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Utilization of mental health services among urban youth with emotional and behavioral disorders: racial/ethnic differences in emergency department and outpatient visits

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UTILIZATION OF MENTAL HEALTH SERVICES AMONG URBAN YOUTH WITH EMOTIONAL AND BEHAVIORAL DISORDERS: RACIAL/ETHNIC DIFFERENCES IN EMERGENCY DEPARTMENT AND OUTPATIENT VISITS

by

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In memory of Javier.

I will think of you on all my long walks.

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ABSTRACT

Rising rates of pediatric emergency department (ED) visits for psychiatric reasons pose a significant burden for healthcare systems in the United States. Utilization of outpatient mental health treatment by youth and their families may prevent some behavioral health crises requiring emergency services, as well as non-urgent ED visits where emergency care is not necessary. This study utilized de-identified electronic health records to examine seasonal and secular patterns in both psychiatric ED presentation and outpatient mental health care utilization among youth, as well as the association of outpatient mental health care with psychiatric ED visits. Racial/ethnic differences in service utilization were also examined. The study sample consisted of 25,545 school-aged youth who were diagnosed with an emotional or behavioral disorder and received services at Boston Medical Center (BMC) between 2009 and 2018. Results indicate significant seasonal patterns in both psychiatric ED visits and outpatient mental healthcare that parallel the school calendar, with more youth receiving services during the school year than in the summer. Mental healthcare among youth of color was more

closely aligned with the school calendar than among White youth, suggesting that schools may be more instrumental for the referral of youth of color into mental healthcare than for White youth. In addition, youth who accessed outpatient care were at decreased risk for psychiatric ED presentation as compared to youth who had not accessed outpatient services. Longer duration of outpatient treatment and a greater number of visits were associated with increased risk for ED presentation, whereas greater frequency of visits was associated with decreased risk for ED presentation. Findings suggest that preventive outreach for youth and families may be particularly helpful in late summer and early winter, prior to significant increases in both psychiatric ED visits and outpatient service use.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BMC	Boston Medical Center
CDW	Clinical Data Warehouse
CPT	Current Procedural Terminology
DSM-5	Diagnostic and Statistical Manual of Mental Disorders
ED	Emergency Department
GLM	Generalized Linear Model
ICD	International Classification of Diseases
NEM-II	Network Episode Model, Phase II

CHAPTER 1: INTRODUCTION

Recent research suggests that almost half of all school-aged youth experience some type of psychiatric disorder by the time they reach adulthood (Merikangas, et al., 2010) and that these youth are at increased risk for a wide range of negative short- and long-term outcomes, including suicide, physical health problems, academic difficulties, impairments in social functioning with family and peers, and involvement with the justice system (Aarons et al., 2008; Fleischmann et al., 2005; Rapee et al., 2012; Skowyra & Cocozza, 2007). Research has identified effective treatments for psychiatric disorders in children and adolescents, that can support healthy development and improve outcomes (Fabiano et al., 2009; Weisz et al., 2004, 2005, 2006).

Unfortunately, only about two-thirds of youth with psychiatric disorders ever receive mental health services (Costello et al., 2014; Merikangas et al., 2011). Among youth who access services, inconsistent or incomplete treatment is a significant barrier to symptom improvement and recovery (Gearing et al., 2014; Schwalbe & Gearing, 2012). Continuity of outpatient mental health care, which refers to regular appointments with consistent providers across time, is associated with treatment adherence, decreased use of emergency services and hospitalization, lower costs, and improved health outcomes (Adair et al., 2005; Brekke et al., 1999; Tait et al., 2004). In the absence of adequate outpatient treatment, youth may experience symptom recurrence and be more likely to experience behavioral health crises (Ali et al., 2012; Frosch, 2011).

One potential consequence of interrupted or incomplete treatment is that youth with psychiatric disorders may be more likely to utilize emergency department (ED)

services (Pittsenbarger & Mannix, 2014; Soto et al., 2009). The ED often becomes the "default" service provider when patients are not receiving needed outpatient psychiatric services and therefore lack regular behavioral healthcare providers when they enter a crisis (Larkin et al., 2005; Weber et al., 2005). Recent studies indicate that psychiatric ED visits by children and adolescents in the United States are on the rise, and that these increases pose a significant resource burden for hospitals (Mahajan et al., 2009; Pittsenbarger & Mannix, 2014). Given its potential for crowds, noise, disturbing sights, and lack of privacy, the ED tends to be an inadequate setting for non-suicidal or non-psychotic mental health assessment and treatment (Cooper & Masi, 2007; Dolan & Fein, 2011). Further, psychiatric ED services are more costly and less intensive than outpatient mental healthcare (Cloutier et al., 2010; Cooper & Masi, 2007; Dolan & Fein, 2011). Understanding patterns in both psychiatric ED and outpatient service use, as well as the association between these two types of mental healthcare, may provide insight into improving mental health service provision for some of the most vulnerable patients and reducing psychiatric ED presentation.

One pattern in psychiatric ED use that may suggest important predictors of mental health need and service utilization is seasonal. A number of studies have examined seasonal patterns in psychiatric emergency service use among school-aged youth (Ali et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017; Peterson et al., 1996). These studies indicate that youth ED visits for psychiatric reasons are more frequent in the fall than the summer, leading researchers and clinicians to hypothesize that youth experience greater mental health challenges when school is in session, and in

particular upon initiation of the school year in September (Ali et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017; Peterson et al., 1996). Yet, another hypothesis is that potential disruptions in continuity of outpatient mental health care during the summer months may be associated with increases in the use of emergency services in the fall. However, few studies have examined continuity in outpatient mental health treatment or addressed the possibility of seasonal patterns in treatment continuity. Understanding seasonal variations in continuity of outpatient mental health care may suggest mechanisms underlying interruptions in treatment, inform efforts to reduce barriers to care, and increase the likelihood that youth will regularly receive needed care, thereby reducing the need for utilization of psychiatric emergency care.

One important demographic variable that has been shown to be associated with youth access to and use of mental health services is race/ethnicity. A rich body of research demonstrates that racial and ethnic minority youth with psychiatric diagnoses are less likely to access outpatient mental health services (Costello et al., 2014; Merikangas et al., 2011), receive fewer treatment sessions when they do access care (Alexandre et al., 2010; Cummings & Druss, 2011), and are more likely to use the ED for mental health services than their White peers even after controlling for socioeconomic status (e.g., income, poverty index; Bruckner et al., 2014; Snowden et al., 2008, 2009). Scholars have suggested some possible reasons for these disparities, including language barriers, mental illness stigma, and distrust of mental healthcare (Alegría & Green, 2015). Nevertheless, existing studies on seasonal patterns in psychiatric ED use have not examined differences in seasonal patterns based on race/ethnicity, either because they

were conducted in U.S. or Canadian samples that were primarily White, did not include racial/ethnic data (Ali et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, Shoenleben, et al., 2017), or because they did not apply statistical methods that accounted for racial/ethnic differences (Peterson et al., 1996). An examination of racial/ethnic variations in seasonal patterns in psychiatric ED visits and outpatient mental health care may help provide a more nuanced understanding of disparities in treatment access and utilization.

In this dissertation, I investigated trends and patterns in continuity of outpatient treatment and ED use, in addition to examining whether continuity of outpatient mental health care is associated with the use of psychiatric ED services. First, I replicated previous research on seasonal patterns and long-term, or secular, trends in youth psychiatric ED use and extended this research by examining differences based on race/ethnicity. Then, I examined seasonal patterns and secular trends in outpatient specialty mental health service use. Finally, I determined whether consistency of outpatient mental health service treatment is associated with psychiatric ED visits. As outlined in this paragraph, this dissertation addressed three specific research questions:

1. How do patterns in youth psychiatric ED visits vary throughout the calendar year and over time?
2. How does continuity of youth outpatient mental health care vary throughout the calendar year and over time?
3. Is continuity of youth outpatient mental health care significantly associated with psychiatric ED presentation?

For each research question, I examined differences by race/ethnicity.

This study will utilize electronic health records (EHRs) from 2009-2018 at an urban healthcare system. This healthcare system includes the largest safety-net hospital in the region, and serves a multicultural population of over 140,000 youth and adults. The sample for the current study will include patients ages 5-18 who received any behavioral health services between September 1, 2009 and May 3, 2018. I hypothesize that psychiatric ED visits and continuity of outpatient mental healthcare will decrease during the summer months, and that there will be significant differences in these patterns related to race/ethnicity (Research Questions 1 and 2). In particular, I expect that racial/ethnic minority youth will experience greater use of psychiatric ED services and more discontinuity in outpatient specialty mental healthcare, and that these patterns will be robust over time. In addition, I hypothesize that more continuous outpatient specialty mental health care will be associated with decreased risk for psychiatric ED presentation (Research Question 3).

Results from this study will provide information that can guide practice and policy, with the goal of maximizing continuity of outpatient specialty mental healthcare for youth with psychiatric disorders and their families and reducing psychiatric ED use. For example, findings may indicate times during the year when outpatient service use is particularly low, suggesting times when outreach may be helpful to promote continuity of care. As another example, understanding disparities in outpatient continuity of care could identify sub-populations that may face substantial barriers to accessing consistent care. This information has the potential to inform outreach and resource allocation for schools,

communities, and behavioral health providers who need to use limited resources as efficiently as possible. Ultimately, the results of this study may support both individual clinicians and healthcare systems in maximizing continuity of youth mental healthcare and add to knowledge that can lead to the minimization of long-term difficulties for children and adolescents who receive those services.

CHAPTER 2: LITERATURE REVIEW

Almost half of school-aged youth in the United States experience an emotional or behavioral disorder by the time they reach adulthood (Merikangas et al., 2010). Many of these youth do not receive needed mental health services (Costello et al., 2014; Merikangas et al., 2011). Among youth who do receive outpatient mental health treatment, there are high rates of incomplete treatment and dropout, which are significant barriers to symptom improvement and recovery (Gearing et al., 2014; Schwalbe & Gearing, 2012). In addition, increasing numbers of youth are presenting in the emergency department (ED) for psychiatric issues, which provides more costly and less adequate mental health services (Dolan & Fein, 2011; Kalb et al., 2019). These issues indicate a critical need for further research examining patterns in the provision and utilization of youth mental health services. In this dissertation, I replicated and extended previous research on psychiatric ED use, conducted parallel analyses on outpatient specialty mental health service utilization, and examined the association between these two types of mental healthcare. To do this, I drew from two theoretical frameworks: (1) Tansella and Thornicroft's (1998) Matrix Model, and (2) Phase II of Pescosolido's Network Episode Model (NEM-Phase II; 2006).

Theoretical Framework

The Matrix Model (Figure 1) was developed with the purpose of describing and interpreting organizational data on mental health service provision (Tansella & Thornicroft, 1998).

Figure 1

The Matrix Model[1]

Overview of the matrix model, with examples of key issues in each cell of the matrix

	Temporal dimension		
Geographical dimension	(A) Input phase	(B) Process phase	(C) Outcome phase
(1) Country/Region level	1A Expenditure on services Role of the media Mental health law Government directives Special interest groups	1B Performance/activity indicators (e.g. admission rates, bed occupancy rates, compulsory treatment rates)	1C Suicide rates SMRs Homelessness Special enquiries
(2) Local level (catchment area)	2A Population needs assessment Population characteristics Budget Staff Fixed expenditure Consumer participation	2B Operational policies Pathways to care Patterns of service use Case loads Contact rates Targeting of special groups	2C Outcomes studies at group level Secondary and tertiary prevention Decrease of local stigma Better access to services
(3) Patient level	3A Individual needs assessment Demands made by patients Demands made by families	3B Quality of treatments Frequency and duration of treatment Continuity of care Income support Vocational services	3C Symptom reduction Satisfaction Quality of life/accommodation Disability/work rehabilitation Burden on care-givers

The matrix model consists of two dimensions, geographical and temporal. The geographical dimension includes aspects of healthcare that are measured at the *country/regional level*, which distinguishes an area of shared laws and government, the *local level*, defined as the catchment area for a specific healthcare system, and the *patient level*, or the domain in which individual or small-group treatment is provided by clinicians. The temporal dimension describes three distinct phases of mental healthcare (*input*, *process*, and *outcome*). *Inputs* describe resources that are invested in the mental healthcare system, and can be visible and invisible. Visible inputs include staff, facilities, and supplies, while invisible inputs include staff training and the working relationships

[1] From "A conceptual framework for mental health services: the matrix Model," by M. Tansella and G. Thornicroft, 1998, *Psychological Medicine, 28*(3), p.503-508 (DOI: 10.1017/s0033291796005880). Copyright 1998 by Cambridge University Press. Reprinted with permission.

between different mental health providers (psychiatrists, social workers, primary care physicians, etc.). The *process phase* consists of the activities involved in the delivery of mental health services, such as the content and timing of treatment and the operational and administrative policies that determine how treatment is provided. *Outcomes* are defined as changes attributable at least in part to the mental healthcare system, although they are subject to many influences (financial, cultural, political, etc.).

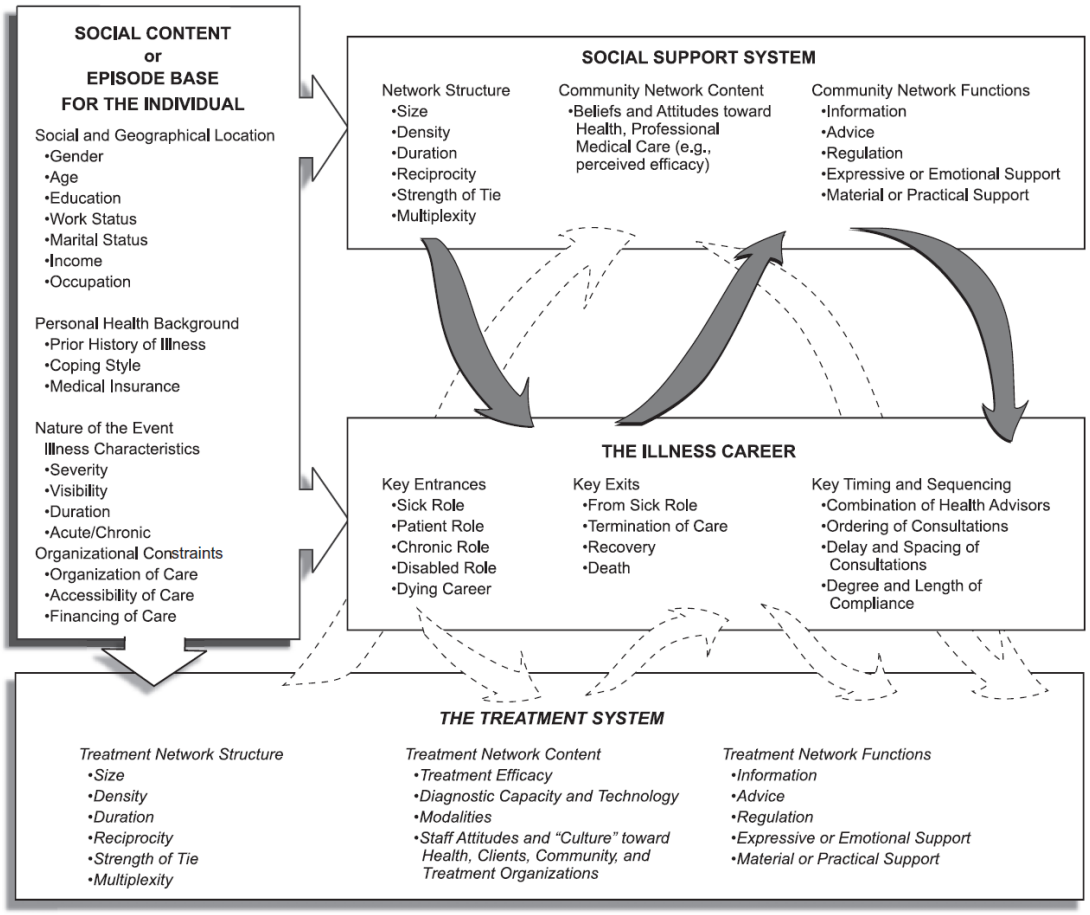
Tansella and Thornicroft (1998) highlight a trend in mental health research that places the most value on data from randomized controlled trials (RCTs), which are designed to establish the clinical efficacy of specific interventions at the patient level. They argue that this narrow focus on RCTs often results in a scarcity of high-quality research at the local and regional levels, and that such research is critical to assessing the clinical effectiveness of treatment in a less rigorous environment (i.e. routine clinical care). However, it becomes more difficult to measure the processes of mental healthcare at the local and regional levels, as the content of mental health treatment provided in routine clinical care contexts is essentially a "black box" (Garland et al., 2010; Tansella & Thornicroft, 1998). The Matrix Model suggests that placing research questions and research findings at their correct geographical and temporal levels can improve understanding of the complex factors that influence mental health service provision (Tansella & Thornicroft, 1998). I employed the Matrix Model as a lens to inform my understanding of existing literature on mental health service provision, develop research questions that would complement this existing scholarship, and interpret findings accordingly.

To better understand the patterns found by analyzing EHR data, I will also draw from the Network Episode Model, Phase II (NEM-II; Figure 2), which offers a time- and network- centered approach to understanding illness and treatment (Pescosolido, 1991, 2006; Pescosolido & Boyer, 1999). Although it can be used to describe other types of illness, the framework was developed to illustrate the range of factors that impact how individuals recognize and respond to mental illness across time.

This model provided an alternative to frameworks which focused primarily on the initial decision to seek and enter care (Pescosolido, 2006; Pescosolido & Boyer, 1999). Instead, the NEM-II highlighted the *illness career*, defined as the "timing and sequencing of key role exits and entrances across an entire episode" (Pescosolido, 2006, p.196). For example, key events in an *illness career* include the point at which a patient conceptualizes him or herself as mentally ill, as well as the point at which they believe they are no longer mentally ill ("the Sick Role"). Other key events include entry and exit points from treatment ("the Patient Role") and significant changes in how an individual views their illness (e.g., "the Disabled Role"). An important aspect of the *illness career* is the timing and sequencing of key events, including delays in accessing/receiving mental healthcare, the time between treatment sessions, and the duration of treatment compliance/adherence. The NEM-II illustrates how the timing and sequencing of key events is influenced by an individual's *social context*, their *social support system*, and their interaction with the *treatment system*, if they have any.

Figure 2

Network-Episode Model, Phase II[2]



As shown in the model, *social context* describes the demographic characteristics of an individual (e.g., gender, race/ethnicity, income) as well as their health background (e.g., history of mental illness, insurance status), current clinical characteristics (e.g., severity of current episode, impairment in daily functioning), and organizational barriers to mental healthcare (e.g., accessibility of services). An individual's *social context* not

[2] From "How do people come to use mental health services? Current knowledge and changing perspectives," by B. Pescosolido and C. Boyer, 1999. In A.V. Horwitz & T. L. Scheid (Eds.), *A handbook for the study of mental health: Social contexts, theories, and systems* (p. 392–411). Copyright 1999 by Cambridge University Press. Reprinted with permission.

only influences the *illness career*, but may also impact their *social support system* and their interaction with the *treatment system* (or lack thereof). *Social support systems* are characterized by the structure of an individual's social network (e.g., the physical and emotional closeness of supporters, the number of supporters, reciprocity between an individual and his or her supporters), the culture of the network (e.g., stigma related to mental illness and/or mental healthcare), and functions of the support network (e.g.,., advice, material support, emotional support). The *social support system* and the illness career impact and interact with one another across time. Sometimes the support system may influence the illness career (e.g., a family member may help convince an individual to seek treatment); at other times, the illness career may impact the *social support system* (e.g., a friend may pull away from an individual because of their refusal to engage in care).

The *treatment system* is similar to the *social support system* in its organization. Key aspects include the network structure (e.g., number of providers, communication between providers), the content of the network (e.g., attitudes towards patients, treatment options, material resources), and the network functions (e.g., information, therapeutic tools/strategies, medication). Although it is not included in this model, for youth, the treatment system also encompass services provided at school, making communication between providers more difficult. Like the *social support system*, the *treatment system* and the *illness career* impact and interact with one another across time. Sometimes the *treatment system* may influence the *illness career* (e.g., effective treatment may decrease the duration of the illness); at other times, the *illness career* may impact the *treatment*

system (e.g., a behavioral health crisis may necessitate new providers being added to the treatment team).

In the illustration, the *social support system* and the *treatment system* do not directly impact one another; however, for children and adolescents, these two systems may actually be in close contact. The parents and/or caregivers, who represent important members of youth support systems, may be a primary point of contact for *treatment systems*, particularly for younger children. Parents/caregivers are often the decision-makers in regards to treatment and exercise a significant degree of control over when and how their children access treatment. As children progress through adolescence, the distance between the *social support system* and the *treatment system* may increase. From a developmental perspective, youth treatment patterns may also be influenced by *social support systems* in ways not accounted for by this model. Taking these developmental considerations into account, I employed the NEM-II as a framework to inform my understanding of the complex factors that influence mental health service utilization at the individual level and interpret findings of analyses conducted at the local and individual levels accordingly.

The NEM-II provides insight into the wide range of treatment patterns that exist for individuals with mental illness, while the Matrix Model (Tansella & Thornicroft, 1998) provides a framework for interpreting treatment patterns on individual, local, and regional levels. In particular, the NEM-II suggests important variables that may predict differences in treatment patterns, such as race/ethnicity. The Matrix Model suggests the importance of examining these socio-demographic differences in treatment patterns not

only at the individual level, but also at the local and regional levels. Throughout this section, and again in the discussion section, I will highlight how these two frameworks informed my understanding of patterns in psychiatric ED use and outpatient mental health treatment among school-aged youth, and how these two types of services are associated with one another.

Youth Psychiatric Emergency Services Utilization

Recent studies demonstrate that pediatric visits to the ED have been increasing significantly over the past two decades (Kalb et al., 2019; Mahajan et al., 2009; Pittsenbarger & Mannix, 2014). Scholars suggest that this may be a result of a number of complex factors, including an increase in prevalence of youth mental illness, increased severity of mental illness, increased diagnosis of mental illness, decreased availability of inpatient care, and patient difficulty in accessing outpatient care (Holder, Rogers, Peterson, & Ochonma, 2017; Holder, Rogers, Peterson, Shoenleben, et al., 2017; Pittsenbarger & Mannix, 2014). This is concerning because psychiatric ED visits require a disproportionate share of hospital resources, including equipment, staff, and space, as compared with non-psychiatric visits; the increasing use of EDs for non-urgent psychiatric issues thereby poses a significant burden for hospitals in the United States (Edelsohn, 2004; Mahajan et al., 2009; Pittsenbarger & Mannix, 2014).

Scholars have suggested that increasing youth access to outpatient specialty mental healthcare has the potential to reduce rates of psychiatric ED visits (Holder, Rogers, Peterson, & Ochonma, 2017; Pittsenbarger & Mannix, 2014; Soto et al., 2009). Youth receiving needed outpatient care may be less likely to experience behavioral health

crises and more likely to utilize outpatient care for non-urgent psychiatric issues (Ali et al., 2012; Frosch, 2011; Soto et al., 2009). This is important given that a significant contributor to rising rates of psychiatric ED use among youth is an increase in visits for non-urgent psychiatric issues, some of which could have been managed with outpatient services, even if they were delayed (Edelsohn et al., 2003; Frosch, 2011; Soto et al., 2009). Specifically, these studies have found that between 33% and 40% of youth psychiatric ED visits are inappropriate, in that they did not involve suicidality or psychosis, and involved a low risk for harm or a low severity of complaint (Edelsohn et al., 2003; Soto et al., 2009). This has led researchers to hypothesize that the ED acts as a "default" service provider when patients who are not receiving needed outpatient services do not have access to regular behavioral health care providers if they experience a crisis (Larkin et al., 2005; Weber et al., 2005). Furthermore, hospital EDs are one of the only locations in which youth with psychiatric symptoms will not be turned away because they have limited or no insurance (Dolan & Fein, 2011).

The primary goal of treatment provided in the ED is stabilization; as a result, services are more costly, less intensive, and less focused on rehabilitation than outpatient care (Cloutier et al., 2010; Cooper & Masi, 2007; Dolan & Fein, 2011). Medical professionals agree that the ED is generally an inadequate setting for non-suicidal, non-psychotic mental health assessment and treatment (Cooper & Masi, 2007; Dolan & Fein, 2011). Dolan and Fein (2011) note that the ED is often crowded, noisy, and may involve exposure to potentially disturbing sights and sounds; in addition, there may be no quiet or private area in which assessment and consultations can take place. One study indicated

that pediatric patients in the ED presenting with mental health complaints waited up to 10 hours for care, almost twice as long as other patients (Christodulu et al., 2002) .

Less than one-quarter of hospital EDs have mental health specialists available to consult with patients (Middleton & Burt, 2006) and over three-quarters of residency programs in emergency medicine do not provide formal training in responding to mental health emergencies (Santucci et al., 2003). This may contribute to findings that approximately 25% of youth presenting in the ED with emotional problems and 30% of youth who had attempted suicide were discharged without receiving a mental health evaluation by a mental health professional (Baraff et al., 2006; Melese-d'Hospital et al., 2002; Substance Abuse and Mental Health Services Administration, 2002). Furthermore, there is evidence to suggest that when emergency room staff do provide care, they may be unprepared or unlikely to implement evidence-based treatment (Grossman et al., 2003). Although treatment providers in the ED may suggest follow-up and provide referrals to outpatient specialty mental health, research examining repeat visits to the ED for psychiatric reasons among youth indicates that patients often do not engage in adequate follow-up care (Mahajan et al., 2007).

Overall, research suggests that non-suicidal, non-psychotic youth with mental health needs who present in the ED are likely to spend long periods of time waiting for suboptimal and inadequate mental health services (cites). Improving utilization of outpatient specialty mental healthcare therefore has the potential to improve treatment for youth with psychiatric disorders, while at the same time alleviating the significant financial burden that psychiatric ED visits place on the healthcare system. This is an

example of how different interactions with the treatment system (e.g., engagement in outpatient care) can influence illness trajectories, as described in the NEM-II (Pescosolido, 2006). In developing strategies to reduce youth psychiatric ED visits and increase outpatient service utilization, examining seasonal patterns in mental healthcare may suggest times of year during which prevention and intervention can have the biggest impact.

Seasonal Patterns in Youth Psychiatric ED Presentation

Previous research has demonstrated that there are seasonal patterns in youth psychiatric ED visits. Studies indicate that pediatric mental health visits to the ED are less frequent during the summer months and subsequently increase in the fall (Ali et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017; Peterson et al., 1996). One study showed that, although ED visits for anxiety disorders, mood disorders and adjustment disorders are lowest in June, they rise steadily throughout the summer and peak in September (Holder, Rogers, Peterson, & Ochonma, 2017). This aligns with the NEM-II (Pescosolido, 2006), in that school and seasonal factors are part of both the social context and social support system of youth, and will therefore impact interactions with the treatment system and illness careers. To explain these patterns, researchers have hypothesized that youth experience greater mental health challenges when school is in session (Ali et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017). I additionally hypothesize that disruptions in outpatient care during the summer may contribute to rising levels of distress over the course of the summer and the resulting increase in psychiatric emergency services utilization. Based on

well-established racial/ethnic disparities in mental health service provision and access (detailed in the next paragraph), I also hypothesize that seasonal patterns in ED visits may vary for youth from different racial/ethnic backgrounds.

Racial and Ethnic Disparities in Mental Health Service Access

Research has consistently indicated differences in youth mental health service provision and utilization based on race/ethnicity. Regardless of season, studies have shown that youth of color are significantly more likely to utilize psychiatric emergency services (Bruckner et al., 2014; Snowden et al., 2008) and significantly less likely to receive any outpatient mental health services than their non-Latino White peers, even after accounting for socioeconomic status (Cook et al., 2013; Cummings & Druss, 2011; Guo et al., 2014). Comparatively greater use of psychiatric ED services among racial and ethnic minority youth may be the result of unmet need for outpatient treatment. Indeed, even when racial and ethnic minority youth do access outpatient services, they receive significantly fewer sessions than their non-Latino White counterparts (Alexandre et al., 2010; Cummings & Druss, 2011). Studies also suggest that youth of color are more likely to receive inconsistent care or drop out of treatment than White youth (Kazdin & Mazurick, 1994; Pellerin et al., 2010). Snowden and colleagues suggest that improving regular outpatient care among minority youth would address mental health needs over the long-term and potentially reduce disparities in the use of emergency services (Snowden et al., 2008). This is consistent with the hypothesis that increasing youth access to outpatient specialty mental healthcare has the potential to reduce rates of psychiatric ED visits in general (Holder, Rogers, Peterson, & Ochonma, 2017; Pittsenbarger & Mannix, 2014;

Soto et al., 2009).

