3	110	110	0
4	89	89	0
Total	346	346	0

Helmets Only Villages

Noorvik		Large Village	
Weeks	Observations	No Helmets	Helmets
1	137	137	0
2	184	184	0
3	151	151	0
Totals	472	472	0

Noatak		Medium Village	
Weeks	Observations	No Helmets	Helmets
1	154	154	0
2	153	153	0
3	121	121	0
4	100	100	0
5	58	58	0
6	82	82	0
7	84	82	2
8	143	143	0
9	115	115	0
Totals	1,010	1,008	2

Deering		Small Village	
Weeks	Observations	No Helmets	Helmets
1	60	60	0
2	66	66	0
3	55	55	0
4	60	60	0
5	68	68	0
6	67	67	0
7	95	93	2
8	66	65	1
9	62	61	1
10	105	104	1
11	16	15	1
Totals	720	714	6

Modeling Villages

Kotzebue		Large Village	
Weeks	Observations	No Helmets	Helmets
1	260	260	0
2	215	214	1
3	199	198	1
4	207	205	2
5	186	185	1
6	160	160	0
7	164	158	6
8	269	259	10
9	201	189	12
11	208	194	14
Totals	2,069	2,022	47

Kiana		Medium Village	
Weeks	Observations	No Helmets	Helmets
1	87	87	0
2	124	123	1
3	107	105	2
4	140	140	0
5	42	40	2
6	75	70	5
7	130	122	8
8	139	139	0
12	165	160	5
Totals	1,009	986	23

Modeling Villages Continued

Buckland		Small Village	
Weeks	Observations	No Helmets	Helmets
1	84	84	0
2	120	120	0
3	110	110	0
4	103	103	0
5	105	105	0
6	131	131	0
7	107	107	0
8	136	134	2
10	98	98	0
11	151	151	0
Totals	1,147	1,145	2

Summary

		Village Strata			
		Large	**Medium**	**Small**	Totals
Control	Observations	806	490	346	1,642
	Riders with Helmets	0	0	0	0
Helmets Only	Observations	472	1,010	720	2,202
	Riders with Helmets	0	2	6	8
Modeling	Observations	2,069	1,009	1,147	4,225
	Riders with Helmets	47	23	2	72
Total	Observations	3,347	2,509	2,213	8,069
	Riders with Helmets	47	25	8	80
Treatment Villages Combined	Observations	2,541	2,019	1,867	6,427
	Riders with Helmets	47	25	8	80

Helmets/Observations

	Village Strata			
	Large	Medium	Small	**Averages**
Control	0	0	0	**0**
Helmets Only	0	0.002	0.0083	**0.0036**
Modeling	0.0227	0.0228	0.0017	**0.017**
Averages	**0.0144**	**0.0099**	**0.0036**	

	Village Strata			
	Large	Medium	Small	**Averages**
Control	0	0	0	**0**
Experimental	0.0185	0.0124	0.0043	**0.0124**

Appendix T

Helmet Sales

Helmets Sales by Week, Village, and Treatment Condition

Helmets Only Villages				
Weeks	Noorvik	Noatak	Deering	TOTAL
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	1	0	1
7	0	1	0	1
8	0	1	1	2
9	0	4	1	5
10	2	2	0	4
11	1	1	0	2
12	2	0	0	2
TOTALS	**5**	**10**	**2**	**17**

Modeling Villages				
Weeks	Kotzebue	Kiana	Buckland	TOTAL
3	0	0	0	0
4	2	0	0	2
5	6	0	0	6
6	4	0	0	4
7	3	0	0	3
8	2	0	0	2
9	14	8	2	24
10	4	6	1	11
11	1	0	0	1
12	6	0	0	6
TOTALS	**42**	**14**	**3**	**59**

Appendix U

Helmet Observations: Demographic Findings

Age, Gender, and Ethnicity of Off-Road Vehicle Riders by Treatment Condition and Village

Control Villages

Selawik — Large Village

Riders Without Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	179	154	183	150	325	8
2	279	194	255	218	468	5
Totals	458	348	438	368	793	13
%	56.8%	43.2%	54.3%	45.7%	98.4%	1.6%

Shungnak — Medium Village

Riders Without Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	63	55	75	43	118	0
2	43	41	55	29	84	0
3	32	28	31	29	60	0
4	48	27	41	34	75	0
5	41	34	30	45	75	0
6	34	31	32	33	65	0
7	7	6	9	4	13	0
Totals	268	222	273	217	490	0
%	54.7%	45.3%	55.7%	44.3%	100%	0%

Ambler — Small Village

Riders Without Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	56	30	47	39	86	0
2	45	16	37	24	61	0
3	94	16	64	46	110	0
4	75	14	46	43	89	0
Totals	270	76	194	152	346	0
%	78%	22%	56%	44%	100%	0%

Helmets Only Villages

Noorvik — Large Village

Riders Without Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	98	39	93	44	134	3
2	121	63	119	65	181	3
3	105	46	99	52	149	2
Totals	324	148	311	161	464	8
%	68.6%	31.4%	65.9%	34.1%	98.3%	1.7%