Youth Outpatient Specialty Mental Healthcare

Recent studies demonstrate that the utilization of outpatient mental healthcare among youth has been increasing over the past two decades (Gandhi et al., 2016; Olfson et al., 2014, 2015). There are increases in the number of youth in the United States participating in both psychotherapy and also the number receiving medication management (Olfson et al., 2014, 2015). While it is clear that more youth than ever before are accessing outpatient services, youth psychiatric ED presentation is increasing at much higher rates than outpatient service use (Gandhi et al., 2016). Research also suggests that approximately half of youth who receive outpatient mental health services attend only a few sessions and drop out of treatment prior to completing the recommended number of sessions (Andrade et al., 2000; Baruch et al., 2009; Harpaz-Rotem et al., 2004), and that this poses a significant barrier to symptom reduction and recovery (Gearing et al., 2014; Schwalbe & Gearing, 2012). The extent to which youth receive ongoing treatment is one aspect of continuity of care, a construct that offers insight into how outpatient mental healthcare may impact individual illness trajectories.

Continuity of Mental Healthcare

Leona Bachrach (1981) was one of the first researchers to describe continuity of care in relation to mental health, writing that it is "a process involving the orderly, uninterrupted movement of patients among the diverse elements of the service delivery system" (Bachrach, 1981, p. 1449). Bachrach highlighted continuity of care as a distinct aspect of service delivery, separate from the content of treatment (e.g., cognitive

behavioral therapy, psychoanalysis). In the almost 40 years since Bachrach first described continuity of mental healthcare, researchers have further developed the concept, emphasizing qualities such as consistency in providers and maintenance of contact (Johnson et al., 1997), appropriate access to needed services and case management (Reid et al., 2016), and quality of the patient-provider relationship (Nutting et al., 2003). However, some researchers believe that scholarly definitions of continuity of mental health care are vague and inadequate, leaving questions about how to best measure and promote it in clinical settings (Burns et al., 2009; Joyce et al., 2004; Naert et al., 2017). Although there is not yet consensus on one unifying definition of continuity of care, scholars agree that it is a multi-dimensional construct that incorporates regular service delivery, provider-patient relationships, and coordination of treatment by an organized team (Burns et al., 2009; Puntis et al., 2015; Weaver et al., 2017).

In some literature, regular service delivery is described as treatment adherence (Gearing et al., 2014; Nock & Ferriter, 2005). The construct of treatment adherence overlaps with some aspects of continuity of care, such as maintenance of contact and timeliness of service utilization; however, much of the literature addressing treatment adherence does not reference continuity of care, and vice versa. These two domains reflect fundamentally different understandings of gaps in care and who is responsible for maintaining ongoing treatment. When discussing continuity of care, responsibility for ongoing treatment is generally attributed to the healthcare system and providers. The literature on treatment adherence places responsibility on the patient, although the role of systems and providers is recognized, and research has evaluated strategies that behavioral

health providers can use to promote treatment adherence for children and adolescents (Cavaleri et al., 2010; Schwalbe & Gearing, 2012; Tait et al., 2004). I will be using terminology consistent with that used in the literature describing continuity of care, such as regular service delivery, although I am including studies from both domains.

In adults with mental illness, continuity of outpatient mental health care has been associated with treatment adherence, decreased use of emergency services and hospitalization, lower healthcare costs, and improved health outcomes (Catty et al., 2013; Chien et al., 2000; Greenberg et al., 2003; Greenberg & Rosenheck, 2005; Saultz, 2005). However, a 2015 systematic literature review identified significant limitations in the literature examining the association between continuity of care and patient outcomes (Puntis et al., 2015). In particular, researchers found that inconsistency in the measurement of continuity of mental healthcare, small sample sizes, short follow-up periods, and conflicting findings across studies, made it difficult to generalize results (Puntis et al., 2015).

Although there are studies describing and evaluating continuity of mental healthcare in youth (Naert et al., 2017; Tobon et al., 2014, 2015), there is little research about how youth continuity of care is associated with relevant patient outcomes. The few studies that have been conducted are promising, and suggest that increased continuity of mental healthcare is associated with an improvement in symptoms and decreased likelihood of psychiatric ED presentation (Pennap et al., 2020; Tait et al., 2004). In one such study, Tait and colleagues (2004) recruited 127 adolescents who presented in the ED for an issue related to substance use; higher continuity of care (measured by attendance at

treatment sessions) was associated with safer substance use behaviors (non-hazardous alcohol consumption and/or non-injecting drug use) and a decline in substance use overall (Tait et al., 2004).

A more recent study analyzed Medicaid claims data for almost 40,000 youth living in the Mid-Atlantic US who received at least two outpatient mental visits prior to appearing in the ED for psychiatric reasons (Pennap et al., 2020). Continuity of care was measured using the Alpha Index, a weighted average incorporating an indicator of the concentration of providers and a measure of the sequential continuity of outpatient visits (Lou, 2000). Results indicated that increased continuity of care was associated with lower odds of psychiatric ED presentation or inpatient hospitalization (Pennap et al., 2020).

Despite few studies on the subject, the existing body of literature generally assumes that consistent and sustained treatment for youth with mental illness is associated with better psychosocial outcomes (Brookman-Frazee et al., 2008). This assumption is likely based on clinical trials that are designed to determine the impact of specific interventions (Boggs et al., 2005; Danko et al., 2016; Kazdin et al., 1994; Kazdin & Wassell, 1998). For example, a 1998 study examined treatment attendance for 304 youth ages 3-13 with externalizing disorders in the context of a clinical trial evaluating the efficacy of cognitive problem-solving skills training (Kazdin & Wassell, 1998). Results indicated that, within the context of this clinical trial, children and families with more cancellations or missed appointments had poorer clinical outcomes than those with fewer cancellations or missed appointments (Kazdin & Wassell, 1998). Surprisingly, there is very little empirical research that addresses psychosocial outcomes associated

with consistency of typical outpatient mental health care, as distinct from treatment attrition and completion in clinical trials.

This is concerning because clinical trials may not be ecologically representative of general outpatient mental healthcare for a number of reasons. First, patients who agree to participate in intervention research are generally not representative of the population as a whole (Kennedy-Martin et al., 2015; Susukida et al., 2016). In addition, the measures put into place to control variability and ensure internal validity further narrow the characteristics of participants (Sherman et al., 2016). For example, clinical trials rigorously screen patients and incorporate specific eligibility criteria for participants prior to their participation, whereas community mental health providers cannot preselect the characteristics of their patients (Sherman et al., 2016). In clinical trials, specialized personnel conduct manualized protocols; in contrast, typical outpatient mental health providers tailor treatment timelines and content to the characteristics and circumstances of each individual patient (Shean, 2014). Although clinical trials are essential to the development of effective interventions, there is also a critical need for research examining continuity of outpatient mental healthcare in naturalistic settings. In fact, medical scholars are increasingly recommending analysis of "real-world evidence," such as Electronic Health Records (EHRs), to complement and inform the work of clinical trials (Booth & Tannock, 2014; Sherman et al., 2016). This aligns with the Matrix Model (Tansella & Thornicroft, 1998), which highlights the role that observational research at the local and regional levels can play in interpreting findings from clinical trials and translating research into practice. In order to conduct quality research on patterns of

outpatient service use, it is first important to discuss and select appropriate methods for measuring continuity of care.

Measuring Continuity of Care. Continuity of care is considered an important indicator when evaluating the quality of mental health service provision, and researchers have therefore developed a number of methods for assessing it (Burns et al., 2009). The earliest measures were developed to assess continuity of care for adults with mental illness. For example, Ware and colleagues (2003) developed a patient interview to measure continuity of care, which was validated in a sample of 400 adults with psychiatric disorders (Ware et al., 2003). Interview questions address patient experiences related to the provider-patient relationship, provider availability, coordination across services, and transitions between different types of services (emergency, inpatient, and outpatient; Ware et al., 2003). Whereas the measure developed by Ware and colleagues (2003) was intended for use by mental health service researchers, the Alberta Continuity of Services Scale for Mental Health (Durbin et al., 2004) was designed, and later refined, for providers and healthcare organizations to monitor continuity of care as an indicator of service quality (Adair et al., 2005). The Alberta Continuity of Services Scale for Mental Health combines a patient self-report survey with a staff assessment package. The patient survey addresses perceptions of the availability of needed services, mechanisms to improve access (e.g., appointment reminders), relationships with providers, and coordination across services (Durbin et al., 2004). For each patient, staff complete measures of patient functioning and a service utilization report of estimated need and actual receipt of clinical and case management services (Durbin et al., 2004).

In 2014, Tobon and colleagues published the first tool to assess continuity of mental healthcare for children. The Continuity of Care in Children's Mental Health Measure is a parent survey with an additional youth self-report component for adolescents (Tobon et al., 2014). Both parents and youth are asked to respond to items about case management, individualized services, relationships with providers, consistency of services over time, and transitions between services and providers (Tobon et al., 2014). The Continuity of Care in Children's Mental Health Measure was intended to provide healthcare organizations and providers a tool to monitor and improve continuity of mental health care for youth with psychiatric disorders.

An alternative approach to assessing continuity of mental health care involves the use of medical records. In 2003, Fortney and colleagues observed that many aspects of continuity of outpatient mental healthcare could be readily assessed using administrative data, and noted that surprisingly little research had addressed this possibility. Administrative data is routinely collected in healthcare systems, often in the form of EHRs, and includes demographic information, medical records, and insurance claims (Evans et al., 2010; Spiranovic et al., 2016). Fortney and colleagues (2003) described how administrative data could be analyzed to address five distinct aspects of continuity of outpatient mental healthcare: (1) the frequency of mental health visits by a patient could be used as an indicator of the timeliness of service provision, (2) quantity of visits over a given period of time could provide a proxy for the intensity of services received, (3) the number of different services received by a patient could be used as an indicator of the comprehensiveness of services provided, (4) the consistency of providers across time

could be used to indicate the stability of the patient-provider relationship, and (5) the receipt of case management services could provide as a proxy for the coordination of service provision.

Electronic health records (EHRs) represent a readily available source of administrative data, which have the potential to inform the field's understanding of continuity of mental health care. Utilization of existing data is both cost-effective and non-invasive, as it presents minimal risk to patients (Evans et al., 2010; Spiranovic et al., 2016). In addition, EHRs are longitudinal by nature, and can therefore be employed to examine patient interactions with the treatment system and aspects of illness trajectories across time, as described in the NEM-II (Evans et al., 2010; Pescosolido, 2006). Furthermore, EHRs offer opportunities to analyze data at the local and regional levels, areas for which the Matrix Model highlights the need for quality research (Tansella & Thornicroft, 1998). Despite their availability, there is a scarcity of research utilizing EHRs to assess the continuity of outpatient behavioral health services, in particular for children and adolescents.

In examining mental health service provision, administrative data offer the opportunity to examine substantially different aspects of continuity of care than patient and clinician interviews and surveys. Research highlighting patient and provider perceptions of continuity of care is valuable, but requires substantial time and funding to obtain; alternatively, administrative data can accurately provide a timeline of mental health care and important events, across different providers and departments. However, there are some limitations when utilizing EHRs for retrospective analysis, as

administrative data are not collected with research in mind. Disadvantages include the potential for inconsistencies in reporting across providers, difficulty linking data from multiple sources, and the availability of relevant variables (Spiranovic et al., 2016; Weiskopf & Weng, 2013). For example, a provider in the ED may not diagnose a psychiatric disorder the same way as an outpatient provider, but both diagnoses will appear in the medical record. In addition, different medical software programs may be used in the ED and in outpatient clinics; merging the data from different software programs can be a complicated and time-consuming process. Scholars have responded to these concerns by outlining a number of steps researchers can take to minimize problems, (Castillo et al., 2015; Spiranovic et al., 2016), which are further discussed in Chapter 3.

Correlates of Continuity of Outpatient Mental Health Care. A few recent studies have identified factors that may be associated with continuity of outpatient mental health treatment in youth. A 2015 study examined factors that were associated with continuity of outpatient mental health care among 952 Ohio youth diagnosed with schizophrenia and bipolar disorder in the foster care system (Fontanella et al., 2015). Administrative data were extracted from Medicaid eligibility and claims files, the Area Resource File (Health Resources and Services Administration, 2007-2010), and Ohio State Psychology and Social Work Licensure Boards. Results indicated that access to previous outpatient care, chronic medical illness, comorbid anxiety, and the use of multiple psychotropic medications were associated with greater likelihood of regular outpatient treatment (defined in this study as the receipt of at least one outpatient mental health visit per month; Fontanella et al., 2015). Youth living in urban areas and regions

with fewer psychiatrists per capita were less likely to receive regular outpatient mental health care (Fontanella et al., 2015). Generalizability of findings were limited by the narrow and specific population of interest, changes in service utilization after health care reform in 2010, and the information available from the data sources (e.g., there were no data related to patient-provider relationships or clinical outcomes). Overall, the findings suggest that youth in the foster care system with mental illness received inadequate continuity of outpatient mental health care.

In 2010, Pellerin and colleagues examined demographic and clinical factors associated with youth psychosocial treatment completion among 250 families at an urban community mental health clinic in southeast Louisiana (Pellerin et al., 2010). Data were obtained from the clinic's database of patient records. It is unclear how treatment completion was assessed by the authors; the authors indicate that individual treatment plans were developed for each patient, but do not state who determined whether treatment had been completed or guidelines for how that determination was made. Results indicated that lower levels of parent educational attainment and higher levels of parental stress were associated with treatment drop-out (Pellerin et al., 2010). In addition, youth with more severe symptoms and functional impairment were less likely to complete the recommended number of treatment sessions (Pellerin et al., 2010). These findings seem to contrast to those of Fontanella and colleagues (2015), who found that indicators of severity (comorbidity, use of medication) were positively associated with higher continuity of care; differences in the population studied (foster children from across Ohio vs. families at one urban clinic in Louisiana likely contribute to contrasting results.

Pellerin and colleagues' (2010) findings were consistent with results from a 2008 study that analyzed data from 169 adolescents aged 11-18 receiving treatment at two community mental health clinics in San Diego County (Brookman-Frazee et al., 2008). Results indicated that youth who reported greater severity of symptoms engaged in significantly more treatment sessions than those who reported less severe symptoms (Brookman-Frazee et al., 2008).

Racial/Ethnic Disparities in Continuity of Care. There are also a few studies that specifically examine differences in continuity of youth outpatient mental healthcare based on race/ethnicity. In 2010, Alexandre and colleagues analyzed data from the nationally representative 2005 National Survey on Drug Use and Health. They identified a sample of 1,688 youth between the ages of 12 and 17 who reported a major depressive episode in the previous year. Findings indicated that the odds of receiving adequate care for a major depressive episode (defined as either an appropriate prescription plus at least four visits with a provider *or* at least eight visits with a mental health provider) were 1.5 times greater for White youth than for youth of color (Alexandre et al., 2010). A similar study from 2011 analyzed data from the same nationally representative survey for the years 2004 to 2007, and identified a sample of 7,704 youth between the ages of 12 and 17 who reported a major depressive episode in the previous year (Cummings & Druss, 2011). In this study, findings indicated that Hispanic youth received significantly fewer outpatient mental health visits (approximately 3 fewer visits per year) than White youth; there were no differences in the number of visits between Black youth or Asian youth and their White peers (Cummings & Druss, 2011). However, given that existing studies

employ either dichotomous measures of continuity of outpatient care or a simple count of the number of outpatient visits, research would benefit from using additional measures of continuity, such as the frequency of visits over time (Fortney et al., 2003). Given the importance of seasonal patterns in psychiatric ED presentation, it may also be important to examine seasonal patterns in outpatient treatment, which may offer additional clues about reasons for interruptions in mental health service provision and utilization.

Seasonal Patterns in Outpatient Mental Health Care

Despite evidence related to seasonal patterns in youth psychiatric ED visits (Ali et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017), limited research has addressed the impact of seasonality on outpatient mental healthcare. There is a narrowly focused body of research looking at 'drug holidays' for youth with ADHD. Studies have found that between 25% and 60% of youth taking medication for ADHD intentionally skipped medication administration at least once during the course of treatment, and that this was usually done during weekends and summer vacation (Barnard-Brak et al., 2013; Dosreis et al., 2003; Faraone et al., 2007; Hugtenburg et al., 2005; Snyman & Truter, 2012; Wilens et al., 2005). A 2008 study of prescription records between 2003 and 2007 indicated that the total monthly volume of ADHD medication prescriptions decreases approximately 25% between May and July (Cascade et al., 2008). A recent review of the literature on ADHD drug holidays found that studies that analyzed prescription records found a lower prevalence of drug holidays among youth with ADHD than studies that used parent report data (Ibrahim & Donyai, 2015). In addition, the most recent practice guidelines published by the American Academy of Child and Adolescent

Psychiatry recommend intentional breaks from medication administration to assess ongoing need for treatment (American Academy of Child and Adolescent Psychiatry, 2007). It is unclear whether breaks from medication administration, whether supervised by a doctor or not, would be associated with fewer outpatient visits or appear on the medical record in a meaningful way.

Beyond the administration of ADHD medication, seasonal factors such as weather, holidays, and scheduling represent potential barriers to continuity of outpatient care for youth with a range psychiatric disorders (Laughlin, 2010; Tovar et al., 2010). Identifying when youth are most likely to experience disruptions in mental health care may suggest times of year when outreach may be particularly important or effective, or when extra staffing may be necessary. Below I describe two examples of how seasonal factors may impact patterns in outpatient mental health service utilization.

First, the closure of most schools in the summer likely affects childcare, scheduling, and finances for families with children (Laughlin, 2010). Given that all three of these represent recognized barriers to mental health service use and treatment adherence (DeRigne, 2010; Mendez et al., 2009; Schwalbe & Gearing, 2012), families may find it difficult to continue regular mental health care for children during the summer months. Providers may limit their schedules during the summer or take time off for vacation, limiting the availability of appointments. Second, schools often facilitate the referral process for mental health services, such as regular counseling from a behavioral health care provider (Green et al., 2013; Wood et al., 2005). A lack of contact with trained teachers and school staff, who interact with students over time, may mean that

students in need are not identified or supported in accessing care during the summer months. Another opportunity for interruptions in mental health service use may be the period between Thanksgiving and Christmas, which can be a stressful time for families. In addition, families and providers may be especially busy and/or traveling throughout this approximately six-week period, and as a result regular schedules may be disrupted and appointments may be missed.

Outpatient Mental Healthcare and Psychiatric ED Visits

Scholars who study psychiatric ED presentation among youth consistently hypothesize that difficulties accessing outpatient mental healthcare are contributing to increases in ED visits and that increasing youth access to and utilization of outpatient care will help reduce psychiatric ED visits (Ali et al., 2012; Holder, Rogers, Peterson, & Ochonma, 2017; Pittsenbarger & Mannix, 2014; Soto et al., 2009). However, few studies have actually examined the association between youth outpatient mental health service use and psychiatric ED presentation. A 2009 study analyzed a year of ED records from a hospital in Queens, New York for children and adolescents under the age of 18 who presented for psychiatric reasons (approximately 1,000 ED visits; Soto et al., 2009). They found that over two-thirds of patients were currently receiving some form of outpatient mental healthcare. A lack of current outpatient treatment was significantly associated with inappropriate ED presentation (that could have been handled in an outpatient setting, even if delayed); however, this relationship was non-significant in models that controlled for symptom severity and other clinical characteristics (Soto et al., 2009).

Frosch and colleagues (2011) examined the association between outpatient mental

healthcare and repeat psychiatric ED presentation among 338 youths who presented in the Johns Hopkins Hospital Pediatric Emergency Department on two occasions within 6 months of each other between 2008 and 2009. Consistent with results from Callahan Soto (2009), nearly two-thirds of youth in the sample were already connected with an outpatient mental health provider at both ED visits in the study period (Frosch, 2011). In addition, most of these repeat ED users presented with non-suicidal, non-psychotic complaints at both visits (exact percentage not provided in article; Frosch, 2011). Because existing studies only include youth who utilize emergency services for psychiatric reasons, it is impossible to draw conclusions about whether youth receiving outpatient mental health treatment are less likely to present in the ED for psychiatric reasons. In addition, existing studies used dichotomous variables to indicate outpatient treatment (yes/no); incorporating measures of continuity of care into future studies would provide more insight into what aspects of outpatient care might help prevent psychiatric ED presentation. Given that scholars have repeatedly hypothesized that improving youth access to and utilization of outpatient mental healthcare has the potential to prevent behavioral health crises, reduce psychiatric ED presentation, and address racial/ethnic disparities treatment provision, the lack of research evaluating this possibility represents a critical gap in the literature.

Current Study

There is a need for more research examining seasonal and secular patterns in youth behavioral health care, including both ED visits and outpatient services. This project will replicate previous research by examining seasonal patterns and secular trends

in psychiatric ED presentation, and then extend the literature by examining seasonal patterns and secular trends in specialty outpatient mental health service utilization. In addition, I will also consider whether continuity of outpatient mental health care is associated with psychiatric ED presentation. Within each analysis, I will investigate potential differences in treatment utilization based on race and ethnicity. Understanding seasonal patterns in behavioral health care may suggest times during the year when there may be a high need for child and adolescent mental health supports, providing opportunities for early identification and prevention. Identifying potential connections between continuity of care and ED presentation may suggest methods for reducing psychiatric ED visits, which could in turn help reduce the significant burden these visits place on the healthcare system. Understanding disparities in service use may help identify specific populations that would benefit from outreach and engagement efforts. Overall, this study has the potential to inform outreach and resource allocation for schools, communities, and mental health providers who support youth with emotional and behavioral disorders throughout the year.

CHAPTER 3: METHODOLOGY

This study used de-identified electronic health records (EHRs), which included emergency department and outpatient medical records at an urban healthcare system from September 1, 2009- May 3, 2018. Boston Medical Center (BMC) is an academic community health care system and the largest safety net hospital in New England, serving a multicultural population of over 140,000 patients, regardless of whether they have insurance or are able to pay for services. Close to three-quarters of BMC patients yield from underserved populations, including low-income and immigrant families. Seventy percent of patients are from racial and ethnic minority backgrounds, almost half of whom do not speak English as a primary language. A range of mental health services are available for youth within the BMC system, including assessment, outpatient and inpatient treatment, and emergency services, as well as consultations for schools, courts, and child serving agencies. These services are facilitated primarily by the Department of Child and Adolescent Psychiatry.

Data Source

All data were obtained from the Clinical Data Warehouse (CDW) at BMC, which compiles and consolidates EHRs from the BMC Electronic Medical Record Systems. Researchers do not have direct access to the CDW; instead, they consult with clinical research data managers employed by the CDW. Through these consultations, an ID-coded dataset with demographic and clinical information was developed. The CDW serves to minimize some of the limitations related to the use of EHRs; for example, the role of the data managers is to compile and merge data from the software programs used

across the BMC system, and they have experience managing inconsistencies between these programs. Once this dataset was extracted, it was stored on Boston University's secure password-protected servers and were accessible only to the research team. IRB approval for this study was obtained from both the Boston University School of Medicine and the Charles River Campus. Records from September 1, 2009 to May 3, 2018 were compiled, to allow for the analysis of seasonal and secular trends since the enactment of Massachusetts and federal healthcare reform (2006 and 2008, respectively).

In accordance with literature related to limitations of EHRs, I took a number of steps during the data extraction process to minimize possible issues (Castillo et al., 2015). First, I discussed the goals of my project with a clinical research data manager with the purpose of identifying the variables of interest (Castillo et al., 2015). This allowed us to consider what data fields, both structured and unstructured, might contain the information needed. This discussion was important because, while I had a clear sense of the information I wanted, the data manager understood the software systems from which the data were being extracted and the issues related to these systems. Second, we used an iterative process to extract data (Castillo et al., 2015). For example, after receiving an initial dataset, I was concerned about missing data in the race and ethnicity data fields; after discussing this with the data manager, we decided to include the patient's zip code in the final data set, since this information could potentially be used to impute race/ethnicity data. Third, I consulted with providers in the Department of Psychiatry and the Department of Pediatrics to develop clear procedures for data cleaning, which are described in the following sections.

Sample

The sample was comprised of 25,545 school-age children and adolescents (ages 5-18) who were treated at BMC between September 1, 2009 and May 3, 2018, and who were identified as having an emotional and/or behavioral diagnosis. Patients were included in the study if they had been diagnosed with any of the following disorders/symptoms as indicated by the International Classification of Disease (ICD) codes listed in Table 1.

Table 1

Emotional and behavioral diagnoses included in the study

ICD-10	**ICD-9**	**Category**
F10-F19	303-305	Substance use disorders
F20-F29	295, 297, 298, 301	Schizophrenia, schizotypal, delusional, and other non-mood psychotic disorders
F30-F39	296, 298, 300, 311	Mood (affective) disorders
F40-F49	298, 300, 307-309, V40, V62	Anxiety, dissociative, stress-related, somatoform and other nonpsychotic mental disorders
F50-F59	302, 307, 316	Behavioral syndromes associated with physiological disturbances and physical factors
F60-63, F65-69	302, 312	Disorders of personality and behavior (excluding gender identity disorders)
F80-F89	299, 315	Pervasive and specific developmental disorders
F90-F98	307, 309, 312-314, V62	Behavioral and emotional disorders with onset usually occurring in childhood and adolescence
F99	V40	Mental disorder, not otherwise specified
R45	V62	Symptoms and signs involving emotional state
R46	V40	Symptoms and signs involving appearance and behavior
T14		Suicide attempt
T50		Poisoning, intentional self-harm

Measures

Study variables were created using the dataset developed with the CDW. The procedures for creating each of these variables is described below.

Diagnostic Category

To categorize the range of diagnoses that patients had been assigned, I first developed a master list of emotional/behavioral diagnoses in the sample using the ICD codes indicated in the problem list and visit diagnosis sections of the medical records. ICD-10 codes were used whenever available. If only an ICD-9 code was available, a crosswalk prepared by psychiatrists at Boston Medical Center was used to find the equivalent ICD-10 code (See Appendix A). This was then checked using an online coding and crosswalk tool (American Academy of Professional Coders, 2020). Diagnoses were then organized into 13 categories based on the Diagnostic and Statistical Manual of Mental Disorders (DSM–5; American Psychiatric Association, 2013). Two additional indicator variables were created to identify mental health issues that may be treated, but do not themselves constitute a specific disorder: (1) symptoms and signs involving emotional state, appearance, and behavior, and (2) suicide attempt. Diagnostic categories and the ICD-10 codes associated with them are described in Table 2.

Comorbidity

The number of diagnostic categories a patient was assigned was summed to create a continuous variable representing the total number of diagnoses from distinct disorder categories a patient was associated with during the study period (score of 0-13).

Table 2

Diagnostic categories

Diagnostic category	**ICD-10 Code**	**Additional description**
Substance use disorders	F10-F19; F55	
Schizophrenia, schizotypal and delusional disorders	F20-F29; F53	
Mood (affective) disorders	F30-F39; F53	Examples include MDD and bipolar disorders
Anxiety and somatoform disorders	F40-F42; F44-F49; F93	Examples include GAD and specific phobias
Traumatic and attachment disorders	F43	Examples include PTSD and reactive attachment disorder
Eating and related disorders	F50; F98	Examples include anorexia, bulimia, pica, and enuresis
Sleep disorders	F51	Examples include insomnia and parasomnia
Otherwise specified childhood onset emotional and behavioral disorders	F54; F93; F98	Diagnoses with these codes are generally listed as ‘unspecified behavioral and emotional disorders with onset occurring in childhood and adolescence’, ‘childhood emotional disorder, unspecified’, or something equally vague
Personality and behavior disorders	F60-F63; F68-F69	Examples include APD and IED
Pervasive and specific developmental disorders	F80-F89; F94-F95	Includes Developmental Delays, ASD, and Tourette’s Disorder
ADHD	F90; F98	
Conduct disorders	F91	Examples include conduct disorders and ODD
Other mental disorder	F99	Diagnoses with these codes are generally listed as ‘mental disorder, NOS’, ‘psychiatric illness’, or something equally vague
Symptoms and signs involving emotional state, appearance, and behavior	R45, R46	Includes, but is not limited to, suicidal ideation, homicidal ideation, agitation, hostility, poor hygiene, strange behavior, slowness or over-activity, and violent behavior
Suicide attempt	T14, T50	Includes intentional overdose

In addition, a binary variable was created to identify whether patients had only one disorder (or multiple disorders from only one category; scored 0) or they had 2 or more disorders from multiple categories (scored 1). For example, a patient who was diagnosed with generalized anxiety disorder and a panic disorder (which are both from the same diagnostic category), would have a score of 1 for the continuous indicator of comorbidity and a score of 0 for the dichotomous indicator of comorbidity. Throughout this dissertation, these two variables will be referred to as the continuous indicator of comorbidity and the dichotomous indicator of comorbidity.

Psychiatric ED Utilization

Psychiatric ED use was determined by the date (MM/DD/YYYY) of each psychiatric ED presentation. ED visits were included in the study if the visit diagnosis (ICD codes) recorded in the EHR was related to mental health, using the same coding criteria described to identify patients for inclusion in the study.

Outpatient Specialty Mental Health Services Utilization

Outpatient visits were included primarily based on Current Procedural Terminology (CPT) codes used for medical billing. Using billing guides developed for psychiatrists, psychologists, and social workers (American Academy of Child and Adolescent Psychiatry, 2018; American Psychiatric Association, 2013; American Psychological Association, 2019; National Association of Social Workers, 2017), I developed a list of potential CPT codes for inclusion. A number of codes were included in the study that had been retired in 2013 and are no longer in use. The initial list of codes was then circulated to an interdisciplinary team of BMC psychiatrists (3), clinical

psychologists (2), and social workers (2) who work with children and adolescents, for their review and feedback. Codes identified by this team that were not already on the list were added (e.g., codes used by psychiatrists for medication management); the team did not identify any codes to be removed.

The CPT codes selected for inclusion in the study included two types of outpatient visits. The first was CPT codes associated with only mental health issues. These included visits coded for psychotherapy (90804, 90806, 90807, 90809, 90832-90834, 90836-90838 90847, 90849, 90853), psychiatric therapeutic procedures (90805), and psychopharmacologic management (90862). Visits associated with these CPT codes were always included in the study. However, a second group of CPT codes used by mental health professionals was not used exclusively for mental health purposes. CPT codes 97110, 97112, 97116, 97150, and 97535 are used primarily for physical and occupational therapy, but may also be used for some behavioral health services (e.g., music therapy). There are also a number of CPT codes used regularly by psychiatrists for office visits and services such as medication management. These codes indicate office or other outpatient services- new patient (99201-99205), office or other outpatient services-established patient (99211-99215), office or other outpatient consultations (99241-99245), and prolonged outpatient services with direct patient contact (99354, 99355). These codes are also used by physicians across many fields of medicine, so additional steps were taken to determine whether a visit with these codes would be included in the study.

For visits coded 97110, 97112, 97116, 97150, 97535, 99201-99205, 99211-

99215, 99241-99245, 99345, and 99355, I identified both the department in which the appointment took place and the primary department with which the provider was affiliated. An outpatient visit with these CPT codes was included in the study if either the visit took place in or the provider's primary department was one of the following departments associated primarily with mental health services: adolescent social services, adult psychiatry, behavioral health, child and adolescent psychiatry, developmental/behavioral pediatrics, pediatric behavioral health, and social work.

Continuity of Outpatient Care. Continuity of outpatient specialty mental health care was measured within treatment periods. Because I was analyzing treatment for a wide range of psychiatric disorders, and practice guidelines for adequate care differ for each specific disorder, (American Academy of Child and Adolescent Psychiatry, 2020), it was necessary to determine criteria for identifying distinct treatment periods that would be appropriate for many disorders. Based on prior studies that examined psychiatric treatment episodes among youth and adults (Cook et al., 2017; Cook et al., 2014; Tansella et al., 1995), a treatment period was defined as beginning the day of the initial visit (or initial visit after a break in treatment 90 days or longer) and ending when care stopped for 90 days or longer.

Once outpatient visits had been organized into distinct treatment periods, continuity of care was measured in three distinct ways. As suggested by Fortney et al. (2003), I examined the duration of a treatment period days between the first visit and the last visit and the quantity of outpatient visits during a treatment period. In addition, I examined the frequency of outpatient visits, defined as the average number of days since

the previous outpatient appointment across the treatment period (Fortney et al., 2003). To calculate frequency of visits, I calculated the number of days since the previous outpatient appointment for each day of the treatment period; I then calculated the average of these values.

When calculating the duration of a treatment period and the quantity of visits, it was necessary to account for both left- and right- censoring in the data. To correct for left-censoring in the data, adjustments were made to exclude treatment periods that may have begun prior to the first day for which data were available. Treatment periods that started during the first 90 days for which outpatient data were available may have in fact begun earlier, and were therefore excluded from analysis related to duration and quantity of treatment. This resulted in the exclusion of 240 treatment periods (4.0%). Right censoring was managed through the selection of appropriate statistical methods, as described in the analysis section of this chapter.

Race/ethnicity

Within the medical records, each patient could be identified as only one race from the following categories: Black, White, Hispanic or Latino, Asian, American Indian/Native American, Native Hawaiian/Pacific Islander, Middle Eastern, Vietnamese, multi-racial, other, and unknown/declined. In accordance with the way data is collected for federal records, the medical records also contained a separate indicator of ethnicity, which could be either Hispanic or non-Hispanic. The indicators of race and ethnicity from the medical records were used to create a composite variable, in which youth were categorized as: (1) Black, (2) Hispanic or Latino, (3) White, or (4) multi-racial/other as

indicated in the medical record. Patients who were identified as Hispanic (ethnicity) and a different race were categorized as Hispanic.

Sex

The medical records system includes a binary indicator used to describe sex at birth. Consultation with primary care physicians in the pediatrics department suggested that there is no systematic way of identifying transgender and gender non-conforming youth (TGNC) within the medical record. For example, some doctors may do this by putting an alternative name in parentheses under the patient's given name, and others may use ICD codes developed for gender dysphoria and gender identity disorder. Due to the fact that there is no way to indicate gender identity in the medical record, the existing binary sex indicator was used to as a variable of whether a patient was born male or female.

Age

Age was calculated in relation to the ED visit or outpatient visit being analyzed. When examining continuity of outpatient care, which is measured across time, age was designated as the age at the start of each treatment period.

Insurance Class

Insurance class was used as a proxy for socioeconomic status (Carson et al., 2011). Because insurance status may change over time, it is recorded in the medical record in relation to specific ED visits or outpatient visits. When examining continuity of outpatient care, which is measured across time, insurance status will be designated as the type of insurance used for the first visit of each treatment period. A binary indicator

variable will indicate each class of insurance (commercial, Medicaid, or free health care/health safety net) associated with an ED visit or outpatient treatment period. Commercial health insurance refers to any private health insurance plan that is not administered by the government. Medicaid refers to insurance provided through the government specifically through the Medicaid program. Because BMC is a safety net hospital, services may be provided for free or be covered by the Massachusetts Health Safety net, which pays for some services for qualified low-income patients. In addition, three lifetime insurance variables were created to indicate whether a patient had ever used each type of insurance.

Analysis

Descriptive analyses were conducted to describe the sample and calculate frequencies for all main study variables. Throughout the paper, significant results are indicated in tables with asterisks (*p<.05, **p<.01, ***p<.001).

Missing Data

The only variable for which there was substantial missing data was race/ethnicity (16.8% missing). Sex was missing for 5 patients (< .0002% of the sample), and all other data were complete. I conducted a number of analyses to examine differences in outcomes and predictor variables for individuals with and without race/ethnicity data, to establish whether these data were missing at random. Patients who were missing race/ethnicity data were significantly younger (M_{age} = 15.61, SD = 4.87) than patients with race/ethnicity data (M_{age} = 17.65, SD = 5.36), t(6,951.67) = 24.95, p < .001). Patients who were missing race/ethnicity data were more likely to be male (63.0%) than

patients with race/ethnicity data (56.7%), $\chi^2(1) = 61.10$, $p < .001$. There were no significant differences between patients with and without race/ethnicity data and the number of comorbid disorder categories (continuous indicator of comorbidity), $t(7{,}013.81) = 1.43$, $p = .15$. There were also significant differences between patients with and without race/ethnicity data on reports of insurance. Patients missing race/ethnicity data were significantly less likely to use Medicaid (66.9%) than patients with race/ethnicity data (72.8%), $\chi^2(1) = 61.91$, $p < .001$. Those missing race/ethnicity data were also significantly less likely to use Health Safety-net services (8.5%) than those with race/ethnicity data (12.5%), $\chi^2(1) = 55.22$, $p < .001$. Finally, youth missing race/ethnicity data were significantly more likely to use private health insurance (41.8%) than youth with race/ethnicity data (37.9%), $\chi^2(1) = 24.43$, $p < .001$. Taken together, these results indicate that the data were not missing completely at random, and that the use of multiple imputation was appropriate (Jakobsen et al., 2017).

To account for missing data, I used the method of multiple imputation with chained equations (MICE) and implemented this procedure is IBM SPSS Statistics 25. The MICE procedure imputes missing values for each variable using a chained equations approach whereby multiple complete datasets are created (10 datasets in this case), the regression model is estimated for each dataset, and standard rules are used to combine the estimates and adjust the standard errors for uncertainty due to imputation. The following study variables were used as predictors in the imputation process: current age (calculated using date of birth), sex, the continuous indicator of comorbidity, lifetime use of Medicaid (yes/no), lifetime use of private insurance (yes/no), lifetime use of health

safety-net services (yes/no). Patient zip code, which was also available in the medical record, potentially offered additional information that would be useful in the imputation model. To accomplish this, racial and ethnic demographic information from the 2010 census for all Massachusetts zip codes were obtained from the United States Census Bureau (2020). These demographic data were matched with patient zip code, and also included in the imputation model. All main analyses were conducted both with the raw data and with imputed data, as sensitivity analyses. The results obtained using the raw data are reported in the main body of this paper, with notes about whether these results differed from those obtained using the imputed data. Results obtained using the imputed data are fully reported in specific appendices, as noted in the main body of the paper.

Research Question 1

The first research question addresses seasonal and secular patterns in youth psychiatric ED visits. Direct comparison of monthly psychiatric ED visits in youth, including graphing trends, were used to replicate analyses of seasonal patterns from previous studies (Ali et al., 2012; Christiansen et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017). Monthly rates of ED were adjusted for a common month length to account for differences (e.g., February is shorter than January; Barnett. et al., 2012; Barnett & Dobson, 2010; Christiansen et al., 2012). Monthly counts were standardized to 30.44 days (the average day of a month across one calendar year; Barnett & Dobson, 2010) with the following formula:

$$\text{Monthly rate} = \frac{visit\ count \times 30.44}{days\ per\ month}$$

A generalized linear model (GLM) with the adjusted monthly rates of ED was fit using a log-linear Poisson function, which allowed for the identification of multiple annual peaks and estimation of peak-to-low ratios (Barnett & Dobson, 2010; Brookhart & Rothman, 2008; Christensen et al., 2011; Christiansen et al., 2012). Mean rate ratios and 95% confidence intervals were compared to determine statistical significance in rates of ED use between months. A second model was estimated to evaluate and correct for secular trends.

$$\text{Log}\,(ED\ visits) = seasonal\ variation + secular\ trend$$

To examine differences in seasonal patterns by race/ethnicity, the same sequence of two GLMs were estimated in sub-samples stratified by racial/ethnic category. As in the models described above, Model 1 served as a baseline model and Model 2 corrected for secular trends.

To address secular trends in the data, I graphed the rates of ED use by year and observed the shape of the graph (e.g., linear, curvilinear). Based on these observations, I conducted multiple time-trend analyses to evaluate changes in psychiatric ED visits over the study period, both for the entire sample and within each racial/ethnic group. First, Spearman correlation coefficients were calculated, as this method requires no assumptions related to the nature of potential associations or outcome distribution (Ely et al., 1997). Simple time-series regression models were also estimated to test for linear trends (Ely et al., 1997). Based on the observed patterns in the data and the quality of fit for linear models, curvilinear regression models were also estimated (Ely et al., 1997).

Research Question 2

The second research question addresses seasonal and secular patterns in youth outpatient specialty mental health care. The date of the initial visit of a treatment period was used as the temporal reference for each data point. The series of analyses used to address Research Question 1 was then replicated to examine seasonal and secular trends in visit counts of outpatient specialty mental health care. Monthly averages were calculated across the sub-sample of participants who accessed outpatient mental health services and adjusted for a common month length (Barnett & Dobson, 2010; Christiansen et al., 2012). GLMs using a log-linear Poisson function were estimated to determine annual patterns and compute peak-to-low ratios (Barnett & Dobson, 2010; Brookhart & Rothman, 2008; Christensen et al., 2011; Christiansen et al., 2012). Mean rate ratios and 95% confidence intervals were compared to determine statistical significance in counts of outpatient visits between months. A second model corrected for secular trends (Christiansen et al., 2012). To examine differences in patterns of outpatient specialty mental healthcare utilization based on race/ethnicity, the same series of analyses (visual inspection, GLM baseline model, GLM model with control for secular trends) was performed within each racial/ethnic sub-sample.

To address secular trends in the data, data were again visually examined and appropriate time-trend analyses were applied to evaluate potential changes in outpatient specialty mental healthcare across the study period. Trends in both in the entire sample and within each racial/ethnic sub-sample were examined. Spearman correlation coefficients, simple time-series regression models, and curvilinear analyses were

estimated as appropriate (Ely et al., 1997).

Continuity of Outpatient Care. Continuity of outpatient care was examined for the sample of youth who attended more than one outpatient specialty mental health visit during the study period. For each patient, outpatient visits were organized into treatment periods. A treatment period was defined as the period beginning the day of a patient's initial visit, or their initial visit after a break in treatment of 90 days or longer, and ending when care stops for 90 days or longer (a duration used in prior research; Cook et al., 2017; Cook et al., 2014; Tansella et al., 1995). It was measured in three distinct ways, as recommended by Fortney et al. (2003): duration of treatment period, quantity of visits during a treatment period, and frequency of visits during a treatment period.

Duration of Treatment Period. The duration of a treatment period was defined as the number of days from the first visit in a treatment period to the last day in a treatment period. To correct for left-censoring in the data, adjustments were made to exclude treatment periods that may have begun prior to the first day for which data were available; treatment periods for which the first visit was within 90 days of the first day for which data were available were thus excluded from analysis. To account for right-censoring in the data, Kaplan-Meier survival estimation was used to examine treatment duration. Survival analysis allows for the possibility that some treatment periods may not have been completed after the study period ended. Any treatment periods that ended within 90 days of the last day for which data were available were assigned as censored, meaning they may have ended after the study period. Kaplan-Meier survival analyses allow for the estimation of both the average and median duration of treatment period (i.e.

the survival time). The median treatment duration was reported instead of the average treatment duration, because average values are heavily influenced by the right-censored nature of the data (Zwiener et al., 2011).

A series of Kaplan-Meier survival curves were estimated to examine bivariate sociodemographic differences in treatment duration. Because these analyses cannot handle continuous independent variables, age was recoded as a categorical variable with three categories: (1) 5-9 years old, (2) 10-13 years old, and (3) 14-18 years old. The dichotomous indicator of comorbidity was used to examine differences in treatment duration based on the number of diagnoses within difference disorder categories. In order to examine seasonal variation in treatment duration, Kaplan-Meier survival curves were estimated for treatment initiated in each month of the calendar year. This analysis was repeated within each racial/ethnic sub-sample to examine seasonal patterns based on race/ethnicity.

To examine secular patterns in treatment duration, Kaplan-Meier survival analyses were used to examine treatment duration for each year during the study period. Median estimates were then graphed, and appropriate time-trend analyses were applied to evaluate significant changes in duration of outpatient specialty mental health care across the study period. Spearman correlation coefficients, simple time-series regression models, and curvilinear analyses were estimated as appropriate (Ely et al., 1997). This series of analyses (Kaplan-Meier survival analysis, graphing of median estimates, Spearman correlation coefficients, and appropriate regression models) were performed within each racial/ethnic sub-sample, to examine seasonal patterns based on race/ethnicity.

Treatment Quantity. The quantity of visits during a treatment period was defined as the number of outpatient specialty mental health visits that occurred between the first visit in a treatment period and the last visit in a treatment period. The method used to examine treatment quantity was identical to that used to analyze treatment duration. To correct for left-censoring, treatment periods that may have begun prior to the first day for which data were available were excluded from analysis. To account for right-censoring in the data, Kaplan-Meier survival estimation was used to examine treatment quantity.

A series of Kaplan-Meier survival curves were estimated to examine bivariate sociodemographic differences in treatment quantity. As noted in the previous section, categorical variables were used for age and comorbidity due to the requirements for Kaplan-Meier survival analysis. To examine seasonal variation in treatment quantity, Kaplan-Meier survival curves were estimated for treatment initiated in each month of the calendar year. This analysis was repeated within each racial/ethnic sub-sample to examine seasonal patterns based on race/ethnicity.

To examine secular patterns in treatment quantity, Kaplan-Meier survival analyses were used for treatment quantity for each year during the study period. Median estimates were then graphed, and appropriate time-trend analyses were applied to evaluate significant changes in quantity of outpatient specialty mental health care across the study period. Spearman correlation coefficients, simple time-series regression models, and curvilinear analyses were estimated as appropriate (Ely et al., 1997). This series of analyses (Kaplan-Meier survival analysis, graphing of median estimates, Spearman correlation coefficients, and appropriate regression models) were performed within each

racial/ethnic sub-sample, to examine seasonal patterns based on race/ethnicity.

Treatment Frequency. Frequency of outpatient treatment was defined as the average number of days between visits during the treatment period. I first calculated the number of days since the previous visit for every day within the study period, and then calculated the average of these values. Treatment frequency is not subject to right-censoring in the same way as treatment duration and quantity. Although treatment frequency might change for an incomplete treatment period (one that started before the study period began or after the study period ended), there is no reason to believe that it would only change in one direction. For example, we know that treatment duration and quantity for an unfinished treatment period would only stay the same or increase past the end of the study period; in comparison, treatment frequency could change in either direction; I therefore used the frequency value for the available data for each treatment period, concluding that it was as a reasonable estimate of treatment frequency for unfinished treatment periods. For this reason, a different series of analyses was used to examine treatment frequency than that used to examine treatment duration and quantity.

To examine seasonal patterns in treatment frequency, monthly averages were calculated for treatment frequency of outpatient specialty mental healthcare across the sub-sample of participants who accessed outpatient mental health services. Then, a series of three GLMs were estimated to determine seasonal patterns and compute peak-to-low ratios (Barnett & Dobson, 2010; Brookhart & Rothman, 2008; Christensen et al., 2011; Christiansen et al., 2012). First, a baseline model will examine monthly patterns. A second model corrected for secular trends, and a third model added sociodemographic

covariates (Christiansen et al., 2012). Mean rate ratios and 95% confidence intervals were compared to determine statistical significance in frequency of outpatient specialty mental healthcare between months. The same sequence of analyses (calculation and graphing of monthly averages, series of three GLMs) was performed within each racial/ethnic sub-sample, to examine difference in seasonal patterns in treatment frequency by race/ethnicity.

To address secular trends in the data, yearly and month-yearly averages of treatment frequency were calculated and graphed for visual inspection. Based on these results, Spearman correlation coefficients, simple time-series regression models, and curvilinear analyses were estimated as appropriate (Ely et al., 1997). The same series of analyses were conducted within each racial/ethnic sub-sample to examine difference in secular trends based on race/ethnicity.

Research Question 3

The third research question is designed to determine whether youth outpatient mental health care is significantly associated with psychiatric ED presentation. First, a series of logistic regression models determined whether the use of any outpatient specialty mental health services is associated with psychiatric ED presentation, when controlling for sex, race/ethnicity, lifetime insurance use, and the continuous indicator of comorbidity. Age could not be included in this analysis because it could only be calculated in relation to a specific ED or outpatient visit. Because the analysis did not reference a specific ED or outpatient visit, the lifetime insurance use variable was included in the analysis. A similar series of linear regressions was then used to determine

the association between any outpatient specialty mental health services and the number of psychiatric visits to the ED.

To examine whether the use of outpatient services was associated with subsequent psychiatric ED presentation, Cox proportional hazard regression was used among the sample patients who received any outpatient specialty mental health care. These survival analyses estimated whether each aspect of continuity of outpatient care (duration, quantity, and frequency of treatment) was associated with an increased risk for subsequent psychiatric ED presentation. Model 1 included duration of treatment measured in days, and Model 2 included quantity of treatment measured by the number of outpatient specialty mental health visits. To estimate the association between frequency of treatment and risk for subsequent psychiatric ED presentation (Model 3), only the sample of patients with two or more outpatient visits was used (the only patients for whom frequency of treatment could be calculated). A fourth and final model was estimated among the same sample of patients with two or more outpatient visits, including both quantity and frequency of treatment. Quantity was included to account for the total treatment "dose" and frequency was included to account for the total period of time over which treatment occurred. The purpose of this model was to determine whether treatment quantity and treatment frequency were associated with subsequent psychiatric ED presentation when accounting for the other.

CHAPTER 4: RESULTS

Descriptive Statistics

The analytic sample consisted of 25,549 school-age children and adolescents (ages 5-18) with an identified emotional or behavioral disorder, who were treated at BMC between September 1, 2009 and May 3, 2018. Over half of patients (57.8%) were male. Patients most commonly identified as Black or African-American (40.5%); 28.3% were Hispanic, 26.1% were White, and 5.1% were multi-racial or another race/ethnicity. The most common emotional or behavioral disorders were pervasive and developmental disorders (40.9%), ADHD (34.8%), and conduct disorders (24.3%). Table 3 shows the frequencies for each of the 13 diagnoses, as well as those related to the presentation of a suicide attempt or signs and symptoms involving emotional state. Comorbidity was common in the sample. On average, youth had diagnoses in 1.98 (*SD* = 1.36) categories. As shown in Table 4, over 50% of youth had diagnoses in 2 or more categories.

Patients used many different kinds of insurance for medical care, including mental health care. Close to three-quarters of the sample (71.8%) had at least some medical care covered by Medicaid at some point during the study period. A much smaller subset (11.8%) were covered under free care, or health safety-net services, at some point during the study period. Over one-third of patients (38.6%) utilized private health insurance to cover medical services at some point during the study period. Many patients had changes in their insurance during the study period; 19.8% of youth were covered by different classes of insurance at different times during the study period.

Table 3

Frequencies of disorder categories in the study sample

Disorder category	**Frequency**	**Percent**
Pervasive and developmental disorders	10,453	40.9
ADHD	8,900	34.8
Conduct disorders	6,199	24.3
Anxiety and somatoform disorders	5,882	23.0
Traumatic and attachment disorders	5,408	21.2
Mood (affective) disorders	5,362	21.0
Substance use disorders	2,588	10.1
Personality and behavior disorders	1,838	7.2
Mental disorder, not otherwise specified	1,431	5.6
Eating disorders	896	3.5
Sleep disorders	666	2.6
Other unspecified emotional or behavioral disorders	643	2.5
Schizophrenia, schizotypal and delusional disorders	442	1.7
Symptoms and signs involving emotional state, appearance, and behavior	3,046	11.9
Suicide attempt	58	0.2

Table 4

Comorbidity frequencies

Number of diagnostic categories	Frequency	Percent
One	12,338	48.3
Two	6,175	24.2
Three	3,335	13.1
Four or more	3,338	13.1

There were significant differences in the number of disorder categories a patient was assigned based on race/ethnicity. Black youth carried diagnoses in significantly more disorder categories (M = 2.14, SD = 1.52) than Hispanic youth (M = 2.01, SD = 1.38), White youth (M = 1.82, M = 1.16), and youth identified as multi-racial or another

race/ethnicity (M = 1.59, M = 1.07). Hispanic youth carried diagnoses in significantly more disorder categories than White youth and youth identified as multi-racial or another race/ethnicity. White youth carried diagnoses in significantly more disorder categories than youth identified as multi-racial or another race/ethnicity. Analysis of multiply imputed data yielded similar results (detailed results in Appendix B).

There were also significant differences by race/ethnicity in lifetime use of Medicaid [$\chi^2(3) = 3{,}725.61$, $p < .001$], health safety-net services [$\chi^2(3) = 289.00$, $p < .001$], and private insurance [$\chi^2(3) = 1{,}620.88$, $p < .001$]. Pairwise comparisons indicated that all differences between racial/ethnic groups were significant (except between Hispanic youth and youth identified as multi-racial or from another racial/ethnic background in relation to the use of health safety-net services). As compared with Hispanic youth, black youth were significantly less likely to utilize Medicaid and significant more likely to use health safety-net services or private insurance. In addition, Black youth were significantly more likely to use Medicaid and health safety-net services than White youth and youth who were multi-racial or another race/ethnicity. Hispanic youth were significantly more likely to utilize Medicaid than their peers who were White or multi-racial or another race/ethnicity; Hispanic youth were also more likely to utilize health safety-net services than White youth. Youth of color were significantly less likely to utilize private health insurance than White youth. Similarly, White youth were significantly less likely to use Medicaid or health safety-net services than youth identified as multi-racial or from another racial/ethnic background. Analysis of multiply imputed data yielded similar results (detailed results in Appendix C-E).

Research Question 1: Psychiatric ED visits

To examine seasonal and secular patterns in youth psychiatric ED visits, I analyzed 9,771 psychiatric ED visits by 6,091 youth in the sample (23.8%). An ED visit was considered a psychiatric visit if it was associated with a diagnosis related to mental health (using the same ICD codes described in the methods section). Youth presenting in the ED for psychiatric reasons were, on average, 13.75 years old (*SD* = 3.76) and 54.1% male. Over half of youth presenting in the ED for psychiatric reasons were Black (53.9%); the remainder were Hispanic (26.2%), White (16.0%), or identified as multi-racial or from another racial/ethnic background (3.9%). Almost three-quarters (73.3%) of these patients were insured through Medicaid and an additional 6.0% received free health care or safety-net services; the remaining 20.6% had private insurance.

As shown in Table 5, psychiatric ED visits were most often associated with issues relating to conduct disorders (32.1% of visits) and mood disorders (23.1% of visits). Visits could be associated with multiple diagnoses or issues; indeed, 41.3% of visits were associated with two or more comorbid disorders or issues. Over one-quarter of youth who presented in the ED for psychiatric reasons visited the ED multiple times during the study period, as shown Table 6. Youth presenting in the ED for psychiatric services averaged 1.6 visits (*SD* = 1.58). On average, youth aged 10-13 (*M* = 1.83, *SD* = 1.85) presented in the ED for psychiatric reasons significantly more times than youth aged 5-9 (*M* = 1.46, *SD* = 1.06) and youth aged 14-18 (*M* = 1.57, *SD* = 1.59), $F(6090) = 16.92$, $p < .001$. Male youth (*M* = 1.67, *SD* = 1.67) presented in the ED for psychiatric reasons significantly more times than females (*M* = 1.53, *SD* = 1.47), $t(6{,}073.89) = 3.40$, $p < .01$.

Table 5

Diagnostic categories associated with ED visits

Disorder	**Frequency**	**Percent**
Conduct disorders	3,134	32.1
Mood (affective) disorders	2,258	23.1
Traumatic and attachment disorders	1,862	19.1
Substance use disorders	1,855	19.0
ADHD	1,665	17.0
Anxiety and somatoform disorders	1,200	12.3
Pervasive and developmental disorders	865	8.9
Schizophrenia, schizotypal and delusional disorders	351	3.6
Mental disorder, not otherwise specified	171	1.8
Personality and behavior disorders	74	0.8
Other unspecified emotional and behavioral disorders	56	0.6
Eating disorders	35	0.4
Sleep disorders	22	0.2
Symptoms and signs involving emotional state, appearance, and behavior	1,912	19.6
Suicide attempt	11	0.1

Table 6

Frequencies for total number of ED visits per patient

Number of ED visits	Frequency	Percent
One	4,363	74.0
Two	801	13.6
Three or more	731	12.4

Youth insured through Medicaid (M = 1.77, SD = 1.76) presented in the ED for psychiatric reasons significantly more than youth with private insurance (M = 1.33, SD = 1.19) or youth using health safety-net services (M = 1.11, SD = .49), $F(6090) = 71.53$, $p <$ .001. Youth with private insurance also presented significantly more times than youth

using health safety-net services. Youth visiting the ED for multiple psychiatric diagnoses or issues (M = 1.88, SD = 1.82) presented significantly more often than those diagnosed with only one disorder (M = 1.45, SD = 1.41), $t(3,591.25) = -9.41$, $p < .001$.