Noatak — Medium Village

Riders Without Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	108	46	96	58	149	5
2	100	53	90	63	150	3
3	87	34	74	47	115	6
4	70	30	63	37	95	5
5	52	6	41	17	57	1
6	55	27	51	31	82	0
7	62	20	60	22	82	0
8	98	45	84	59	143	0
9	84	31	72	43	115	0
Totals	716	292	631	377	988	20
%	71%	29%	62.6%	37.4%	98%	2%

Riders With Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
7	1	0	1	0	1	0
Totals	1	0	1	0	1	0
%	100%	0%	100%	0%	100%	0%

Helmets Only Villages continued

Deering — Small Village

Riders Without Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	49	11	40	20	60	0
2	52	14	44	22	66	0
3	41	14	33	22	55	0
4	48	12	37	23	56	4
5	46	22	42	26	66	2
6	51	16	48	19	62	5
7	71	22	63	30	86	7
8	53	12	46	19	56	9
9	46	15	43	18	51	10
10	72	32	68	36	92	12
11	11	4	9	6	13	2
Totals	540	174	473	241	663	51
%	75.6%	24.4%	66.2%	33.8%	92.9%	7.1%

Riders With Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
7	2	0	2	0	2	0
8	1	0	1	0	1	0
9	1	0	1	0	1	0
10	1	0	1	0	0	1
11	1	0	1	0	0	1
Totals	6	0	6	0	4	2
%	100%	0%	100%	0%	67%	33%

Modeling Villages

Kotzebue — Large Village

Riders Without Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	194	66	198	62	226	34
2	175	39	146	68	184	30
3	159	39	142	56	178	20
4	160	45	176	29	174	31
5	147	38	139	46	146	39
6	141	19	127	33	127	33
7	131	27	141	17	135	23
8	220	39	201	58	207	52
9	161	28	140	49	144	45
11	158	36	157	37	156	38
Totals	1,646	376	1,567	455	1,677	345
%	81.4%	18.6%	77.5%	22.5%	83%	17%

Riders With Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
2	1	0	1	0	0	1
3	1	0	1	0	1	0
4	2	0	2	0	2	0
5	1	0	1	0	1	0
7	5	1	2	4	6	0
8	8	2	9	1	10	0
9	8	4	12	0	8	4
11	13	1	13	1	9	5
Totals	39	8	41	6	37	10
%	83%	17%	87%	13%	79%	21%

Modeling Villages continued

Kiana — Medium Village

Riders Without Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	64	23	58	29	75	12
2	76	47	87	36	114	9
3	70	35	82	23	96	9
4	82	58	103	37	128	12
5	29	11	30	10	36	4
6	46	24	55	15	66	4
7	72	50	80	42	110	12
8	81	58	94	45	134	5
12	109	51	99	61	138	22
Totals	629	357	688	298	897	89
%	63.8%	36.2%	69.8%	30.2%	91%	9%

Riders With Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
2	0	1	1	0	1	0
3	0	2	2	0	2	0
5	2	0	2	0	0	2
6	5	0	5	0	0	5
7	7	1	8	0	3	5
12	5	0	5	0	0	5
Totals	19	4	23	0	6	17
%	82.6%	17.4%	100%	0%	26%	74%

Modeling Villages continued

Buckland		Small Village

Riders With Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
1	68	16	66	18	84	0
2	94	26	94	26	120	0
3	72	38	70	40	110	0
4	67	36	65	38	103	0
5	71	34	60	45	105	0
6	88	43	82	49	131	0
7	70	37	62	45	107	0
8	96	40	85	51	136	0
10	73	25	59	39	98	0
11	104	47	91	60	151	0
Totals	803	342	734	411	1,145	0
%	70%	30%	64.1%	35.9%	100%	0%

Riders With Helmets

Weeks	Age		Gender		Ethnicity	
	Adult	Youth	Male	Female	Native	Non-Native
8	1	1	2	0	2	0
Totals	1	1	2	0	2	0
%	50%	50%	100%	0%	100%	0%

Appendix V

Frequencies: Nonhelmet Wearer Curbside Interview

Village

	Interviews	Observations	Percent
Buckland	9	213	4.2%
Deering	10	114	9%
Kiana	35	246	14%
Kotzebue	12	402	3%
Noatak	8	219	3.7%
Noorvik	15	334	4%
Selawik	5	774	1%
Total	94	2,302	4.1%

Village

	Number	Percent
Buckland	9	9.6%
Deering	10	10.6%
Kiana	35	37.2%
Kotzebue	12	12.8%
Noatak	8	8.5%
Noorvik	15	16%
Selawik	5	5.3%
Total	94	100%

Type

	Number	Percent
No Helmet	65	69.1%
Walker	23	24.5%
Auto	6	6.4%
Total	94	100%

Sex

	Number	Percent
Male	48	51.1%
Female	46	48.9%
Total	94	100%

Age

	Number	Percent
<9	1	1.1%
<19	21	22.8%
<29	21	22.8%
<39	22	23.9%
<49	22	23.9%
<59	3	3.3%
>60	2	2.2%
Total	92	100%