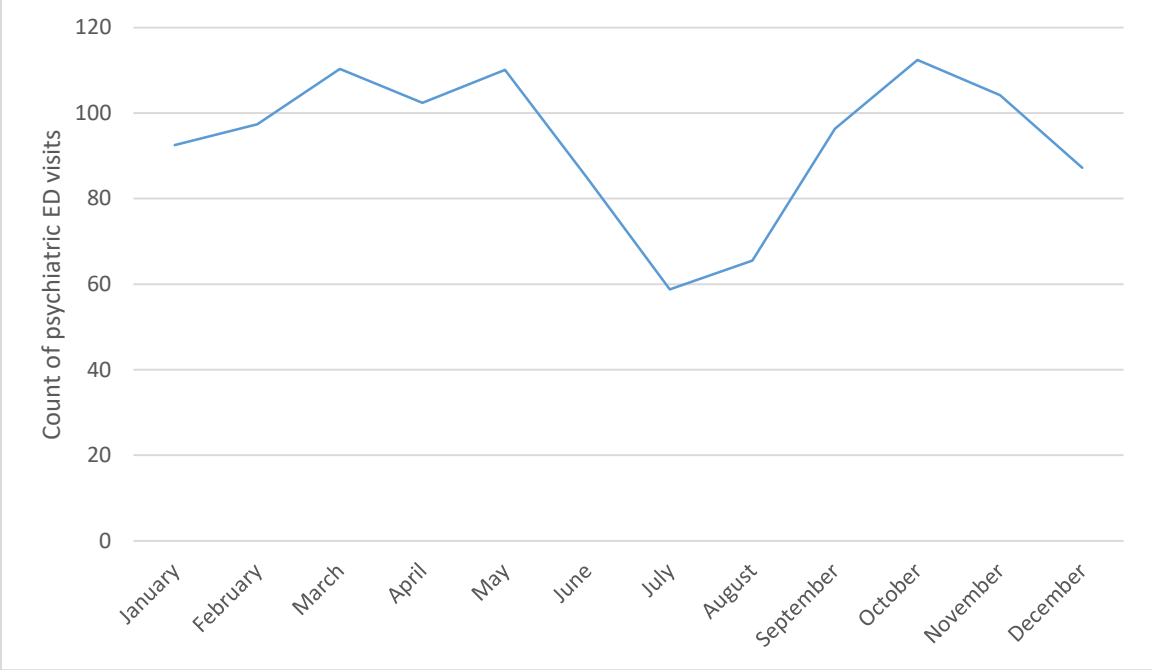
There were also significant racial and ethnic differences in the number of times youth visited the ED, $F(5,794) = 49.40$, $p < .001$. In particular, Black youth (M = 1.85, SD = 1.95) presented in the ED for psychiatric reasons significantly more times than Hispanic youth (M = 1.57, SD = 1.34), White youth (M = 1.27, SD = 1.05), and multi-racial youth or those from another racial and ethnic background (M = 1.13, SD = .52). Additionally, Hispanic youth used psychiatric ED services significantly more times than White youth and those from another racial and ethnic background. Additional analysis using multiple imputation was used to account for missing race/ethnicity data in the sample. The results for all 10 imputations showed the same significant differences (detailed results in Appendix F).

Seasonal Patterns

Monthly psychiatric ED visits were calculated using an adjustment for common month length, as depicted in Figure 3 (Barnett et al., 2012; Barnett & Dobson, 2010; Christiansen et al., 2012). ED visits for psychiatric reasons were lowest in July (average of 58.8 visits per month), and increased through August, September, and into October, when they were highest (average of 112.4 visits per month). Visits then decreased through November and into December (average of 87.2 visits per month). There was then an increase in visits through January, February, and March (average of 110.3 per month). Visits remained steady into May, and then decreased sharply into June and July.

Figure 3

Seasonal patterns in psychiatric ED visits



A series of GLMs with the adjusted monthly rates of ED use were fit using a log-linear Poisson function. First, a baseline model was fit. A second model was then fit to control for secular trends. January was used as a reference month, because the average number of visits in January (92.5) was closest to the average number of visits per month (adjusted for common month length: 93.5). Mean rate ratios and 95% confidence intervals from this second model are shown in Table 7. As shown in the table, the rate of visits in March, April, May, October, and November were significantly higher than the rate of visits in January. In addition, the rate of visits in July and August were significantly lower than the rates of visits in January. This indicates the presence of two peaks (March-May, October/November) and two low points (July/August, December/January) during the calendar year.

Table 7

Seasonal patterns in psychiatric ED visits: GLM

Month	Rate ratio	95% CI	Z-value	*p*-value
January	ref	-	-	-
February	1.04	.95, 1.15	.88	.38
March	1.19	1.09, 1.31	3.78	<.001***
April	1.11	1.01, 1.22	2.12	.03*
May	1.21	1.11, 1.33	4.04	<.001***
June	.94	.85, 1.04	-1.29	.20
July	.65	.58, .73	-7.58	<.001***
August	.72	.65, .81	-5.87	<.001***
September	1.08	.98, 1.19	1.60	.11
October	1.26	1.15, 1.38	4.99	<.001***
November	1.17	1.06, 1.28	3.28	.001**
December	0.98	0.89, 1.08	-.44	.07

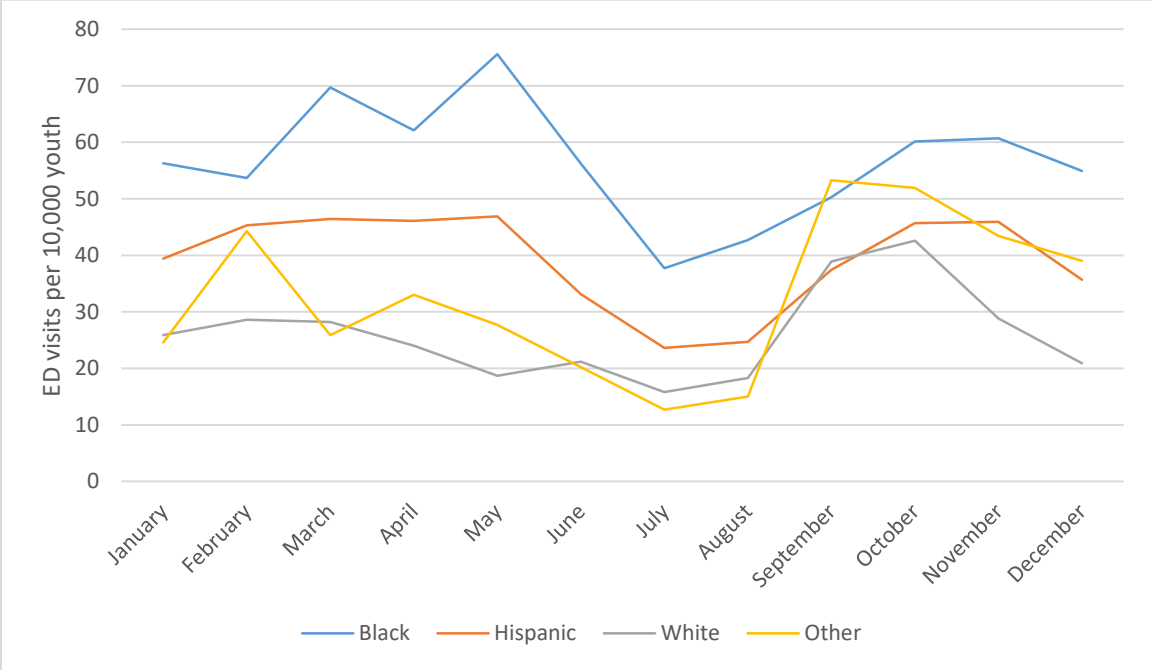
The same series of analyses (direct comparison, sequence of two GLMs) was applied to sub-samples stratified by race/ethnicity. Figure 4 depicts monthly rates of psychiatric ED visits for Black youth, Hispanic youth, White youth, and youth identified as multi-racial or from another racial/ethnic background. These rates represent the number of ED visits per 10,000 youth, and were calculated using the number of youth from each racial/ethnic category in the full study sample (youth in the BMC system during the study period who were identified as having an emotional or behavioral disorder).

A series of GLMs with the adjusted monthly rates of ED use were fit for each sub-sample using a log-linear Poisson function. First, a baseline model was fit. A second

model was then fit to control for secular trends. Mean rate ratios for the second model are shown in Table 8. In addition, a larger table with 95% confidence intervals is available in Appendix G.

Figure 4

Racial/ethnic variations in seasonal psychiatric ED patterns



As shown in both Figure 4 and Table 8, seasonal patterns in psychiatric ED visits are different as a function of race/ethnicity. Although visit rates are significantly lower in the summer across all ethnic groups, patterns during the rest of the year vary. Among Black youth, visit rates increase significantly in March and May. Among Hispanic youth, visit rates are not significantly different across the winter and early spring, but they are significantly higher in October and November than they are in January. Similar to Hispanic youth, rates of psychiatric ED visits among White youth are not significantly

different across the winter and early spring. Visit rates among White youth are also significantly higher in the fall, although the increase occurs earlier in the fall (September

Table 8

Racial/ethnic variations in seasonal psychiatric ED patterns: GLMs

	Black	Hispanic	White	Multi-racial/other
	(*n*=5054)	(*n*=2459)	(*n*=1498)	(*n*=365)
Month	Mean rate ratios			
January	ref	ref	ref	ref
February	.95	1.15	1.09	1.79*
March	1.24***	1.18	1.08	1.04
April	1.10	1.17	.92	1.33
May	1.36***	1.23*	.71*	1.13
June	1.01	.87	.80	.83
July	.68***	.62***	.60***	.52
August	.77***	.65***	.69**	.62
September	.92	1.01	1.44**	2.19**
October	1.10	1.24*	1.57***	2.16**
November	1.12	1.25*	1.07	1.80*
December	1.01	.97	.77*	1.61

and October) than for Hispanic youth (October and November). In addition, visit rates among White youth drop significantly in May. Among youth identified as multi-racial or from another racial/ethnic background, visit rates in February are significantly higher than in January; rates are also significantly higher from September through November than they are in January.

Secular Trends

To address secular trends in the use of services for mental health issues, I first plotted psychiatric ED visits among children and adolescents across time to consider the shape of this graph. Figure 5 shows psychiatric ED visits graphed by month-year, and

Figure 6 shows visits graphed only by year. In Figure 5, increasing rates of psychiatric ED visits can be observed even when accounting for the consistent seasonal patterns. Figure 6 allows for the observation of secular trends without the noise of the seasonal patterns. Both graphs indicate that psychiatric visits to the ED among children and adolescents increased across the study period (net increase from 2010 to 2017 was 146 visits per year, a 13.9% increase).

Figure 5

Secular trends in youth psychiatric ED visits by month-year

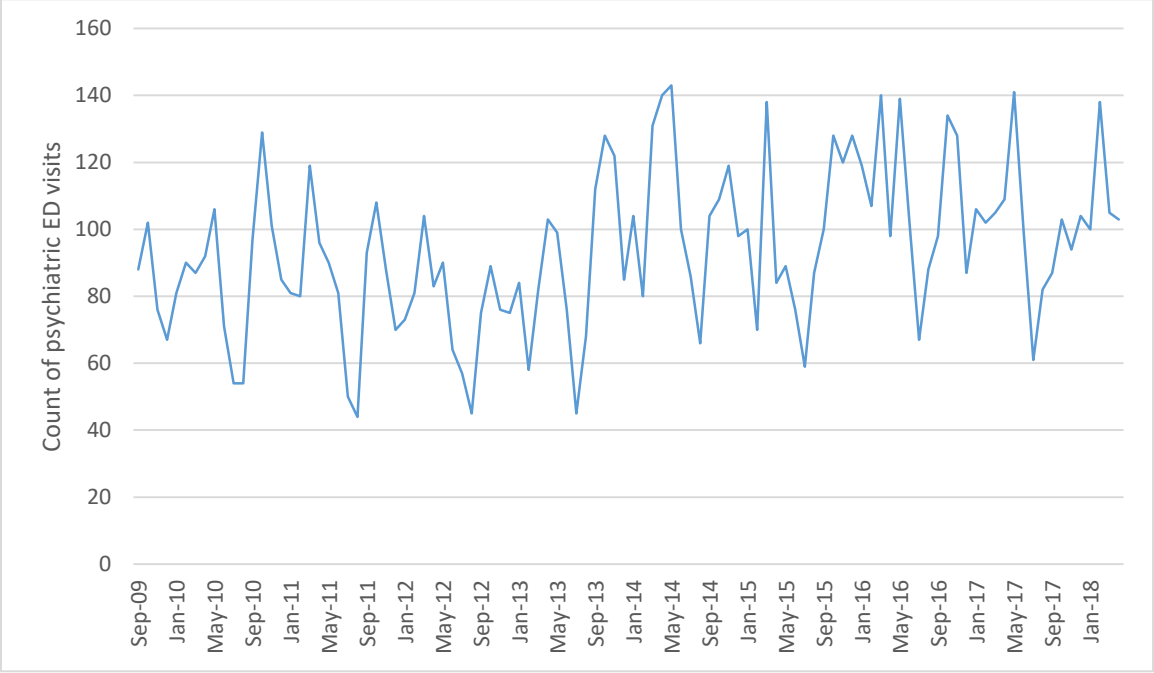
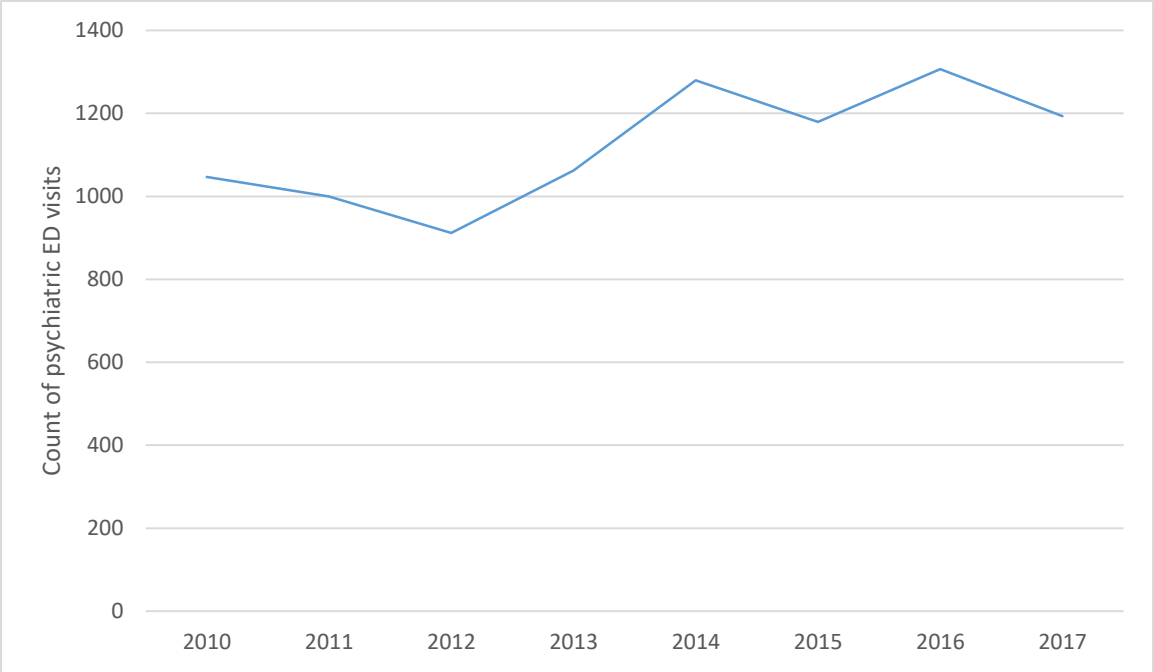


Figure 6

Secular trends in youth psychiatric ED visits by year



To further examine potential secular trends in the data, Spearman correlation coefficients were calculated, as this method requires no assumptions related to the nature of potential associations or outcome distribution (Ely et al., 1997). Spearman correlations were calculated for the association between both year (2010, 2011, etc.) and year-month (e.g., January 2010, February 2010, etc.) to better account for the seasonal patterns established in previous sections. The Spearman correlations indicated a significant positive association between month-year and count of psychiatric ED visits ($\rho = .38$, $p <. 001$) as well as year and count of psychiatric ED visits ($\rho = .79$, $p <. 05$), suggesting that youth psychiatric ED visits were significantly increasing during the study period.

I then estimated simple time-series regression models to test for linear trends (Ely

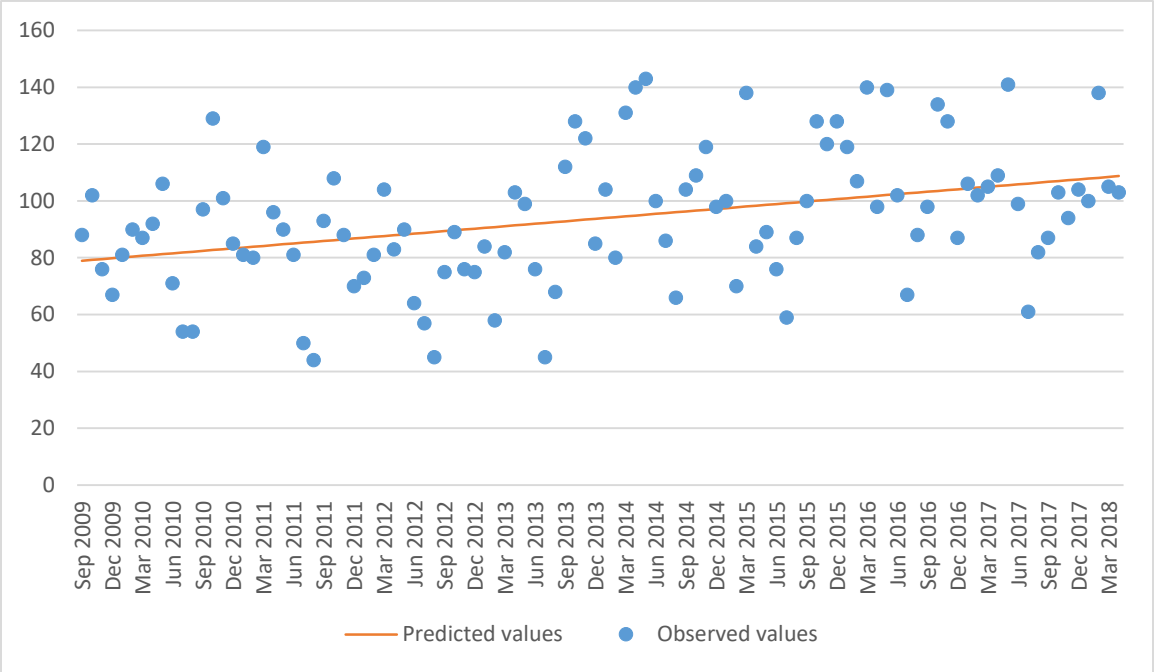
et al., 1997). Because the counts for each year and year-month are large (>10), the Poisson distribution can be approximated adequately with the normal distribution, and simple linear regression may be used. Regressions using both month-year ($\beta = .37$, $p < .001$) and year ($\beta = .75$, $p < .05$) as independent variables indicated a significant upward trend in psychiatric ED visits. The similarity between the Spearman correlation coefficients and the linear regression coefficients suggests that the upward trend is, in fact, linear (as opposed to another shape). These two regression models are displayed in Figure 7 and Figure 8.

An identical series of analyses (graphing, Spearman correlations, and linear regression) were performed on sub-samples of the data by race/ethnicity, to examine secular trends across racial and ethnic groups. Figure 9 shows the rate of psychiatric ED visits (per 10,000 youth) by year, within each racial/ethnic subsample. Figure 9 seems to indicate that rates of psychiatric ED visits are steadily increasing among Hispanic youth and youth identified as multi-racial or from another racial/ethnic background, slightly increasing among Black youth, and decreasing among White youth.

To further explore secular trends within racial and ethnic sub-samples, Spearman correlation coefficients and simple linear regression models were estimated. Results are depicted in Table 9. These results confirm that rates of psychiatric ED use among Hispanic youth significantly increased across the study period. They further suggest that rates among Black youth have increased slightly and rates among White youth may have decreased slightly.

Figure 7

Secular trends in psychiatric ED visits by month-year: linear regression



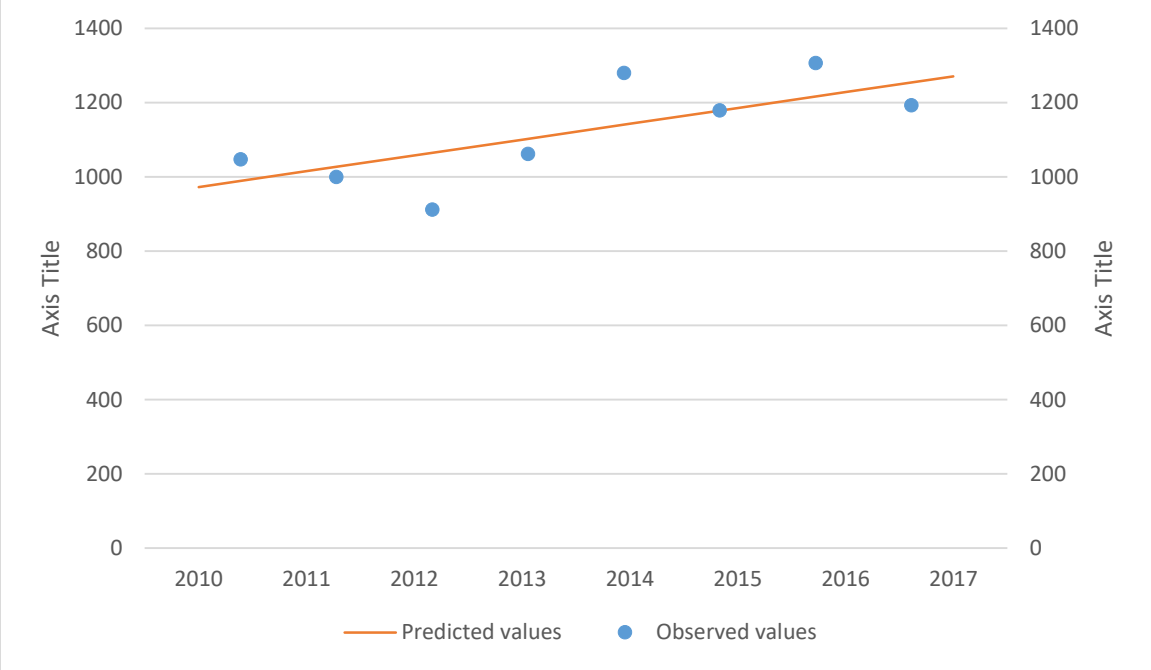
Research Question 2: Outpatient visits

To answer research question 2, I analyzed 32,487 outpatient visits by 3,894 youth in our sample (15.2%). Visits took place between August 1, 2010 and May 3, 2018. Youth utilizing psychiatric outpatient treatment were an average of 10.97 years old (*SD* = 4.04) at their first psychiatric outpatient visit. Over half of the sample was male (59.4%). Approximately half of youth receiving psychiatric outpatient treatment were Black (48.1%); the remainder were Hispanic (31.2%), White (17.2%), or identified as multi-racial or from another racial/ethnic background (3.5%). Almost three-quarters (73.4%) of these patients were insured through Medicaid and an additional 1.8% received free health care or safety-net services; the remaining 24.9% had private commercial insurance. As

shown in Table 10, youth receiving psychiatric outpatient treatment were most often diagnosed with pervasive and developmental disorders (54.8%), ADHD (53.4%), and conduct disorders (51.9%). In addition, 85.2% of youth were diagnosed with more than one disorder. Over half of youth (62.2%) had diagnoses of three or more comorbid disorders.

Figure 8

Secular trends in psychiatric ED visits by year: linear regression

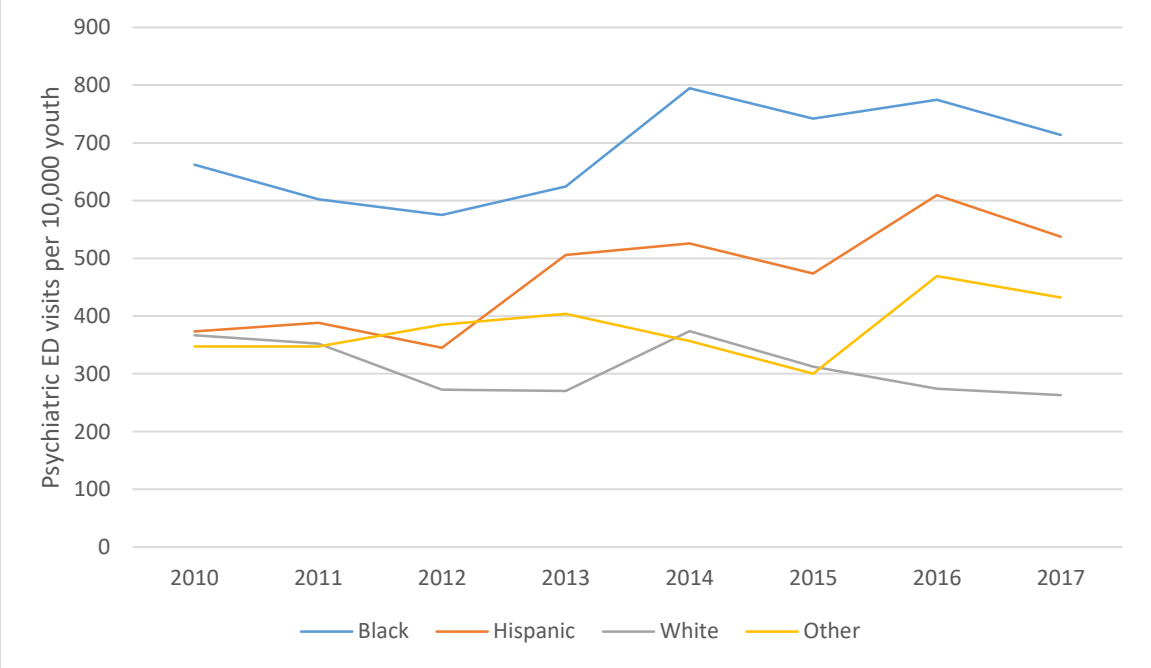


Over one-quarter (29.6%) of patients utilized psychiatric outpatient services only one time during the study period. Patients received an average of 8.34 visits (*SD* = 14.87) during the study period. There were no significant differences in the number of outpatient visits received by sex or insurance status. Patients who were older at treatment initiation received significantly more sessions than patients who were younger at treatment

initiation (B = .77, SE = .06, $p < .001$). Youth with two or more comorbid psychiatric disorders ($M = 9.14$, $SD = 15.77$) received significantly more outpatient visits than those diagnosed with only one disorder ($M = 3.74$, $SD = 6.10$), $t(2,174.01) = -14.46$, $p < .001$.