Ethnicity

	Number	Percent
Eskimo	82	88.2%
Caucasian	9	9.7%
Other	2	2.2%
Total	94	100.0%

How often do you ride?		
	Number	Percent
<3 days/week	27	28.7%
>4 days/week	67	71.3%
Total	94	100%

Can a helmet prevent injury?		
	Number	Percent
Yes	85	90.4%
No Opinion	8	8.5%
No	1	1.1%
Total	94	100%

Have you been injured?		
	Number	Percent
Yes	25	26.6%
No	69	73.4%
Total	94	100.0%

Do you own a helmet?		
	Number	Percent
Yes	26	27.7%
No	68	72.3%
Total	94	100%

Where did you buy it?		
	Number	Percent
With vehicle	0	0
Kotzebue	7	28%
Village	3	12%
Other	15	60%
Total	25	100%

Why didn't you wear it today?		
	Number	Percent
Never thought of it	6	24%
Not needed	1	4%
Friends don't wear	0	0%
Ugly	1	4%
Fogs Up	0	0%
Uncomfortable	2	8%
Limits my vision	0	0%
Other	15	60%
Total	25	100%
Detail: Other	Too cold	In Town
Didn't want to	Not Racing	In School

People wearing a helmet look:		
	Number	Percent
Odd	6	6.4%
Safe	55	58.5%
Smart	23	24.5%
Strange	2	2.1%
Other	8	8.5%
Total	94	100%
Detail: Other	Stupid	Warm (2)
Saves Hearing	OK (2)	Silly

Did you attend the safety class?		
	Number	Percent
Yes	4	4.3%
No	88	95.7%
Total	92	100%

Did you see the safety messages?		
	Number	Percent
Yes	19	21.8%
No	68	78.2%
Total	92	100%

Have you seen more people wearing helmets?		
	Number	Percent
Yes	19	20.6%
No	73	79.3%
Total	92	100.0%

Should there be a law?		
	Number	Percent
Yes	50	54.3%
No	42	45.7%
Total	92	100%

Walkers and auto riders only: Will you wear your helmet next time?		
	Number	Percent
Yes	2	6.5%
No	29	93.5%
Total	31	100%

Appendix W

Frequencies: Helmet Wearer Curbside Interview

Village			
	Interviews	Observations	Percent
Buckland	1	213	0.5%
Deering	0	114	0
Kiana	1	246	0.4%
Kotzebue	3	402	1%
Noatak	0	219	0
Noorvik	0	334	0
Selawik	0	774	0
Total	5	2,302	0.2%

Age		
	Number	Percent
<9	0	0
<19	1	20%
<29	1	20%
<39	2	40%
<49	1	20%
<59	0	0
>60	0	0
Total	5	100%

Village		
	Number	Percent
Buckland	1	20%
Deering	0	0
Kiana	1	20%
Kotzebue	3	60%
Noatak	0	0
Noorvik	0	0
Selawik	0	0
Total	5	100%

Ethnicity		
	Number	Percent
Eskimo	2	40%
Caucasian	3	60%
Other	0	0
Total	5	100.0%

How often do you ride?		
	Number	Percent
<3 days/week	3	60%
>4 days/week	2	40%
Total	5	100%

Sex		
	Number	Percent
Male	4	80%
Female	1	20%
Total	5	100%

Can a helmet prevent injury?		
	Number	Percent
Yes	5	100%
No Opinion	0	0%
No	0	0%
Total	5	100%

Have you been injured?		
	Number	Percent
Yes	1	20%
No	4	80%
Total	5	100%

Where did you buy your helmet?		
	Number	Percent
With vehicle	0	0
Kotzebue	4	80%
Village	0	0
Other	1	20%
Total	5	100%

Did you wear it the last time you rode?		
	Number	Percent
Yes	5	100%
No	0	0
Total	5	100%

People wearing a helmet look:		
	Number	Percent
Odd	0	0%
Safe	5	100%
Smart	0	0%
Strange	0	0%
Other	0	0%
Total	5	100%

Did you attend the safety class?		
	Number	Percent
Yes	0	0%
No	5	100%
Total	5	100%

Did you see the safety messages?		
	Number	Percent
Yes	4	80%
No	1	20%
Total	5	100%

Do you intend to wear your helmet the next time you ride?		
	Number	Percent
Yes	5	100%
No	0	0%
Total	5	100.0%

Should there be a law?		
	Number	Percent
Yes	4	80%
No	1	20%
Total	5	100%

Why are you wearing a helmet?		
	Number	Percent
Saw other people wearing	0	0
Went to the class	0	0
Could buy in town	1	20%
Saw the poster	0	0
Have been wearing for a long time	0	0
Other	4	80%
Total	5	100%

Detail: Other
To be protected
Personal safety
To be safe - - too many accidents in Alaska

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