Figure 9

Racial/ethnic variations in secular psychiatric ED trends



There were also significant differences in the number of outpatient visits received based on race/ethnicity $F(3,267) = 10.09$, $p < .001$. In particular, Black patients ($M = 10.42$, $SD = 17.13$) received significantly more visits than Hispanic patients ($M = 7.71$, $SD = 12.24$), White patients, ($M = 7.61$, $SD = 16.23$) and multi-racial patients or those from another racial/ethnic background ($M = 5.73$, $SD = 8.19$). Analyses were repeated in with the imputed data. The results for all 10 imputations showed the same significant racial/ethnic differences as found in the raw data (detailed results in Appendix H)

Table 9

Secular trends in psychiatric ED visits: Time-trend analyses

	Year		Month-year	
	Spearman Correlation Coefficient (ρ)	Linear Regression Coefficient (β)	Spearman Correlation Coefficient (ρ)	Linear Regression Coefficient (β)
Black	.62	.67	.33**	.31**
Hispanic	.83*	.84**	.46***	.46***
White	-.48	-.55	-.19*	.16
Multi-racial/ other	.54	.49	-.03	-.02

Table 10

Diagnostic categories of youth receiving outpatient specialty mental health services

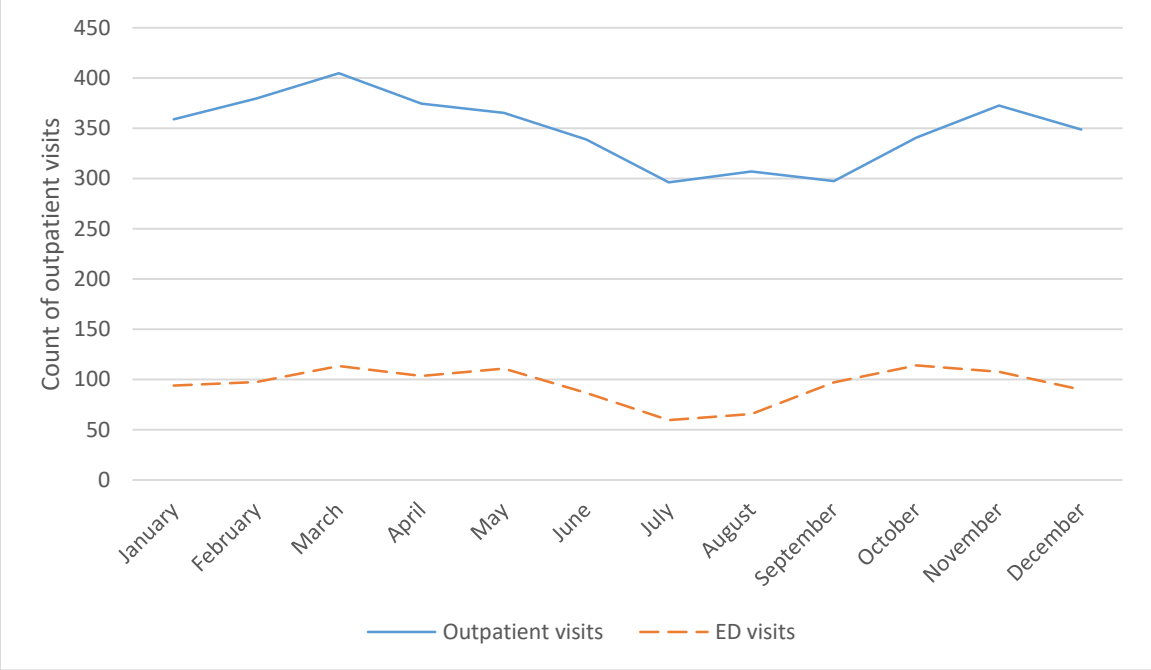
Disorder	**Frequency**	**Percent**
Pervasive and developmental disorders	2,134	54.8
ADHD	2,078	53.4
Conduct disorders	2,022	51.9
Traumatic and attachment disorders	1,638	42.1
Anxiety and somatoform disorders	1,596	41.0
Mood (affective) disorders	1,463	37.6
Personality and behavior disorders	595	15.3
Mental disorder, not otherwise specified	369	9.5
Substance use disorders	248	6.4
Eating disorders	231	5.9
Other unspecified emotional and behavioral disorders	209	5.4
Schizophrenia, schizotypal and delusional disorders	148	3.8
Sleep disorders	93	2.4
Symptoms and signs involving emotional state, appearance, and behavior	700	18.0
Suicide attempt	11	0.3

Seasonal Patterns.

Average monthly outpatient visits were calculated using an adjustment for common month length, as depicted Figure 10 (Barnett, Baker, & Dobson, 2010; Christiansen et al., 2012). Outpatient specialty mental health visits were lowest in July and September (average of 296.2 and 297.4 visits), and increased steadily through November (average of 372.7 visits). Visits decreased in December, but then rose from January through March, when visits were highest (average of 404.6 visits). Visits then decreased through April, May, and June. For comparative purposes, the average monthly ED visits for the same time period are included in Figure 10.

Figure 10

Seasonal trends in outpatient specialty mental health treatment



A series of GLMs with the adjusted monthly rates of outpatient psychiatric visits were fit using a log-linear Poisson function. December was used as the reference month,

because the average number of visits in December (348.8) was closest to the average number of visits per month (adjusted for common month length; 348.7). First, a baseline model was fit. A second model was then fit to control for secular trends. Mean rate ratios and 95% confidence intervals from this second model are shown in Table 11.

Table 11

Seasonal patterns in outpatient specialty mental health treatment: GLM

Month	Rate ratio	95% CI	Z-value	*p*-value
January	1.06	1.01, 1.12	2.24	.03*
February	1.11	1.06, 1.17	3.96	<.001***
March	1.20	1.14, 1.26	6.95	<.001***
April	1.11	1.05, 1.17	3.86	<.001***
May	1.06	1.01, 1.12	2.28	.02*
June	.99	.93, 1.04	-.47	.64
July	.86	.82, .91	-5.13	<.001***
August	.88	.83, .93	-4.66	<.001***
September	.85	.82, .90	-5.13	<.001***
October	.98	.93, 1.03	-.89	.37
November	1.07	1.01, 1.13	2.52	.01*
December	ref	-	-	-

As shown in the table, there were significantly more outpatient visits in November and January through May than there were in December. In addition, there were significantly fewer visits in July through September than in December. This indicates the presence of one peak (March) and one low point (July-September) during the calendar year.

The same series of analyses (direct comparison, sequence of two GLMs) was applied to sub-samples stratified by race/ethnicity. Figure 11 depicts monthly rates of psychiatric outpatient visits for Black youth, Hispanic youth, White youth, and youth identified as multi-racial or from another racial/ethnic background. These rates represent the number of outpatient visits per 10,000 youth, and were calculated using the number of youth from

each racial/ethnic category in the full study sample (youth in the BMC system during the study period who were identified as having an emotional or behavioral disorder). A series of GLMs with the adjusted monthly averages for outpatient visits were fit for each sub-sample using a log-linear Poisson function. First, a baseline model was fit. A second model was then fit to control for secular trends. Mean rate ratios for each month are shown in Table 12. A table with 95% confidence intervals is available in Appendix I.

Figure 11

Racial/ethnic variations in seasonal outpatient treatment patterns

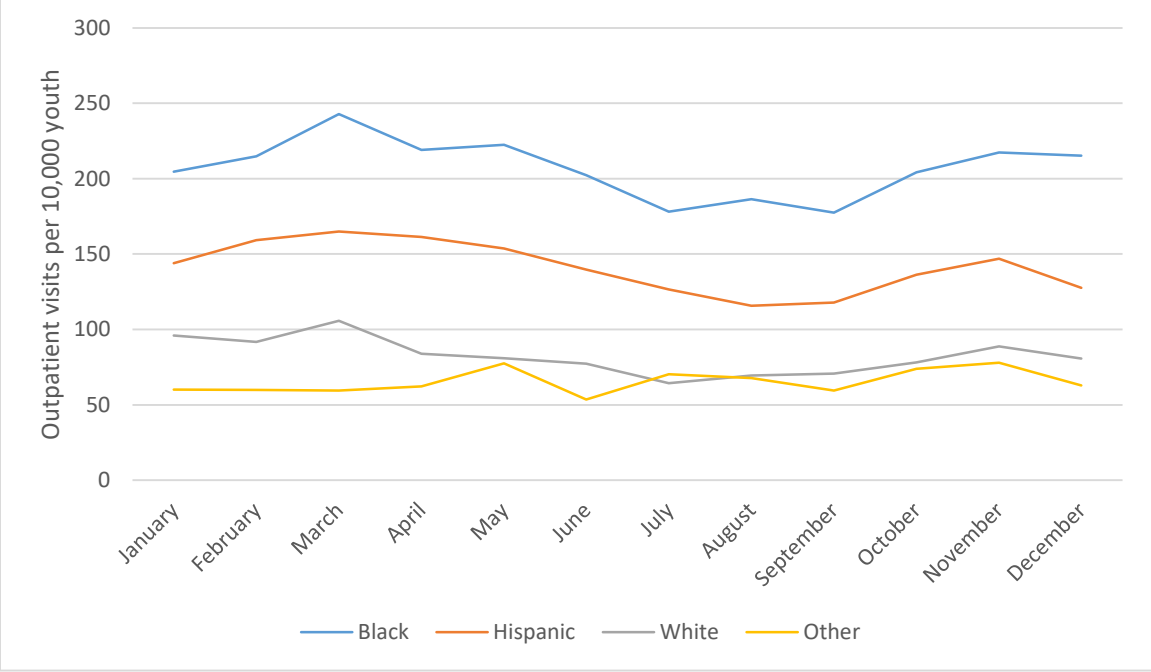


Table 12

Racial/ethnic variations in seasonal outpatient treatment patterns: GLMs

	Black	Hispanic	White	Multi-racial/ other
	n = 1572	*n* = 1021	*n* = 562	*n* = 113
Month	Mean rate ratios			
January	1.03	1.10	1.12	.96
February	1.08*	1.21***	1.17*	.95
March	1.23***	1.26***	1.23**	.96
April	1.11**	1.23***	1.02	1.01
May	1.08*	1.18**	.96	1.25
June	.98	1.07	.95	.85
July	.87***	.97	.77**	1.12
August	.87***	.91	.87	1.09
September	.83***	.92	.91	.96
October	.95	1.07	.97	1.19
November	1.01	1.15**	1.15	1.24
December	ref	ref	ref	ref

As illustrated in both the figure and the table, seasonal patterns in psychiatric outpatient treatment varies as a function of race/ethnicity. Among Black youth and Hispanic youth, there are significantly more visits in February through May than in December. Among White youth, there are significantly more visits in February and March than on average. There is also a decrease in visits among Black youth in July through September. Although outpatient visits among Hispanic youth did not decrease significantly in the summer, there were significantly fewer visits among White youth in July than on average. There were no significant differences in outpatient visits across the calendar year among multi-racial youth or those from another racial/ethnic background, although this could be due to the small sub-sample size for these youth.

Secular trends

To address secular trends in the data, I first plotted monthly and yearly counts of outpatient specialty mental health visits among children and adolescents, in order to consider the shape of the graph. Figure 12 shows outpatient visits graphed by month and year, and Figure 13 shows visits graphed only by year. For comparative purposes, monthly and yearly counts for psychiatric ED visits during the same period are also included on the graphs. Both graphs indicate that outpatient specialty mental health visits among children and adolescents decreased between 2011 and 2014, and then increased from 2014 through 2017.

Figure 12

Secular trends in outpatient specialty mental health services by month-year

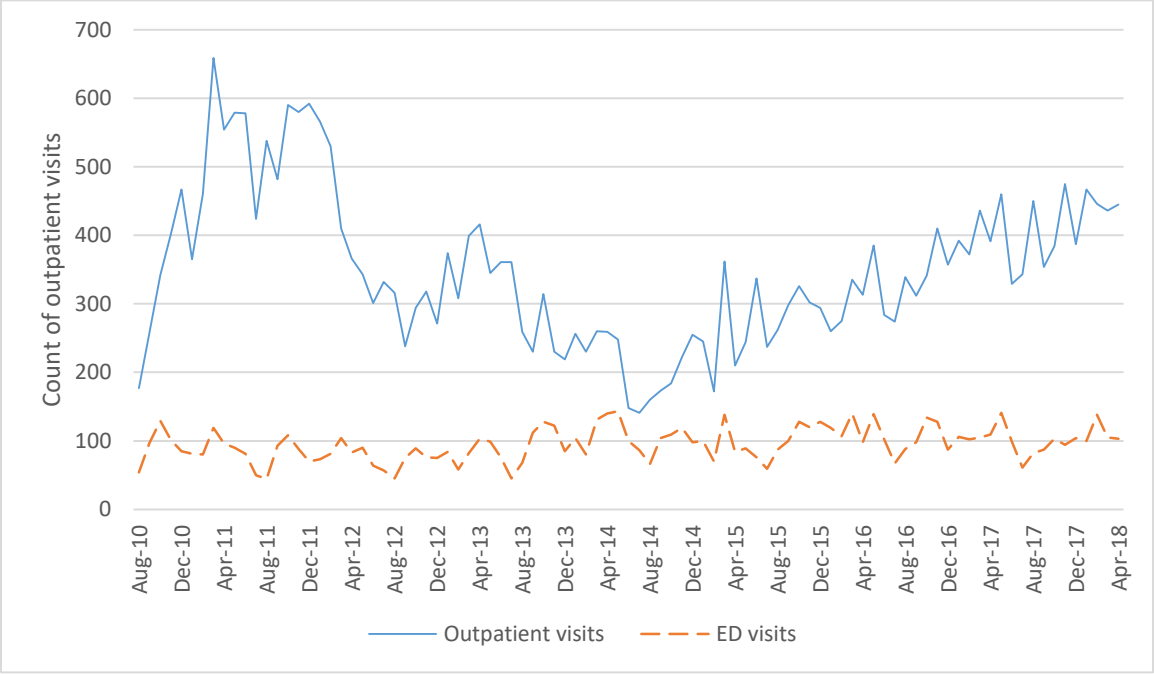
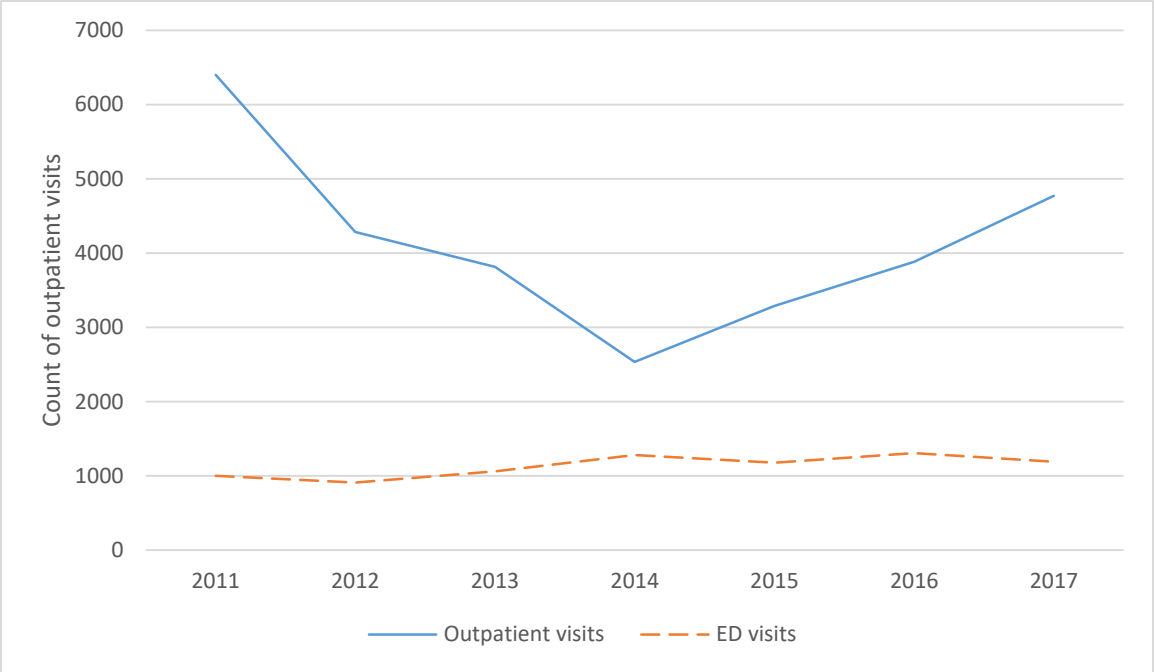


Figure 13

Secular trends in outpatient specialty mental health services by year



To further examine secular trends in outpatient specialty mental health visits, Spearman correlation coefficients were calculated, as this method requires no assumptions related to the nature of potential associations or outcome distribution (Ely et al., 1997). Spearman correlations were calculated for the association between both year-month and year to better account for the seasonal patterns established in previous sections. The Spearman correlations indicated that there were not significant monotonic associations between month-year and count of outpatient visits (ρ = -.10, p = .32) or between year and count of outpatient visits (ρ = -.21, p = .65), suggesting that the number of outpatient visits did not change monotonically as a function of time.

Based on the shape of the data as graphed in Figures 12 and 13, I estimated a quadratic regression model to test for a parabolic trend. Results, as shown Table 13,

indicated a significant parabolic trend in outpatient visits. Additionally, both regression models are displayed in Figures 14 and 15, along with the observed data.

Table 13

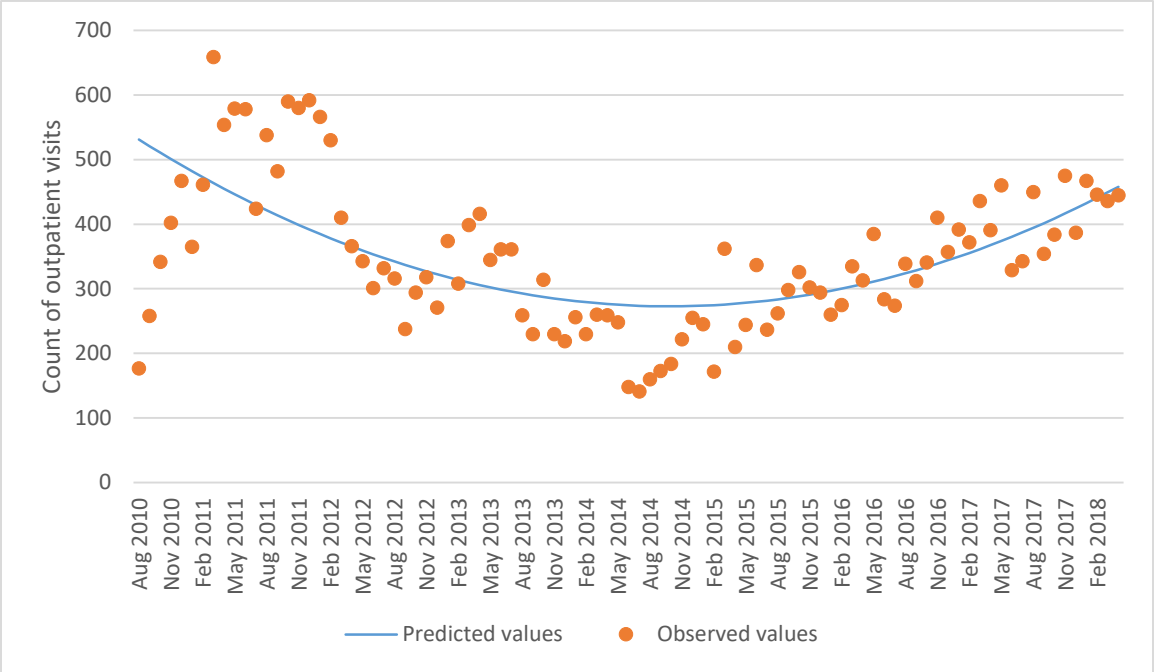
Secular trends in outpatient specialty mental health services: Quadratic regressions

	Year	Month-year
	Standardized β	Standardized β
Time	-4.49**	-2.51***
$Time^2$	4.20**	2.39***
Model R^2	.94**	.39***

An identical series of analyses (graphing, Spearman correlations, and quadratic regression) were performed on sub-samples of the data stratified by race/ethnicity, to examine secular trends across racial and ethnic groups. Figure 16 shows the rate of outpatient specialty mental health visits (per 10,000 youth) by year, within each racial/ethnic subsample. Figure 16 suggests that rates of outpatient specialty mental health visits decreased from 2011 to 2014 and increased from 2014 to 2017 across all racial/ethnic groups. To further explore these secular trends within racial and ethnic sub-samples, spearman correlation coefficients and quadratic regression models were estimated. Results are shown in the Table 14.

Figure 14

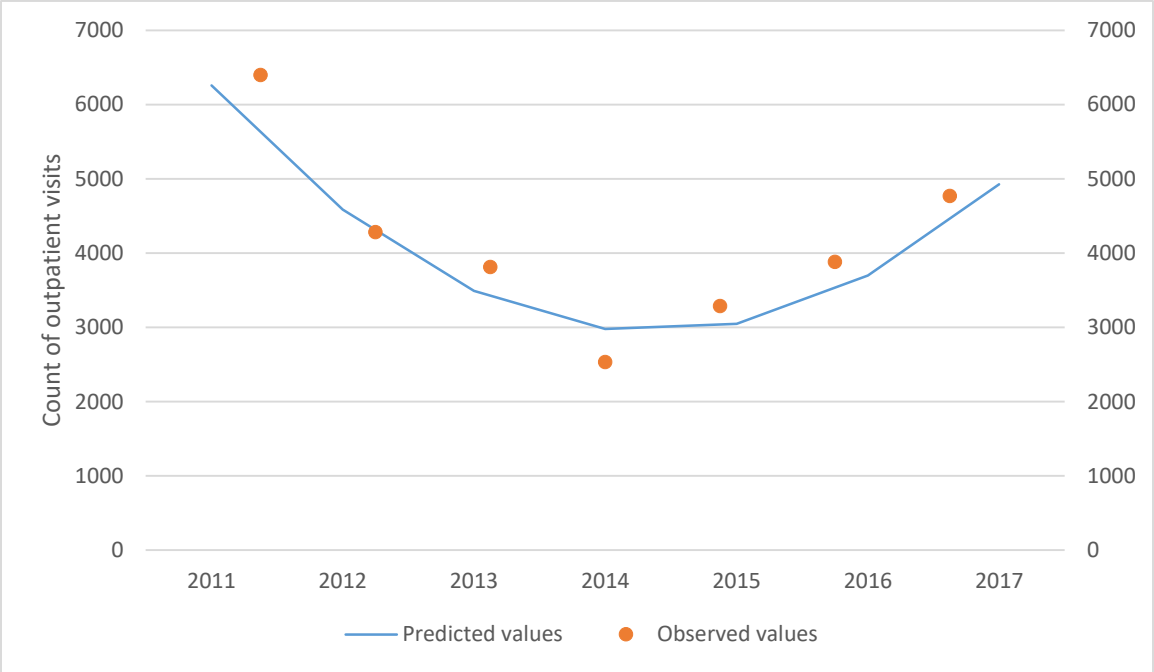
Secular trends in psychiatric ED visits by month-year: Quadratic regression



These findings confirm that rates of outpatient specialty mental health service use among youth in the study sample followed similar quadratic patterns from late 2010 through early 2018 across racial and ethnic groups. In addition, the spearman correlation coefficients suggest that overall, outpatient visits by Black patients increased and by White patients decreased.

Figure 15

Secular trends in psychiatric ED visits by month-year: Quadratic regression



Continuity of Care

Continuity of care was examined for the sample of 2,741 youth who received 2 or more outpatient treatment sessions (70.4% of youth receiving any outpatient care, 11.2% of study sample). For each patient, outpatient visits were organized into treatment periods. A treatment period is defined as the period beginning the day of a patient's initial visit, or their initial visit after a break in treatment of 90 days or longer, and ending when care stops for 90 days or longer (a duration used in prior research; Cook et al., 2017; Cook et al., 2014; Tansella et al., 1995). Using these procedures, 29,026 outpatient specialty mental health visits were organized into 6,034 treatment periods.

Figure 16

Racial/ethnic variations in secular outpatient treatment trends

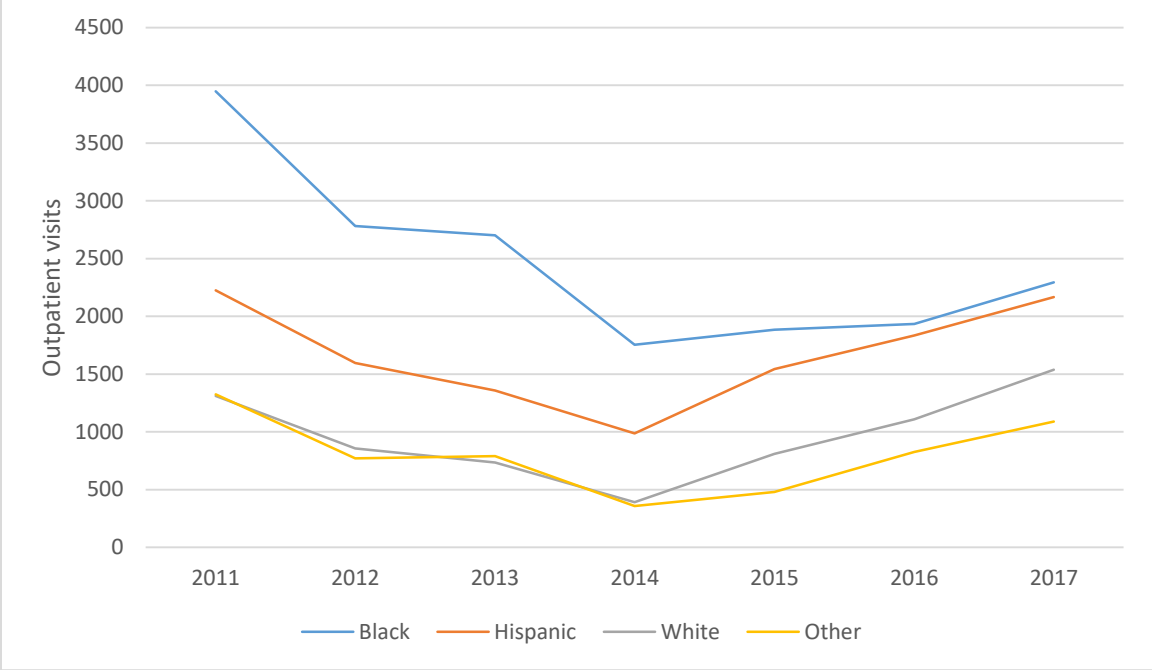


Table 14

Secular trends in outpatient specialty mental health services: Time-trend analyses

	Year		Month-year	
	Spearman Correlation Coefficient (ρ)	Quadratic coefficient (time^2)	Spearman Correlation Coefficient (ρ)	Quadratic coefficient (time^2)
Black	-.64	2.87**	-.51***	1.44***
Hispanic	.00	4.44**	.20	2.44***
White	.21	4.40**	.27**	2.83***
Multi-racial/other	-.04	4.34**	.07	1.05*

Youth who received multiple outpatient specialty mental health visits averaged 2.16 treatment periods (*SD* = 1.86) during the study period. Male youth experienced significantly more treatment periods (*M* = 2.39, *SD* = 2.10) than female youth (*M* = 1.84,

SD = 1.39), *t*(2,500.76) = 7.84, *p* < .001. There were also significant differences in in the number of treatment periods youth engaged on based upon insurance class *F*(2,505) = 8.13, p < .001. Patients using Medicaid (*M* = 2.25, *SD* = 1.96) engaged in significantly more treatment periods than those using private insurance (*M* = 1.91, *SD* = 1.49). Youth with two or more comorbid psychiatric disorders (*M* = 2.23, *SD* = 1.91) experienced significantly more treatment periods than those diagnosed with only one disorder (*M* = 1.57, *SD* = 1.24), *t*(434.22) = -7.68, *p* < .001.

There were also significant racial and ethnic differences in the number of treatment periods that patients engaged in, F(2,127) = 10.81, p < .001. In particular, Black youth (*M* = 2.48, *SD* = 2.22) experienced significantly more outpatient treatment periods than Hispanic youth (*M* = 2.23, *SD* = 1.95), White youth (*M* = 1.83, *SD* = 1.34), and multi-racial youth or those from another racial and ethnic background (*M* = 1.65, *SD* = .71). Additionally, Hispanic youth experienced significantly more treatment periods than White youth. Analysis of multiple imputed data yielded similar results (detailed results in Appendix J). Five of ten imputations indicated no significant differences between Black and Hispanic youth and five of ten imputations indicated that Hispanic youth engaged in significantly more treatment periods than youth identified as multi-racial or from another racial/ethnic group. Despite these inconsistencies, analyses clearly showed that Black and Hispanic youth engaged in significantly more treatment periods than White youth. Practically speaking, youth who engage in more treatment periods experience more interruptions in treatment over the long term, than youth who engage in fewer treatment periods.

Continuity of care was further measured in three distinct ways: duration of treatment period, quantity of visits during a treatment period, and frequency of visits during a treatment period (calculated as the average number of days since the previous visit across a treatment period). To correct for left-censoring in the data, adjustments were made to exclude treatment periods that may have begun prior to the first day for which data were available. Treatment periods that started between August 1, 2010 and October 30, 2010 (the first 90 days for which data were available) may have in fact begun prior to August 1, 2010, and were therefore excluded from analysis. This resulted in the exclusion of 240 treatment periods (4.0%). There were no significant differences in patient sex, race/ethnicity, or insurance class between treatment periods that were excluded and those that were not. However, excluded treatment periods were involved patients who were significantly older, $t(6032) = -6.57$, $p < .001$, and had diagnoses from significantly more categories, $t(6032) = -6.63$, $p < .001$, than treatment periods that were not excluded.

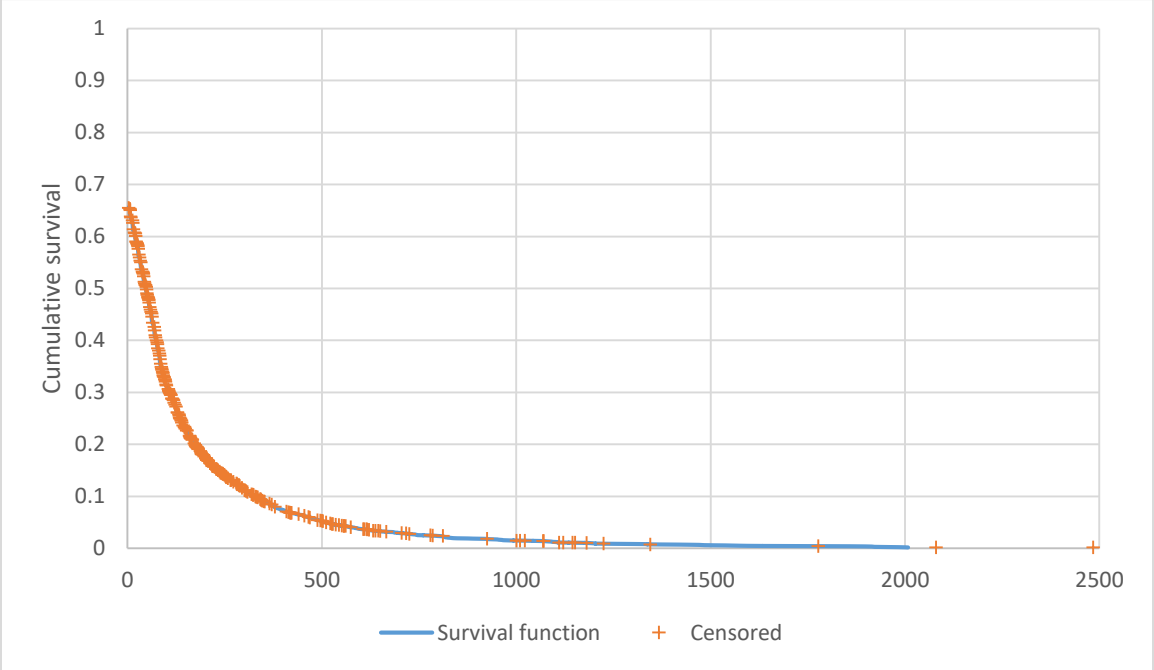
Treatment duration. To account for right-censoring in the data, Kaplan-Meier survival estimation was used to examine treatment duration. These analyses allow for the estimation of both the average and median duration of treatment period (i.e. the survival time). The median treatment duration was reported instead of the average treatment duration, because the average values are heavily influenced by the right-censored nature of the data (Zwiener et al., 2011). Analysis indicated a median treatment duration of 48.00 days (SE = 1.85). The Kaplan-Meier survival curve is shown in Figure 17.

A series of Kaplan-Meier survival curves were estimated to examine

sociodemographic differences in treatment duration. Because Kaplan-Meier analysis does not handle continuous independent variables, age and comorbidity were recoded as categorical variables. Median estimates for treatment duration and 95% confidence intervals are show in Table 15. Analyses indicated that female patients engaged in significantly longer treatment periods than male patients (difference in median estimates = 14 days). There were no significant differences in treatment duration based on age at treatment initiation or race/ethnicity. Treatment duration for patients using Medicaid was

Figure 17

Kaplan-Meier survival curve for treatment duration



significantly longer than for patients using private health insurance (difference in median estimates = 17 days). Patients with diagnoses from 2 or more disorder categories engaged in significantly longer treatment periods than patients with diagnoses from one category.

Seasonal Patterns. In order to examine seasonal variation in treatment duration, Kaplan-Meier survival curves were estimated for treatment initiated in each month of the calendar year. Figure 18 shows the median treatment duration for each month, with 95% confidence intervals. Treatment initiated in May had a significantly shorter duration than treatment initiated in February, March, September, and October.

Table 15

Median estimates for treatment duration: Kaplan-Meier survival analysis

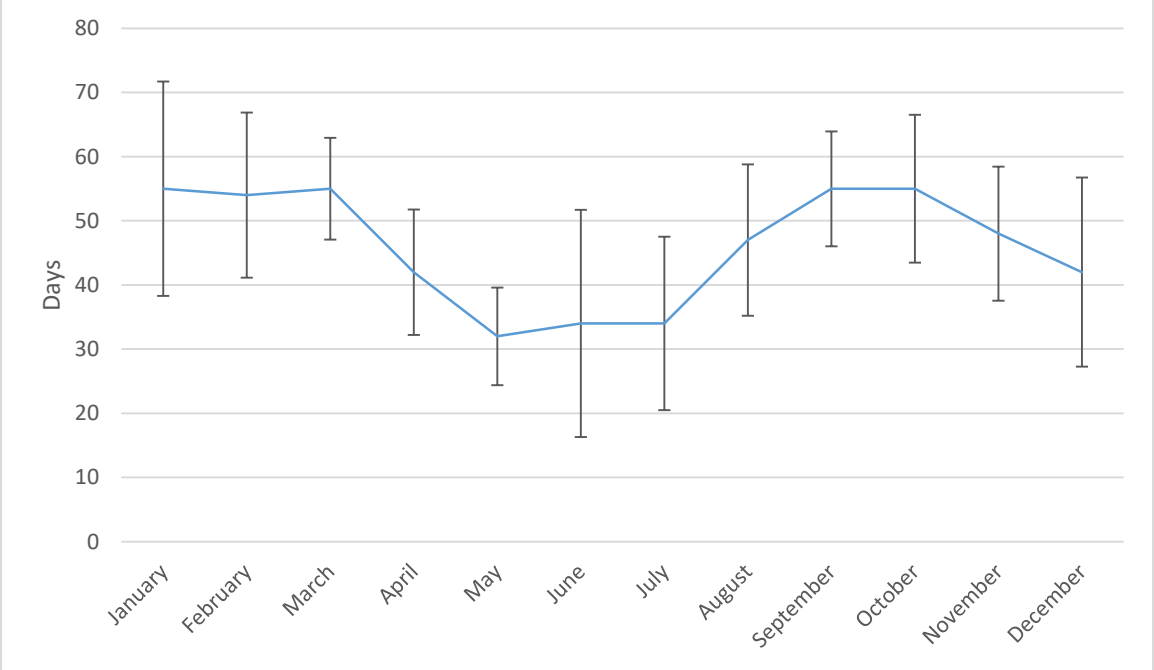
	Median estimate	95% confidence interval
Sex		
Male	42.00	37.62, 46.38
Female	56.00	50.27, 61.73
Age		
5-9 years	48.00	42.08, 53.92
10-13 years	42.00	35.02, 48.98
14-18 years	52.00	45.66, 58.34
Race/ethnicity		
Black	48.00	42.57, 53.43
Hispanic	54.00	48.11, 59.89
White	51.00	40.43, 61.57
Multi-racial/other	25.00	.30, 49.70
Insurance class		
Medicaid	51.00	46.76, 55.25
Health safety-net	36.00	10.15, 61.85
Private	34.00	26.86, 41.14
Comorbidity		
1 disorder category	26.00	19.02, 32.98
2+ disorder categories	49.00	45.32, 52.68

To examine racial/ethnic differences in seasonal variation in treatment duration, Kaplan-Meier survival curves were estimated for treatment duration within three sub-samples stratified for race/ethnicity (Black, Hispanic, and White). Youth identified as

multi-racial or another race/ethnicity were excluded from this analysis because of the small sample size (N=119), which did not allow for the calculation of standard errors and confidence intervals for many of the median estimates. Figure 19 and Table 16 show the median treatment duration estimates for each month, within each racial/ethnic subsample. In addition, Table 16 includes 95% confidence intervals.

Figure 18

Seasonal patterns in treatment duration: Kaplan-Meier median estimates

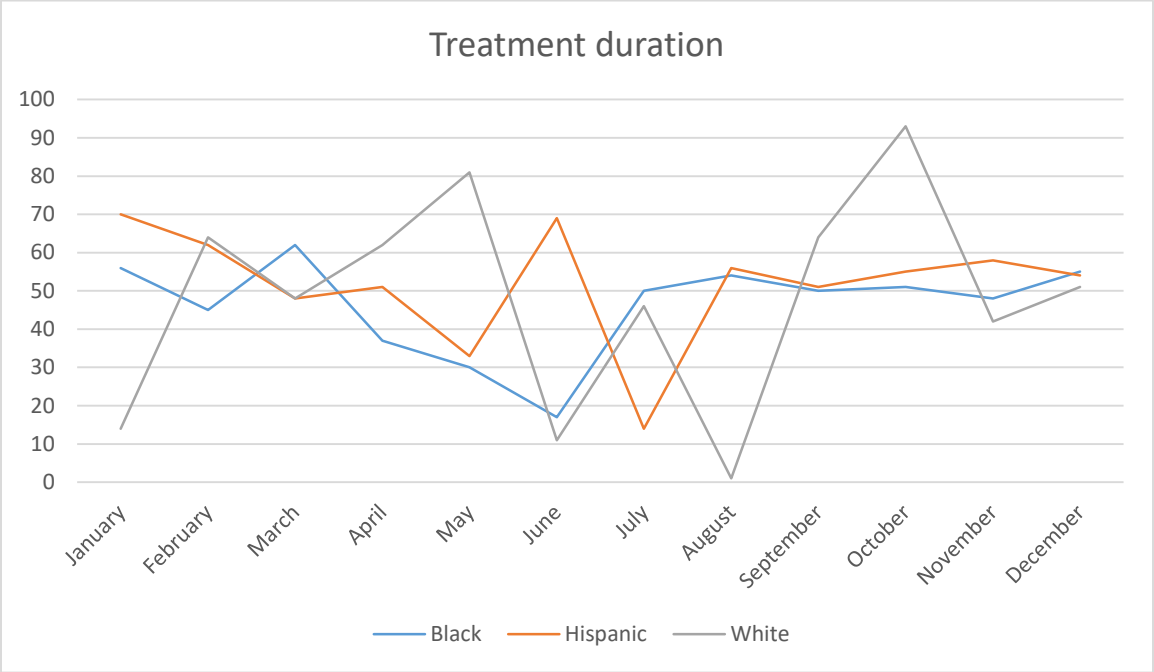


As shown in Figure 19, treatment duration among Black youth is longest for treatment initiated in March, and then seems to decrease for treatment initiated through June. Duration then increases drastically for treatment periods initiated in July, and remains relatively steady for treatment initiated for the rest of the year. Treatment initiated in June was significantly shorter in duration than treatment initiated in January, March, August, and October. Treatment initiated in April and May was significantly

shorter in duration than treatment initiated in March.

Figure 19

Racial/ethnic variations in seasonal patterns for treatment duration



Among Hispanic youth treatment duration is highest for treatment initiated in January and June. Treatment duration seems to decrease for treatment initiated in February through May. After the spike in duration for treatment initiated in June, duration drops drastically for treatment initiated in July. Duration time then rises for treatment initiated in August and remains relatively steady for the rest of the year. Also, among Hispanic youth, treatment initiated in July was significantly shorter in duration than treatment initiated in all other months (except May). Treatment initiated in May was significantly shorter in duration than treatment initiated in January, February, June, and December.

Table 16

Seasonal patterns in treatment duration: Kaplan-Meier median estimates

	Black (*n* = 2,740)		Hispanic (*n* = 1,534)		White (*n* = 680)	
	Median	95% CI	Median	95% CI	Median	95% CI
January	56.00	36.94, 75.06	70.00	49.48, 90.52	14.00	.00, 38.10
February	45.00	22.61, 67.39	62.00	51.87, 72.13	64.00	35.85, 92.15
March	62.00	49.27, 74.73	48.00	37.85, 58.15	48.00	34.10, 61.90
April	37.00	26.83, 47.17	51.00	36.19, 65.81	62.00	.00, 126.38
May	30.00	17.46, 42.54	33.00	19.92, 46.08	81.00	55.09, 106.91
June	17.00	.71, 33.29	69.00	46.92, 91.08	11.00	n/a
July	50.00	24.28, 75.72	14.00	.00, 29.69	46.00	20.32, 85.83
August	54.00	36.74, 71.26	56.00	36.87, 75.13	1.00	n/a
September	50.00	31.67, 68.33	51.00	38.43, 63.57	64.00	40.24, 87.76
October	51.00	35.49, 66.51	55.00	38.50, 71.50	93.00	65.03, 120.97
November	48.00	31.23, 64.77	58.00	27.93, 88.07	42.00	.00, 120.44
December	55.00	28.05, 81.95	54.00	48.11, 59.89	51.00	40.43, 61.57

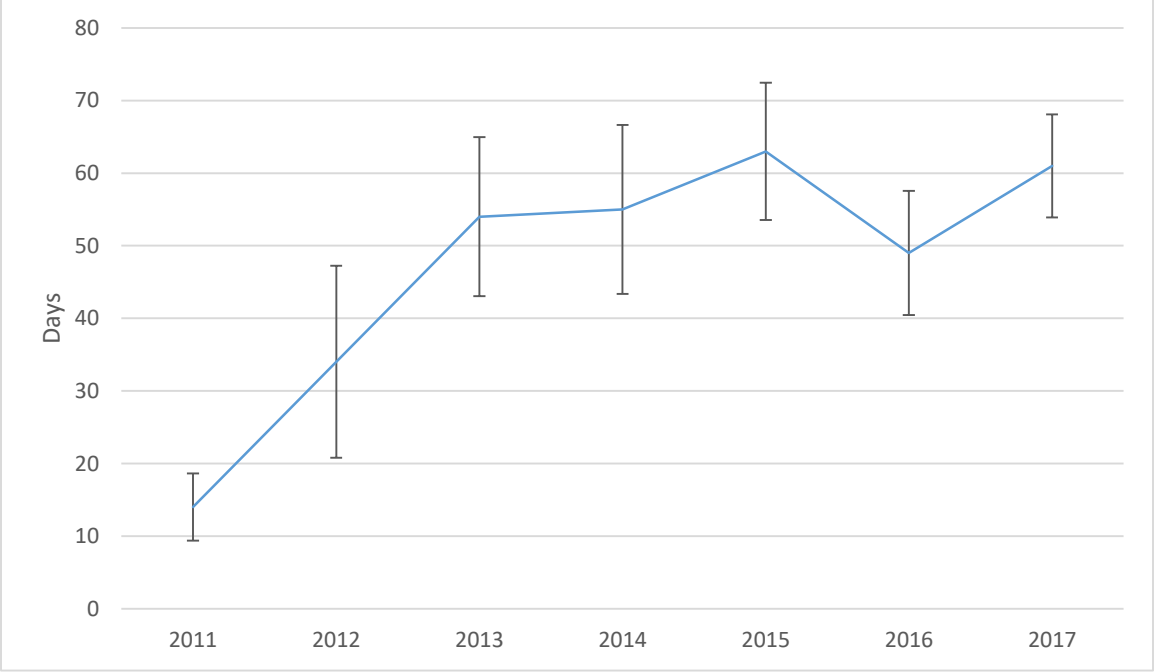
Among White youth, treatment duration was highest for treatment initiated in October, and then seems to generally decrease for treatment initiated through January. Duration then generally increases for treatment initiated through May. Among White youth, treatment initiated in January was significantly shorter in duration than treatment initiated in May, September, October, or December. Treatment initiated in March or December was significantly shorter in duration than treatment initiated in October. Due to the small sample size for this population (N = 680) in relation to the number of months per year (12), SPSS was unable to calculate standard errors for treatment initiated in June and August. It is therefore difficult to draw conclusions about patterns for treatment initiated in June through August.

Secular trends. In order to examine secular trends in treatment duration, Kaplan-Meier survival curves were estimated for treatment initiated in the years 2011-2017 (for

which data were available for the full calendar year). The graph below shows the median treatment duration for each year, with 95% confidence intervals. As shown in Figure 20, treatment duration seems to be significantly increasing across the study period. As a sensitivity analysis, the same procedure was performed on a dataset including the 240 cases excluded due to left censoring; results indicated the identical median estimates for each year (details in Appendix K).

Figure 20

Secular trends in treatment duration: Kaplan-Meier median estimates



To further examine secular trends in treatment duration, Spearman correlation coefficients were calculated for the median yearly estimates. The Spearman correlation coefficient indicated that there were not significant associations between year and count of outpatient visits ($\rho = .71$, $p = .07$). Failure to reach significance may be related to the small sample size ($n = 7$ years). I also estimated a simple time-series regression model to

test for linear trends (Ely et al., 1997). Results indicated a significant linear increase in the median treatment duration across the study period ($\beta = .80$, $p < .05$). The similarity between the Spearman correlation coefficient and the linear regression coefficient suggests that the upward trend was linear (as opposed to another shape).

To examine racial/ethnic differences in secular trends in treatment duration, Kaplan-Meier survival curves were estimated for treatment duration within three sub-samples stratified for race/ethnicity (Black, Hispanic, and White). Youth identified as multi-racial or another race/ethnicity were excluded from this analysis because of the small sample size (N=119), which did not allow for the calculation of standard errors and confidence intervals for many of the median estimates. Figure 21 shows the median treatment duration within each subsample. As shown, median treatment duration increased across all racial/ethnic groups during the study period. Spearman correlations and linear regression models were estimated for median duration estimates from the Kaplan-Meier analyses. Table 17 shows the Spearman correlation coefficients and regression coefficients within each sub-sample. Results indicated that treatment duration significantly increased across the study period only among Hispanic youth.

Figure 21

Racial/ethnic variations in secular trends for treatment duration

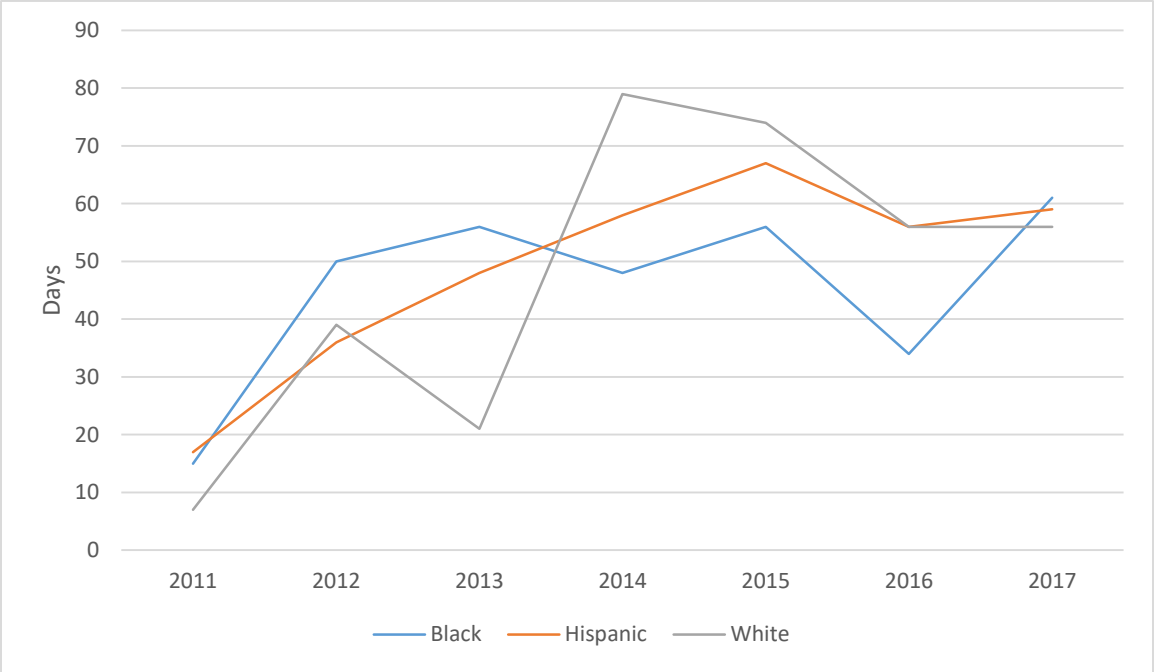


Table 17

Racial/ethnic variations in secular trends for treatment duration: Time-trend analyses

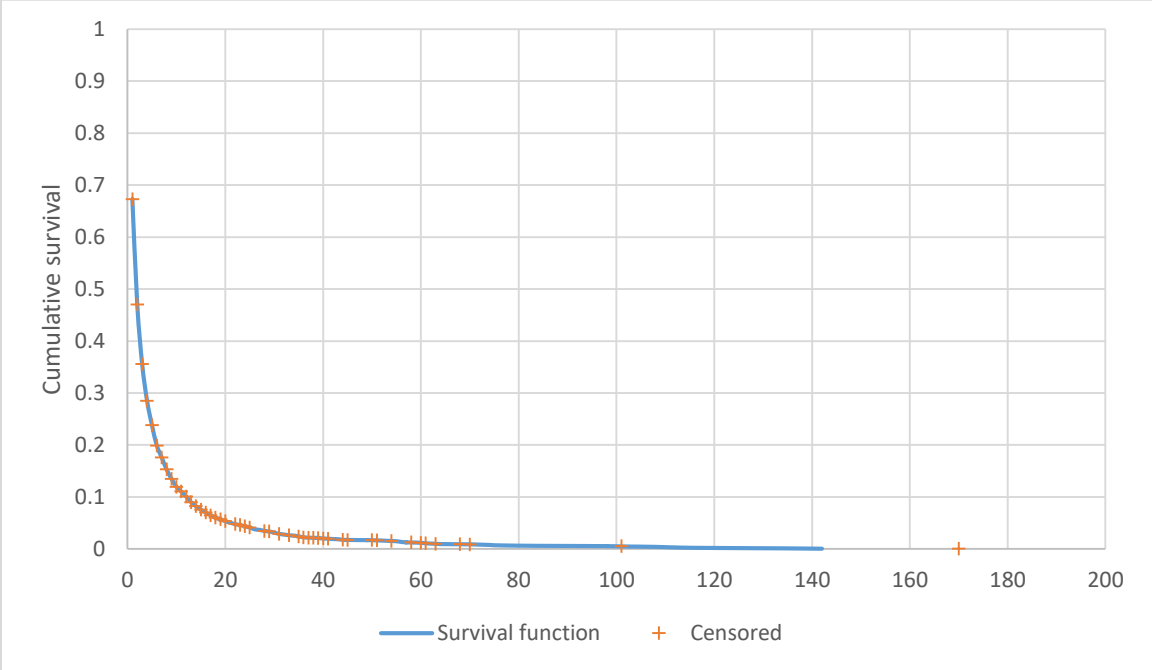
	Spearman Correlation Coefficient (ρ)	Linear Regression Coefficient (β)
Black	.51	.51
Hispanic	.82*	.84*
White	.63	.68

Treatment Quantity. To account for right-censoring in the data, Kaplan-Meier survival estimation was used to examine treatment quantity. Analysis indicated a median quantity of 2.00 visits (SE = .042) for each treatment period. The median treatment

quantity was reported instead of the average treatment quantity, because the average values are heavily influenced by the right-censored nature of the data (Zwiener et al., 2011). The Kaplan-Meier survival curve is shown in Figure 22.

Figure 22

Kaplan-Meier survival curve for treatment quantity



A series of Kaplan-Meier survival curves were then estimated to examine sociodemographic differences in treatment quantity. Because Kaplan-Meier analysis does not handle continuous independent variables, age and comorbidity were recoded as categorical variables. Median estimates for treatment quantity and 95% confidence intervals are show Table 18. Analyses indicated that female patients received significantly more treatment visits within a given treatment period than male patients (difference in median estimates = 1 visit). In addition, patients aged 14-18 at treatment

initiation received significantly more treatment visits within a given treatment period than patients aged 5-9 and patients aged 10-13 at treatment initiation (difference in median estimates = 1 visit). White patients received significantly more treatment visits within a given treatment period than Black patients, Hispanic patients, and those identified as multi-racial or another race/ethnicity (difference in median estimates = 1 visit). There were no significant differences in treatment quantity based on insurance class at treatment initiation or diagnoses from 2 or more disorder categories.

Table 18

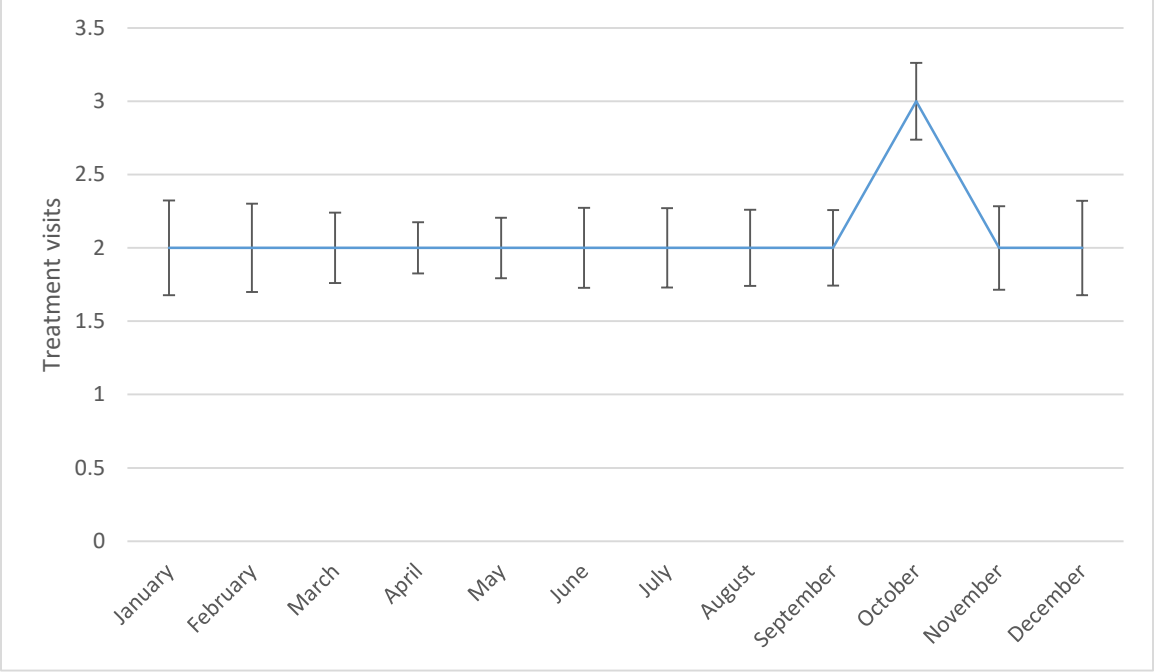
Median estimates for treatment quantity: Kaplan-Meier survival analysis

	Median estimate	95% confidence interval
Sex		
Male	2.00	1.92, 2.08
Female	3.00	2.86, 3.14
Age		
5-9 years	2.00	1.91, 2.09
10-13 years	2.00	1.84, 2.16
14-18 years	3.00	2.83, 3.17
Race/ethnicity		
Black	2.00	1.88, 2.12
Hispanic	2.00	1.85, 2.15
White	3.00	2.75, 3.25
Multi-racial/other	2.00	1.39, 2.61
Insurance class		
Medicaid	2.00	1.91, 2.09
Health safety-net	2.00	1.23, 2.77
Private	2.00	1.87, 2.13
Comorbidity		
1 disorder category	2.00	1.75, 2.25
2+ disorder categories	2.00	1.91, 2.09

Seasonal Patterns. In order to examine seasonal variation in treatment quantity, Kaplan-Meier survival curves were estimated for treatment initiated in each month of the calendar year. Figure 23 shows the median treatment quantity for treatment periods in each month of the year, with 95% confidence intervals. Patients who initiated treatment in October received significantly more treatment visits within a given treatment period than patients who initiated treatment any other time during the year.

Figure 23

Seasonal patterns in treatment quantity: Kaplan-Meier median estimates

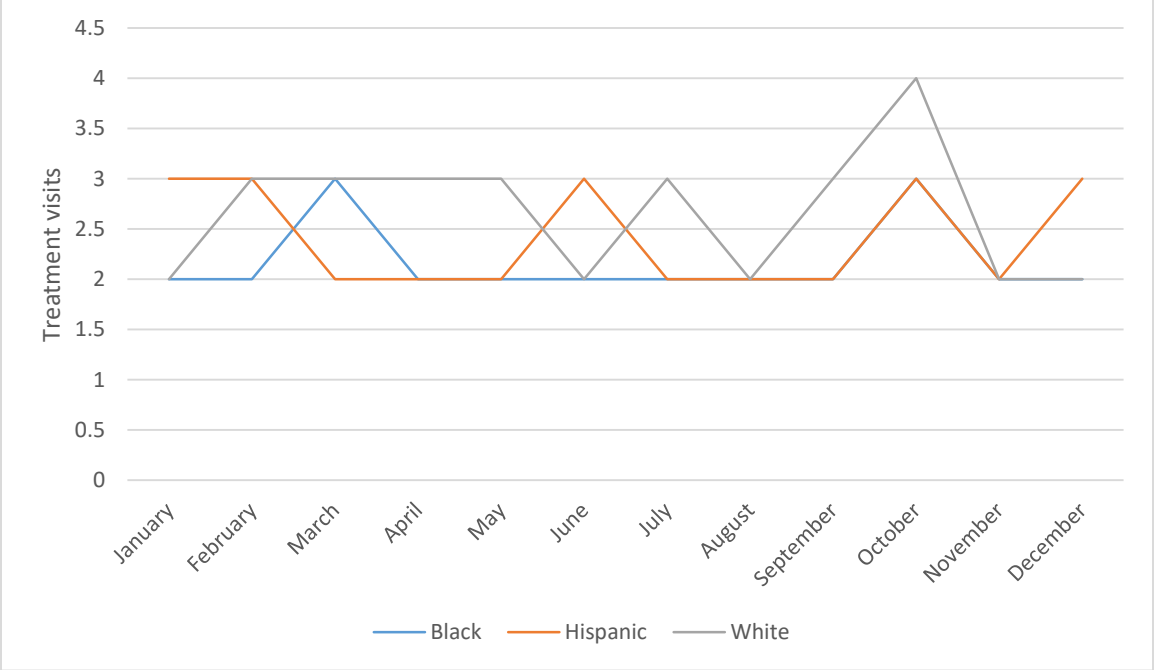


To examine racial/ethnic differences in seasonal variation in treatment quantity, Kaplan-Meier survival curves were estimated for treatment quantity within three sub-samples stratified for race/ethnicity (Black, Hispanic, and White). Youth identified as multi-racial or another race/ethnicity were excluded from this analysis because of the small sample size (N=119), which did not allow for the calculation of standard errors and

confidence intervals for many of the median estimates. Figure 24 shows the median treatment quantity within each subsample, and Table 19 also includes 95% confidence intervals.

Figure 24

Racial/ethnic variations in seasonal patterns for treatment quantity



Treatment quantity among Black youth was significantly higher for treatment initiated in March and October than during the rest of the year. Among Hispanic youth, treatment quantity was significantly higher in October than in March, July, and August, and significantly higher in January than in March and July. Among White youth, treatment quantity was significantly higher in October than in January, August, and November and significantly higher in December than in January. Due to the small sample size for this population (N = 680) in relation to the number of months per year (12), SPSS

was unable to calculate standard errors for treatment initiated in June. It is therefore difficult to draw conclusions about patterns for treatment initiated in June.

Table 19

Seasonal patterns in treatment quantity: Kaplan-Meier median estimates

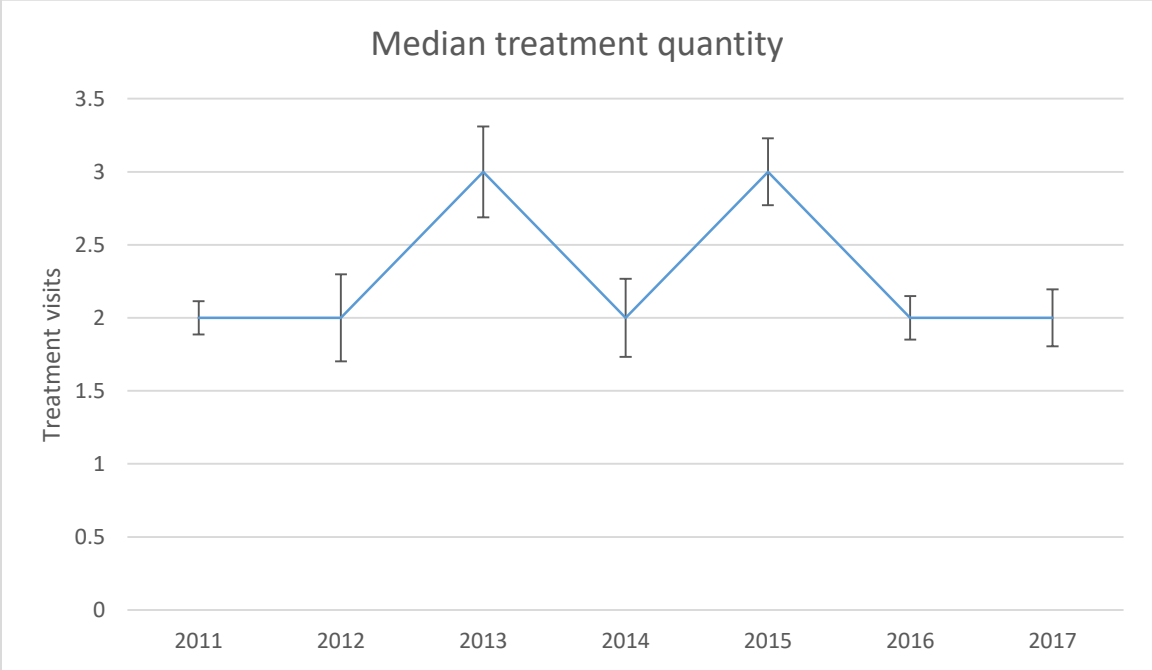
	Black		Hispanic		White	
	Median	95% CI	Median	95% CI	Median	95% CI
January	2.00	1.54, 2.46	3.00	2.42, 3.58	2.00	1.36, 2.64
February	2.00	1.74, 2.26	3.00	2.34, 3.66	3.00	1.52, 4.48
March	3.00	2.62, 3.38	2.00	1.61, 2.38	3.00	2.20, 3.80
April	2.00	1.73, 2.27	2.00	1.43, 2.57	3.00	1.91, 4.09
May	2.00	1.69, 2.31	2.00	1.51, 2.49	3.00	2.22, 3.78
June	2.00	1.63, 2.38	3.00	2.14, 3.86	2.00	n/a
July	2.00	1.44, 2.56	2.00	1.59, 2.41	3.00	1.72, 4.28
August	2.00	1.61, 2.39	2.00	1.55, 2.45	2.00	1.16, 2.84
September	2.00	1.69, 2.31	2.00	1.56, 2.44	3.00	2.35, 3.65
October	3.00	2.60, 3.40	3.00	2.46, 3.54	4.00	3.10, 4.90
November	2.00	1.57, 2.43	2.00	1.52, 2.48	2.00	1.18, 2.83
December	2.00	1.88, 2.12	3.00	2.27, 3.73	2.00	2.75, 3.25

Secular Trends. In order to examine secular trends in treatment quantity, Kaplan-Meier survival curves were estimated for treatment initiated in the years 2011-2017 (for which data were available for the full calendar year). Figure 25 shows the median treatment quantity for each year, with 95% confidence intervals. As shown on the graph, median treatment quantity increased in 2013 and 2015, but overall remained steady across the study period. To further examine secular trends in treatment duration, spearman correlation coefficients were calculated for the median yearly estimates. The spearman correlation coefficient indicated that there were not significant associations between year and median quantity of visits ($\rho = .00$, $p = 1.00$). I also estimated a simple time-series regression model to test for linear trends (Ely et al., 1997). Results indicated

that year and median treatment quantity were not associated across the study period (β = .00, p < 1.00). Taken together, these results indicate that quantity of treatment visits did not change significantly during the study period.

Figure 25

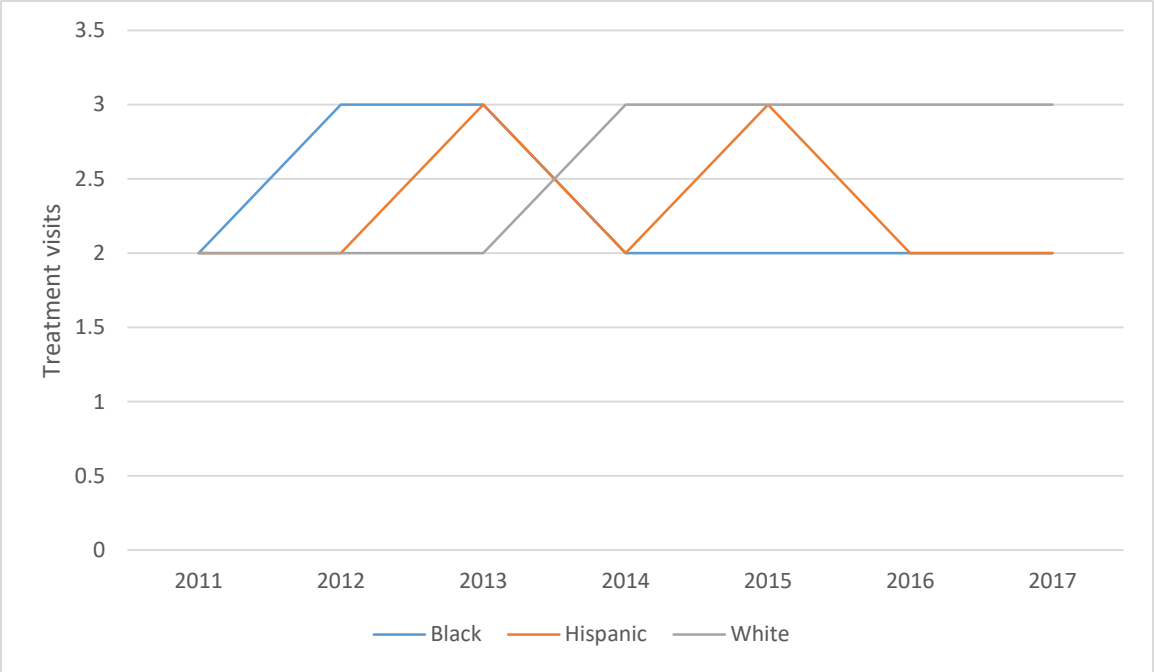
Secular trends in treatment quantity: Kaplan-Meier median estimates



To examine racial/ethnic differences in secular trends in treatment quantity, Kaplan-Meier survival curves were estimated for treatment quantity within three sub-samples stratified for race/ethnicity (Black, Hispanic, and White). Youth identified as multi-racial or another race/ethnicity were excluded from this analysis because of the small sample size (N=119), which did not allow for the calculation of standard errors and confidence intervals for many of the median estimates. Figure 26 shows the median treatment quantity for each year within each subsample. In addition, Table 20 shows the median treatment quantity for each year, with 95% confidence intervals.

Figure 26

Racial/ethnic variations in secular trends for treatment quantity



Among Black youth, median treatment quantity in 2012 and 2013 was significantly greater than in 2011, 2014, 2015, 2016, and 2017. Overall treatment quantity remained roughly the same across the study period. Among Hispanic youth, median treatment quantity in 2013 was significantly greater than in 2011 and 2016. Median treatment quantity in 2015 was significantly greater than in 2011, 2012, 2014, 2016, and 2017. Overall treatment quantity remained roughly the same across the study period. Among White youth, although treatment quantity does seem to be increasing with the duration of time, there were no significant differences in median treatment quantity between any years in the study period. However, for 2011, the survival function did not reach .45, and thus confidence intervals could not be calculated.

Table 20

Racial/ethnic variations in secular trends for treatment quantity

	Black		Hispanic		White	
	Median	95% CI	Median	95% CI	Estimate	95% CI
2011	2.00	1.80, 2.20	2.00	1.76, 2.24	2.00	n/a
2012	3.00	2.61, 3.40	2.00	1.50, 2.50	2.00	.99, 3.01
2013	3.00	2.59, 3.41	3.00	2.34, 3.66	2.00	1.43, 2.57
2014	2.00	1.75, 2.26	2.00	1.43, 2.57	3.00	1.77, 4.23
2015	2.00	1.63, 2.38	3.00	2.61, 3.39	3.00	2.04, 3.96
2016	2.00	1.77, 2.23	2.00	1.78, 2.22	3.00	2.32, 3.68
2017	2.00	1.72, 2.28	2.00	1.65, 2.36	3.00	2.19, 3.81

Spearman correlations and linear regression models were estimated for median treatment quantity estimates from the Kaplan-Meier analyses. The table below shows the Spearman correlation coefficients and regression coefficients within each sub-sample. Results indicated that treatment quantity significantly increased across the study period only among White youth. The similarity between the spearman-rank correlation coefficients and the linear regression coefficients indicates that the trend is in fact linear.

Table 21

Racial/ethnic variations in secular trends for treatment quantity: Time-trend analysis

	Spearman Correlation Coefficient (ρ)	Linear Regression Coefficient (β)
Black	-.47	-.47
Hispanic	.00	.00
White	.87*	.87*

Treatment frequency. To calculate treatment frequency, I first calculated the number of days since the previous visit for every day within the study period. I then took the average of these values. Treatment frequency is not subject to right-censoring in the

same way as treatment duration and quantity. Although treatment frequency might change for an unfinished treatment period, there is no reason to believe that it would only change in one direction. For example, we know that treatment duration and quantity for an unfinished treatment period would only stay the same or increase past the end of the study period; in comparison, treatment frequency could change in either direction, and therefore the value for an unfinished treatment period can be used as a reasonable estimate for what treatment frequency might be for the entire study period. For this reason, a different series of analyses was used to examine treatment frequency.

Frequency of outpatient visits during a treatment period could only be calculated for treatment periods with at least 2 visits that spanned more than one day (N = 3,871, 64.2% of treatment periods). The average frequency of visits during a treatment period was 21.33 days between visits (*SD* = 10.17). Male youth received significantly less frequent visits (*M* = 22.39 days between visits, *SD* = 10.30) than female youth (*M* = 19.52, *SD* = 9.97), $t(3,423) = 7.99$, $p < .001$. Patients who were older at treatment initiation received significantly less frequent visits than those who were younger at treatment initiation (B = -.13, SE = .05, p<.01). There were significant differences in the frequency of visits by insurance class $F(3,425) = 13.21$, $p < .001$; patients using Medicaid (*M* = 21.76, *SD* = 10.21) received less frequent treatment than those using private insurance (*M* = 19.67, *SD* = 10.34). Youth with two or more comorbid psychiatric disorders (*M* = 21.54, *SD* = 10.18) received significantly less frequent visits than those diagnosed with only one disorder (*M* = 18.14, *SD* = 10.85), $t(3,424) = -5.03$, $p < .001$.

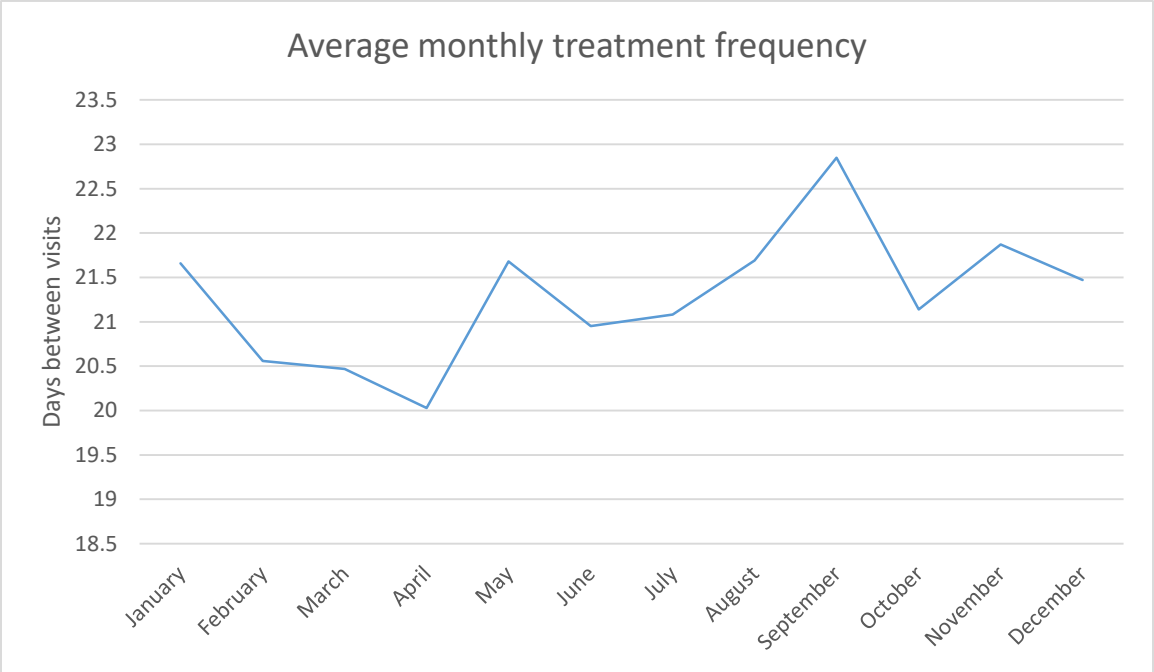
There were few racial and ethnic differences in the frequency of visits within a

treatment period, $F(3,415) = 3.77$, $p < .05$. Black youth ($M = 21.60$, $SD = 10.20$), Hispanic youth ($M = 21.49$, $SD = 10.20$), and White youth ($M = 21.10$, $SD = 9.83$) engaged in treatment significantly less frequently than youth who were multi-racial or another race ($M = 17.53$, $SD = 8.12$). Analysis of multiply imputed data yielded similar results, although with some discrepancies regarding youth identified as multi-racial or from another racial/ethnic background (detailed results in Appendix L). In most imputations, the differences between youth in the multi-racial/other category and youth in the three other categories (Black, Hispanic, White) were non-significant (in six of ten imputations for multi-racial/other youth as compared to White youth; in three of ten imputations for multi-racial/other youth as compared to Black and Hispanic youth). Overall, results indicate no significant racial/ethnic differences in frequency of treatment between the three largest groups in the study, Black, Hispanic, and White youth.

Seasonal Patterns. The average monthly values for treatment frequency are shown in Figure 27. Treatment periods initiated in September tended to have less frequent visits and treatment periods initiated in February and April tended to have more frequent visits. Generalized linear modeling was used to estimate seasonal variations in treatment frequency. The reference month was the month with the average frequency closest to the average frequency for the entire sample (December). First, a baseline model was fit. A second model was then fit to control for secular trends. A final model was fit to control for sociodemographic covariates (age, sex, race/ethnicity, insurance class, and the number of comorbid diagnosis categories). Regression coefficients and standard errors from each model are shown in Table 22.

Figure 27

Seasonal patterns in treatment frequency



These results cannot be interpreted in the same way that as the results for treatment duration and quantity. In this case, the dependent variable, frequency of treatment, is higher for treatment that is less consistent (more days between visits) and lower for treatment that is more consistent (fewer days between visits). When interpreting regression coefficients, a negative value indicates more frequent visits (an indicator of good continuity of services) and a positive value indicates less frequent visits (an indicator of poor continuity of services).

Table 22

Seasonal patterns in treatment frequency: GLMs

	Model 1	Model 2	Model 3
		B (SE)	
Month			
January	.19 (.79)	-.90 (.79)	-.85 (.76)
February	-.91 (.82)	-1.75 (.82)*	-1.84 (.79)*
March	-1.00 (.76)	-1.73 (.76)*	-1.77 (.73)*
April	-1.44 (.82)	-1.91 (.81)*	-1.95 (.78)*
May	.21 (.83)	-.40 (.82)	-.44 (.79)
June	-.52 (.88)	-.81 (.87)	-.63 (.85)
July	-.39 (.88)	-.91 (.87)	-.91 (.84)
August	.22 (.76)	.23 (.75)	.29 (.73)
September	1.38 (.77)	1.37 (.76)	1.18 (.74)
October	-.33 (.77)	-.50 (.76)	-.43 (.74)
November	.40 (.80)	.19 (.79)	.39 (.76)
December	ref	ref	ref
Year		.68 (.07)***	.73 (.07)***
Age			-.39 (.04)***
Female			-2.32 (.33)***
Race/Ethnicity			
Black			ref
Hispanic			-.31 (.37)
White			.18 (.50)
Multi-racial/other			-3.56 (1.19)**
Insurance			
Medicaid			ref
HSN			-2.91 (1.25)*
Private			-1.55 (.41)***
Comorbidity			.44 (.09)***

Consistent with Figure 27, the GLM estimates in Table 22 indicate that patients who initiated treatment in February, March, and April, engaged in treatment significantly more frequently than in December. In particular, this was true when the model accounted for secular trend, in which treatment frequency significantly decreased across the study period. The seasonal patterns also remained when controlling for sociodemographic

variables.

Patients who were older at treatment initiation engaged in treatment significantly more frequently than patients who were younger at treatment initiation. Treatment was also significantly more frequent among female youth than male youth in the sample. Treatment was significantly more frequent among patients who used private health care or health safety-net services than among those who used Medicaid. Finally, patients with diagnoses from more disorder categories engaged in treatment significantly less frequently than patients with diagnoses from fewer categories. Hispanic and White youth engaged in treatment about as frequently as Black youth; however, youth identified as multi-racial, or from another racial/ethnic background, engaged in treatment significantly more frequently than Black youth. Analysis in multiply imputed data sets yielded similar findings (pooled results are available in Appendix M).

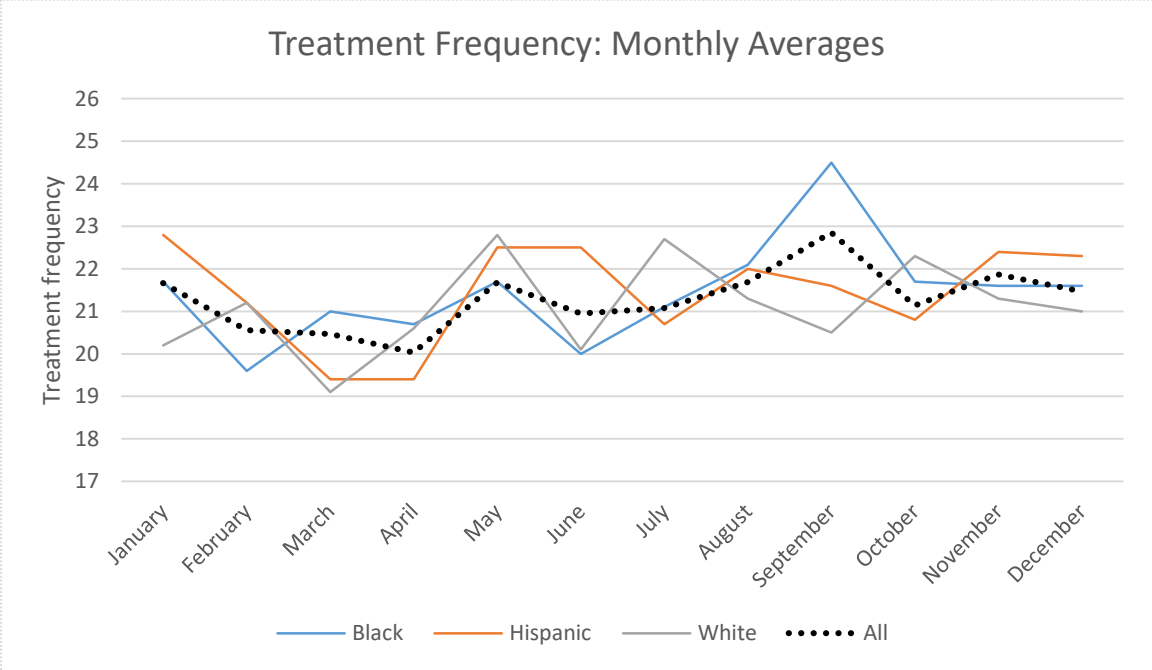
The same series of analyses (direct comparison, sequence of three GLMs) was applied to sub-samples stratified by race/ethnicity. Figure 28 shows the monthly averages for treatment frequency for Black youth, Hispanic youth, and White youth. Youth identified as multi-racial or from another racial/ethnic background were excluded from this series of analyses, as the sample size was very small (N=69). The trend line for the entire sample is included for comparative purposes.

A series of GLMs were fit to estimate treatment frequency for each racial/ethnic sub-sample. First, a baseline model was fit. A second model was then fit to control for secular trends. A final model was fit to adjust for sociodemographic covariates (age, sex, insurance class, and number of comorbid disorder categories). The reference month for

each model was the month for which the average treatment frequency was closest to the average treatment frequency for the corresponding racial/ethnic sub-sample. Regression coefficients and standard errors for each of the final models are shown in Table 23.

Figure 28

Racial/ethnic variations in seasonal patterns for treatment frequency



The only significant seasonal effects in treatment frequency occurred among Black and Hispanic youth. Among Black youth only, treatment initiated in September was associated with significantly less frequent treatment sessions than treatment initiated during the reference month and treatment initiated in February was associated with significantly more frequent treatment sessions that treatment initiated during the reference month. Among Hispanic youth, treatment initiated in April was associated with significantly more frequent treatment sessions than treatment initiated during the

reference month. Results also indicated that treatment became significantly less frequent across the study period among all racial/ethnic sub-samples.

Table 23

Racial/ethnic variations in seasonal patterns for treatment frequency: GLMs

	Black	Hispanic	White
Month		B (SE)	
January	-.76 (1.08)	-.15 (1.34)	-1.42 (2.42)
February	-2.63 (1.18)*	-1.10 (1.37)	-1.00 (2.22)
March	-1.25 (1.03)	-2.62 (1.30)*	-2.61 (2.27)
April	-1.26 (1.10)	-1.81 (1.45)	-2.02 (2.52)
May	-.28 (1.16)	.63 (1.41)	.07 (2.36)
June	-1.49 (1.25)	1.64 (1.44)	-1.99 (2.69)
July	-1.06 (1.20)	-.49 (1.61)	1.02 (2.53)
August	.76 (1.02)	.98 (1.31)	-.28 (2.40)
September	2.96 (1.04)**	ref	-.60 (2.28)
October	.03 (1.06)	-.23 (1.32)	.79 (2.19)
November	.21 (1.08)	1.41 (1.34)	-.55 (2.30)
December	ref	1.28 (1.42)	ref
Year	.78 (.10)***	.97 (.13)***	.50 (.28)**
Age	-.35 (.06)***	-.44 (.08)***	-.25 (.13)*
Female	-2.11 (.48)***	-3.12 (.62)***	-2.38 (.93)*
Insurance class			
Private	-.81 (.59)	-3.49 (.99)***	-2.44 (.96)*
HSN	-2.62 (2.15)	-3.29 (2.47)	-.02 (2.80)
Medicaid	ref	ref	ref
Comorbidity	.30 (.13)*	.47 (.17)**	.60 (.25)*

Age at treatment initiation was significantly associated with treatment duration among Black, Hispanic, and White youth, such that youth who were older at treatment initiation engaged in significantly more frequent treatment than those who were younger at treatment initiation. Sex was also associated with treatment frequency among Black, Hispanic, and White youth, such that female youth engaged in significantly more frequent treatment sessions than male youth. Insurance class was associated with

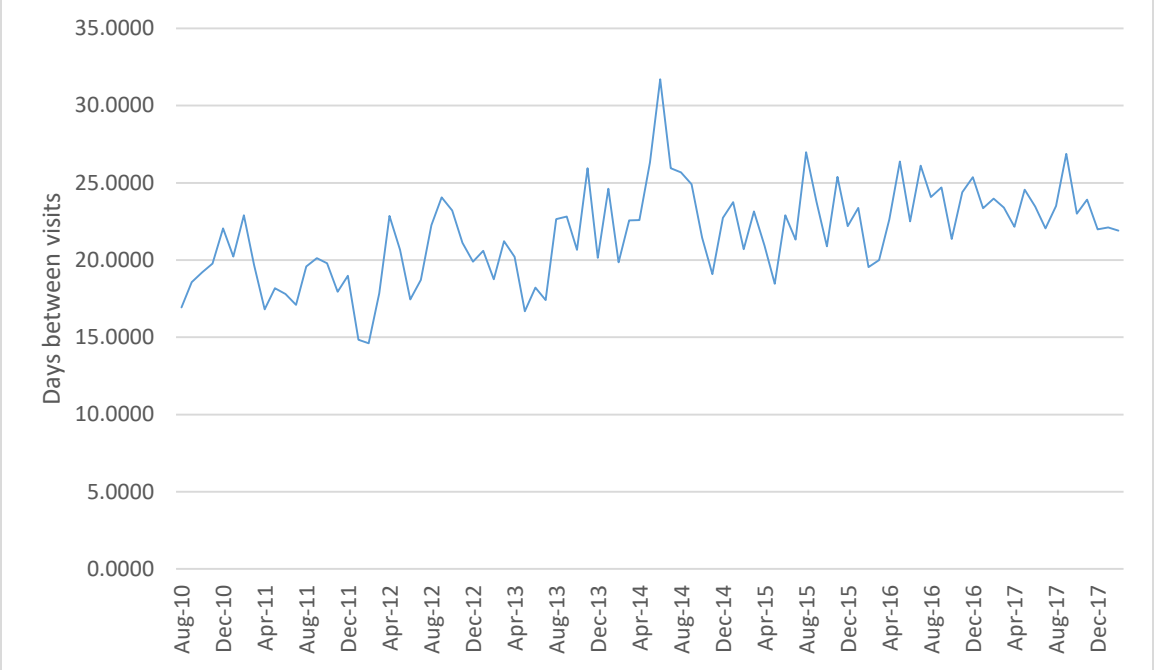
treatment duration only among Hispanic and White youth, such that those using private health insurance engaged in significantly more frequent treatment than those using Medicaid. Among all youth, those with psychiatric diagnoses from a greater number of disorder categories received significantly less frequent treatment than those with diagnoses from fewer categories.

Secular Trends. To further explore secular trends in frequency of outpatient specialty mental health treatment, I first plotted averages for frequency of outpatient specialty mental health visits among children and adolescents by month-year and year. Figure 29 shows secular patterns by month-year and Figure 30 shows secular patterns by year. Both graphs indicate a small but steady increase in the average time between outpatient specialty mental health visits across the study period.

To further examine frequency of outpatient specialty mental health visits, spearman correlation coefficients were calculated, as this method requires no assumptions related to the nature of potential associations or outcome distribution (Ely et al., 1997). Spearman correlations were calculated for the association between both month-year and year to better account for the seasonal patterns established in previous sections. The spearman correlations indicated a significant positive association between month-year and number of days between visits (ρ =.60, $p < .001$) as well as, between year and number of days between visits (ρ = .96, $p < .001$), suggesting that frequency of visits decreased across the study period.

Figure 29

Secular patterns in treatment frequency by month-year



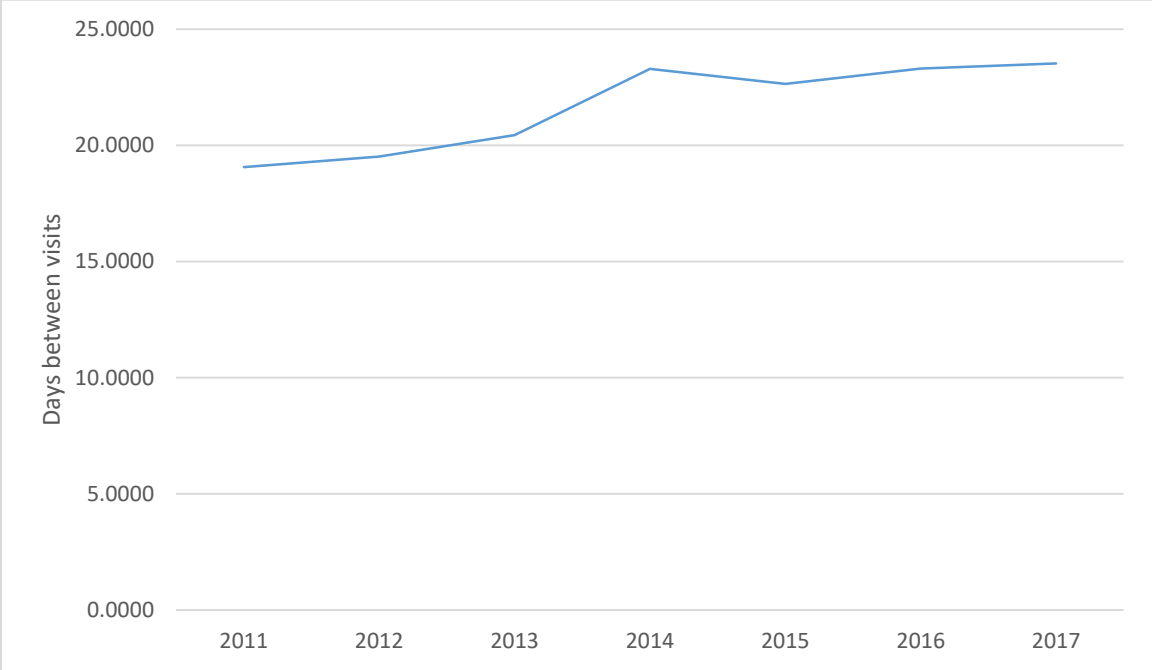
Based on the shape of the data in Figures 29 and 30, I estimated simple linear regression models to test for linear trend. Results indicated that both month-year ($\beta = .56$, $p < .001$) and year ($\beta = .92$, $p < .001$) were significantly and positively associated with the average number of days between outpatient visits. This confirms that visit frequency significantly decreased across the study period. The similarity between the spearman correlation coefficients and the linear regression coefficients suggests that the upward trend is linear.

An identical series of analyses (graphing, spearman correlations, and linear regression) were performed on sub-samples of the data stratified by race/ethnicity, to examine secular trends across racial and ethnic groups. Figure 31 shows the average

number of days between visits by year within each racial/ethnic subsample. The graph indicates that the number of days between outpatient specialty mental health visits increased across the study period, meaning that treatment became less frequent over time.

Figure 30

Secular patterns in treatment frequency by year



To further explore these secular trends within racial and ethnic sub-samples, spearman correlation coefficients and linear regression models were estimated. Results are shown in Table 24. Findings indicate that number of days between outpatient specialty mental health visits among Black and Hispanic youth was increasing at a similar rate across the study period; among White youth, number of days between treatment sessions was increasing, but less than among non-White youth.

Figure 31

Racial/ethnic variations in secular patterns for treatment frequency

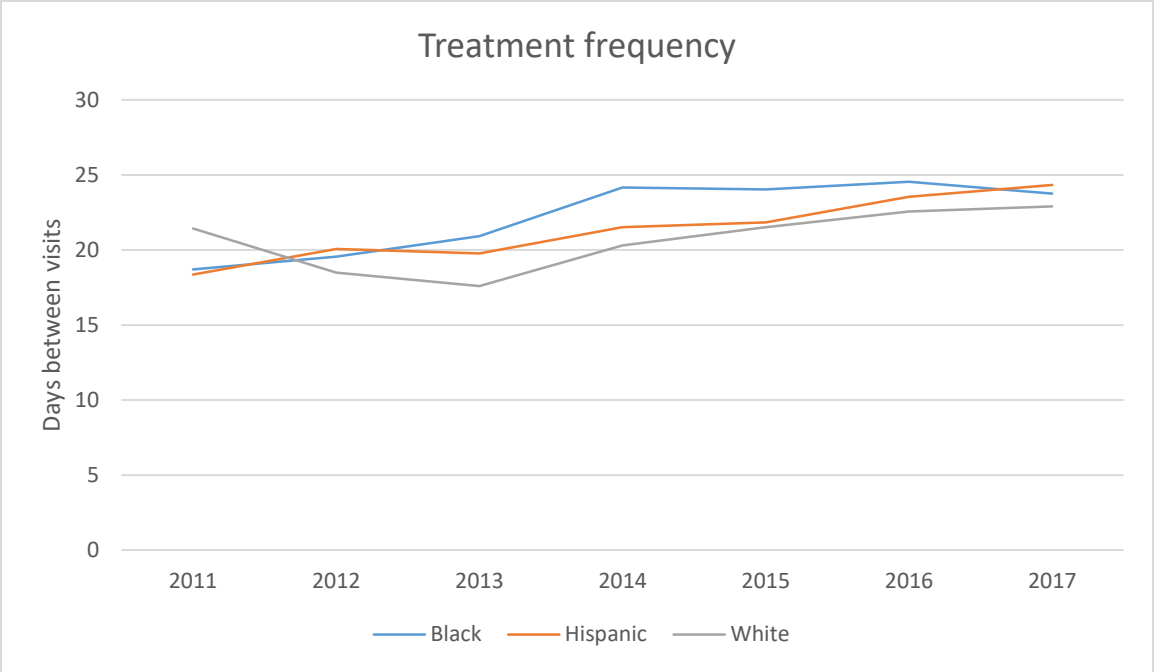


Table 24

Racial/ethnic variations in secular patterns for treatment frequency: Time-trend analyses

	Year		Month-year	
	Spearman Correlation Coefficient (ρ)	Linear regression coefficient (β)	Spearman Correlation Coefficient (ρ)	Linear regression coefficient (β)
Black	.75	.89**	.48***	.43***
Hispanic	.96***	.98***	.46***	.41***
White	.75	.63	.31**	.26*

Research Question 3: Outpatient Care and Psychiatric ED Presentation

A series of binary logistic regression models were estimated to examine the association between any outpatient specialty mental health service use during the study period and any psychiatric ED presentation, among the sample of youth with diagnosed emotional and behavioral disorders. Model 1 included only sociodemographic covariates (sex, race/ethnicity, and the continuous indicator of comorbidity). Model 2 included a binary indicator of outpatient specialty mental healthcare at any time during the study period. Odds ratios and 95% confidence intervals for these models are shown in Table 25.

Table 25

Association between any outpatient treatment and psychiatric ED presentation

	Model 1		Model 2	
	OR	95% CI	OR	95% CI
Female	1.41***	1.33, 1.49	1.41***	1.33, 1.50
Race/ethnicity				
Hispanic	1.20***	1.12, 1.29	1.21***	1.12, 1.30
White	1.05	.96, 1.13	1.04	.95, 1.12
Multi-racial/other	1.69***	1.47, 1.94	1.69***	1.47, 1.95
Lifetime use of Medicaid	1.03	.95, 1.12	1.05	.97, 1.15
Lifetime use of safety-net care	1.93***	1.78, 2.10	1.95***	1.80, 2.13
Lifetime use of private insurance	.89**	.83, .96	.91*	.85, .98
Comorbidity	1.24***	1.21, 1.26	1.29***	1.26, 1.32
Outpatient service use			.71***	.65, .77

Results indicated that female patients were more likely to present in the ED for psychiatric reasons than male patients. Hispanic youth and youth identified as multi-racial or from another racial/ethnic background were at greater risk for psychiatric ED presentation than Black youth; there were no significant differences in ED presentation between Black and White youth. Patients who had utilized health safety-net care at any

point during the study period were more likely to present in the ED for psychiatric reasons than their peers who had not utilized health safety net services. Additionally, patients who had used private health insurance at any point during the study period were less likely to present in the ED for psychiatric reasons than their peers who had not used private health insurance. Youth with diagnoses from more disorder categories were at greater risk for psychiatric ED presentation than youth with diagnoses from fewer disorder categories. Finally, Patients who received any outpatient specialty mental health services during the study period were significantly less likely to visit the ED for psychiatric reasons than patients who did not receive outpatient care.

Analyses conducted in multiply imputed data accounting for missing race/ethnicity data yielded similar results overall, with notable discrepancies related to race/ethnicity and lifetime insurance use. Pooled results for model 2 indicated that Hispanic youth (OR = .79, CI = .73, .85, $p < .001$) and White youth (OR = .56, CI = .52, .61, $p < .001$) were significantly less likely to present in the ED for psychiatric reasons than Black youth. These results also indicated that there were no significant differences in probability of psychiatric ED presentation between Black youth and youth identified as multi-racial or from another racial/ethnic background (OR = 1.02, CI = .88, 1.18, $p = .80$). Pooled results for model 2 indicated that patients who had utilized Medicaid at any point during the study period were significantly less likely to present in the ED for psychiatric reasons than patients who had not utilized Medicaid (OR = .89, CI = .81, .96, $p < .01$). The finding that patients with any outpatient specialty mental health services use were less likely to present in the ED for psychiatric reasons than patients without

outpatient service use was comparable using the imputed data. Pooled estimates for both models are provided in Appendix N.

A similar series of two linear regression models were estimated to determine the association between any outpatient specialty mental health service use and the number of times a patient presented in the ED for psychiatric reasons, among the sample of youth with diagnosed emotional and behavioral disorders. Regression coefficients and standard errors are shown in Table 26.

Table 26

Association between any outpatient treatment and number of psychiatric ED visits

	Model 1		Model 2	
	B	SE	B	SE
Female	.10***	.01	.10***	.01
Race/ethnicity				
Hispanic	.01	.02	.01	.02
White	-.05**	.02	-.05**	.02
Multi-racial/other	.05	.03	.05	.03
Lifetime use of Medicaid	.08***	.02	.08***	.02
Lifetime use of safety-net care	.18***	.02	.18***	.02
Lifetime use of private insurance	-.01	.02	-.01	.02
Comorbidity	.22***	.01	.24***	.01
Outpatient service use			-.14***	.02

Similar to the results of the logistic regression, sex, race, comorbidity, and outpatient specialty mental health service use were significantly associated with a greater number of psychiatric ED visits. Female youth presented in the ED significantly more times than male youth. White youth presented in the ED significantly less times than Black youth. Youth who utilized Medicaid or safety-net services at any point during the study period presented in the ED for psychiatric reasons significantly more times than

youth who had not utilized Medicaid or safety-net services, respectively. Patients with diagnoses from a greater number of disorder categories visited the ED for psychiatric reasons more times than patients with diagnoses from fewer categories. Any use of outpatient specialty mental health services was associated with fewer visits the ED for psychiatric reasons.

Analyses conducted in multiply imputed data accounting for missing race/ethnicity data yielded similar results overall, with notable discrepancies related to race/ethnicity and lifetime insurance use. Pooled results for model 2 indicated that, Hispanic youth (B = -.13, SE = .02, $p < .001$) and youth identified as multi-racial or from another racial/ethnic background (B = -.09, SE = .03, $p < .01$) presented in the ED for psychiatric on significantly fewer occasions than Black youth. Results also indicated that lifetime use of Medicaid was not significantly associated with psychiatric ED presentation (B = -.02, SE = .02, $p < .23$). The finding that patients with any outpatient specialty mental health services use presented in the ED for psychiatric reasons significantly fewer times than patients without outpatient service use was comparable using the imputed data. Pooled estimates for both models are provided in Appendix O.

To better understand the association between outpatient specialty mental health service use and psychiatric ED presentation, Cox proportional hazards regression was used among the sample of patients who utilized outpatient services. This series of models estimated whether psychiatric ED presentation occurred *after* outpatient service use. For patients who presented in the ED for psychiatric reasons, the earliest ED visit that occurred after any outpatient treatment was selected, and survival time was calculated as

the number of days between the last outpatient appointment prior to that ED visit and that ED visit. For patients who did not present in the ED for psychiatric reasons or who only presented in the ED for psychiatric reasons prior to outpatient care, survival time was calculated as the number of days between the last outpatient appointment and the last day of the study period (May 3, 2018).

First, a baseline model (model 1) was estimated to examine the association between psychiatric ED presentation and sociodemographic covariates (age at outpatient treatment initiation, sex, race/ethnicity, insurance type at treatment initiation, and the continuous indicator of comorbidity). A second model (model 2) was estimated to control for previous psychiatric ED visits during the study period. Hazard ratios and 95% confidence intervals for each model are presented in Table 27.

Table 27

Psychiatric ED presentation among youth who received outpatient treatment

	Model 1		Model 2	
	λ	95% CI	λ	95% CI
Age	1.00	.98, 1.02	.98	.96, 1.00
Female	1.24**	1.06, 1.45	1.28**	1.10, 1.50
Race/ethnicity				
Black	ref	-	ref	-
Hispanic	.99	.83, 1.18	1.02	.85, 1.21
White	.67**	.51, .89	.68**	.51, .90
Multi-racial/other	.66	.37, 1.17	.70	.39, 1.24
Insurance				
Medicaid	ref	-	ref	-
Health safety-net	1.18	.68, 2.05	1.31	.75, 2.27
Private	.67***	.54, .82	.71**	.57, .88
Comorbidity	1.50***	1.45, 1.56	1.47***	1.41, 1.52
# previous ED visits			1.42***	1.33, 1.52

Results indicated that female patients who received outpatient care were at greater risk for psychiatric ED presentation than male patients who received outpatient care. White youth were at decreased risk for psychiatric ED presentation than Black patients. Patients using private health insurance at outpatient treatment initiation were at decreased risk for psychiatric ED presentation, as compared to patients using Medicaid. Patients with a higher number of comorbid diagnoses were at increased risk for psychiatric ED presentation, as compared to patients with fewer comorbid disorders. Finally, for each previous psychiatric ED visit, a patient had 42% greater risk for subsequent psychiatric ED presentation.

Analysis in multiply imputed data accounting for missing race/ethnicity data differed in regards to the association between age and race/ethnicity with risk of psychiatric ED presentation. Pooled results for model 2 indicated that as age increased the risk for psychiatric ED presentation decreased slightly ($\lambda = .98$, CI = .96, 1.00, $p < .05$). Pooled results for model 2 also indicated that Hispanic youth ($\lambda = .83$, CI = .69, 1.00, $p < .05$) and youth identified as multi-racial or from another racial/ethnic background ($\lambda = .55$, CI = .31, 1.00, $p < .05$) were at decreased risk for psychiatric ED presentation as compared to their Black peers. Pooled estimates for both models are provided in Appendix P.

Next, I examined the association between continuity of care and subsequent psychiatric ED presentation. For patients who presented in the ED for psychiatric reasons, the earliest ED visit that occurred after any outpatient treatment was again selected. The last treatment period before that ED visit was used to calculate each of the

three indicators of continuity of care (duration of treatment, quantity of treatment, and frequency of treatment). Only the outpatient visits that occurred prior to the ED visit were considered for these calculations. Survival time was again calculated as the number of days between the last outpatient appointment prior to the ED visit and the ED visit. For patients who did not present in the ED for psychiatric reasons, or who presented prior to outpatient care, the most recent treatment period was used to calculate each aspect of continuity of care. Survival time was calculated as the number of days between the last outpatient appointment and the last day of the study period (May 3, 2018). All analyses controlled for the number of previous psychiatric ED visits as well as the number of prior outpatient treatment periods. Model 1 included duration of the most recent outpatient treatment period and model 2 included the quantity of outpatient visits in the most recent treatment period. Results are provided in Table 28.

Results for sociodemographic covariates were comparable to those in the baseline models. Youth who had engaged in a greater number of previous treatment periods were at greater risk for subsequent psychiatric ED presentation than youth who had engaged in fewer previous treatment periods. In addition, longer treatment duration and a greater number of outpatient visits were associated with greater risk for subsequent psychiatric ED presentation. Analysis in multiply imputed data accounting for missing race/ethnicity data yielded similar results. In fact, the only difference was in regards to insurance status. Specifically, results indicated no significant difference in risk for psychiatric ED presentation between youth with private health insurance and youth with Medicaid (results from model 2: $\lambda = .82$, CI = .66, 1.01, $p = .06$). Pooled results for both models are

provided in Appendix Q.

Table 28

Continuity of outpatient treatment and subsequent psychiatric ED presentation

	Model 1		Model 2	
	λ	95% CI	λ	95% CI
Age	1.00	.98, 1.02	1.00	.98, 1.02
Female	1.40***	1.20, 1.64	1.39***	1.19, 1.63
Race/ethnicity				
Black	ref	-	ref	-
Hispanic	1.01	.85, 1.21	1.03	.86, 1.22
White	.73*	.55, .98	.70*	.53, .94
Multi-racial/other	.80	.45, 1.43	.80	.45, 1.42
Insurance				
Medicaid	ref	-	ref	-
Health safety-net	1.29	.74, 2.24	1.30	.75, 2.25
Private	.78*	.63, .97	.77*	.62, .96
Comorbidity	1.36***	1.30, 1.41	1.36***	1.31, 1.41
# previous ED visits	1.44***	1.35, 1.55	1.45***	1.35, 1.55
# previous treatment periods	1.25***	1.21, 1.29	1.25***	1.22, 1.29
Treatment duration (days)	1.00***	1.00, 1.00		
Treatment quantity (visits)			1.02***	1.02, 1.02

Next, I estimated a third model to examine the association between treatment frequency (measured in average number of days between visits) and subsequent ED presentation. This model was estimated only in the sample of patients who received 2 or more outpatient visits (the only patients for which treatment frequency could be calculated). A fourth, and final model, estimated among patients who received 2 or more outpatient visits, predicted subsequent psychiatric ED presentation from both quantity and frequency of outpatient visits. Results from these models are provided in Table 29.

Table 29

Continuity of outpatient care and subsequent psychiatric ED presentation

	Model 3		Model 4	
	λ	95% CI	λ	95% CI
Age	1.02	.99, 1.05	1.02	.99, 1.04
Female	1.21	.99, 1.47	1.21	.99, 1.47
Race/ethnicity				
Black	ref	-	ref	-
Hispanic	.91	.72, 1.15	.91	.72, 1.15
White	.87	.62, 1.23	.82	.58, 1.15
Multi-racial/other	.68	.30, 1.54	.69	.31, 1.56
Insurance				
Medicaid	ref	-	-	ref
Health safety-net	1.04	.51, 2.10	1.11	.55, 2.25
Private	.78	.59, 1.04	.78	.59, 1.03
Comorbidity	1.37***	1.30, 1.45	1.33***	1.26, 1.41
# previous ED visits	1.35***	1.23, 1.48	1.37***	1.25, 1.50
# previous treatment periods	1.19***	1.14, 1.24	1.21***	1.16, 1.26
Treatment quantity (visits)			1.02***	1.01, 1.02
Treatment frequency (days)	1.01	1.00, 1.02	1.01*	1.00, 1.02

Among the sample of patients who engaged in two or more outpatient specialty mental health visits, there were no significant differences in likelihood of a subsequent psychiatric ED visit based on age, sex, race, or insurance status. The continuous indicator of comorbidity, the number of previous psychiatric ED visits, and the number of previous outpatient treatment periods were all significantly associated with increased risk for a subsequent psychiatric ED visit. Treatment frequency was only significant in the model that also controlled for quantity of outpatient specialty mental health visits, such that the longer the time between visits, the greater the risk for subsequent psychiatric ED presentation. Analysis of multiply imputed data accounting for missing race/ethnicity data yielded similar overall results. However, pooled estimates indicated that White

youth had significantly lower risk of psychiatric ED presentation than Black youth at any given time point (model 4 results: $\lambda = .62$, CI = .43, .88, $p < .01$). Pooled results from both models are provided in Appendix R.

CHAPTER 5: DISCUSSION

Emotional and behavioral disorders are common among youth, and place them at greater risk for health, academic, and social difficulties (Aarons et al., 2008; Breslau et al., 2008; Fleischmann et al., 2005; Merikangas et al., 2010; Rapee et al., 2012; Skowyra & Cocozza, 2007). Although evidence-based treatments for psychiatric disorders have been developed and evaluated, many youth never receive these services (Costello et al., 2014; Merikangas et al., 2011). Furthermore, youth who do receive mental healthcare may not receive effective or appropriate treatment. Studies indicate a considerable gap between the availability of evidence-based interventions and their use by clinicians in common treatment settings (Aarons & Sawitzky, 2006; Cook et al., 2017; England et al., 2015). In addition, research demonstrates that 28-75% of youth terminate mental health treatment prematurely, suggesting that youth may not complete interventions being provided by clinicians (de Haan et al., 2013; Gearing et al., 2014; Schwalbe & Gearing, 2012). Finally, increasing numbers of school-aged youth are seeking mental health services in the ED, which is often an inadequate and inappropriate setting for mental healthcare, and seeks primarily to triage and stabilize crises rather than to treat complex emotional and behavioral disorders (Cloutier et al., 2010; Cooper & Masi, 2007; Dolan & Fein, 2011).

This study sought to examine patterns in how a diverse sample of youth with emotional and behavioral disorders utilized hospital-based mental health services over a period of almost 8 years. Using the lens of Tansella and Thornicroft's Matrix Model (1998), I sought to better understand the process phase of service provision on a local

level. This understanding may inform the development and evaluation of interventions reflecting treatment utilization in real-world settings and the identification of areas in which outreach may promote youth engagement in mental healthcare (e.g., vulnerable populations, important times during the year). This research is meant to complement research being conducted on an individual patient level, which is typically designed to assess needs, deliver care, and evaluate psychosocial outcomes (e.g., randomized controlled trials). By its nature, individual-level research does not account for population trends and patterns related to routine clinical care at the community-level. This study is also designed to complement statewide, national, and global studies, which provide insight into widespread patterns in service expenditure, mental health policy, rates of hospital admission, and illness prevalence. However, studies on these state, national, and global levels often mask differences by race/ethnicity, socioeconomic status, and other factors that may be particularly important in local settings.

Pescosolido's NEM-II (1991, 2006) also provided a framework for understanding the process of mental health service delivery and utilization. Central to this framework is the concept of an "illness career," with important contextual and temporal aspects. It would be easy to imagine that emotional and behavioral disorders were issues that simply appeared, would respond to treatment, and then be cured. In reality, this is not the trajectory for many psychiatric disorders. The NEM-II emphasizes how social and clinical contexts impact the development of mental illness across time, including remission and relapse. Varying illness careers may result in patients entering and leaving treatment at various times for clinical, practical, and social reasons. Symptoms may

resolve and reappear in response to life events, stress, seasonal factors, and interactions with the treatment system (if any exist), all of which influence long-term illness trajectories. The current study aims to describe specific aspects of patients' interactions with the treatment system, including psychiatric ED presentation and continuity of outpatient care, accounting for a number of clinical and sociodemographic characteristics. In doing this, it is important to remember that results reflect a wide range of illness careers and that many factors, including factors that the data are unable to account for, shaped patients' and families' decisions regarding treatment utilization. The purpose of this study was therefore to describe treatment patterns and significant associations between variables, without judgement as to what amount of treatment would have been most appropriate or ideal. An understanding these patterns and associations can then support clinicians in selecting interventions that reflect the utilization patterns of their patients and suggest outreach and engagement efforts that may help inform patients about available services and how to get the most out of them. This study can also inform the development and evaluation of mental health interventions that reflect utilization patterns in real-world clinical settings, such as brief interventions that require fewer treatment sessions.

Research Question 1: Psychiatric ED Visits

The first research question in this dissertation addressed both seasonal and secular patterns in psychiatric ED visits among school-aged youth. Consistent with previous research, findings indicated that psychiatric ED visits were lowest during the summer months and were significantly higher in the fall months, particularly October (Ali et al.,

2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017). Also similar to previous research, although less discussed, I found that psychiatric ED visits dropped in December/January (although not as low as they did in the summer) and spiked again in the spring to levels similar to that in October (Ali et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017). This pattern mirrors the school calendar in the Boston area (a typical pattern for US school districts). Psychiatric ED visits were lowest in July and August, when school was out for summer vacation, and was also low, although not to the same extent, in December, which corresponds to the longest school break (the period from Christmas through New Year's) besides summer vacation.

This study extended previous research by examining these monthly patterns in sub-samples stratified by race/ethnicity. Prior studies have not examined racial or ethnic differences in these patterns, often because studies were conducted in U.S. samples that were primarily White (Holder, Rogers, Peterson, & Ochonma, 2017) or Canadian samples that did not include racial/ethnic data (Ali et al., 2012; Goldstein et al., 2005). Considering potential differences in seasonal patterns based on race/ethnicity is important because racial and ethnic disparities in mental health care, and in particular the use of psychiatric ED services, have been well-established in the literature (Bruckner et al., 2014; Snowden et al., 2008, 2009). Indeed, my analysis revealed significant differences in seasonal patterns based on race/ethnicity.

For youth of color, but not White youth, rises in psychiatric ED visits corresponded to the months when school was in session, and drops in visits corresponded to months when school was not in session. Among White youth, psychiatric ED visits

peak in September and October and then drop markedly in November and December. Visits then remained low through the spring and only drop slightly further into the summer. Among youth of color, there was a drastic decline in visits from May to July that was not present in White youth. Black and Hispanic youth also show a more gradual increase in visits from July through October than their White peers. Among Black youth there were two marked drops in psychiatric ED visits in February and April, which are separated by distinct peaks in March and May; these patterns seem to correspond with the February and April school vacations (i.e., youth are in school fewer days during these two months). One possible explanation for these results is that school staff may be driving many of the psychiatric ED referrals among youth of color. A 2014 study at a large urban hospital in the northeast US, with a similar population to that of BMC, found that 44.1% of psychiatric ED evaluations were initiated by schools, and that youth of color were over-represented in these referrals as compared with White youth (Grudnikoff et al., 2015).

Even if racial/ethnic disparities are not driven by referrals from school staff, it may be that inequities in the school setting related to discipline, setting, and delivery of special education supports create difficulties for students of color with emotional and behavioral disabilities that have effects outside of school, prompting parents and caregivers to seek emergency care. A large body of research has documented inequities in the way youth of color are treated in US schools. Youth of color are less likely to receive special education services and significantly more likely to receive exclusionary school discipline or be placed in more restrictive learning environments (Blanchett et al., 2009;

Morgan et al., 2017; Noltemeyer & Mcloughlin, 2012; Okonofua et al., 2016; Sullivan, 2017). As a result of these disparities, time in school may be particularly difficult for youth of color who are struggling with emotional and behavioral disorders. Among White students, who are less likely to experience inequities in school settings, it may be that the transition to school after summer vacation presents difficulties, explaining the spike in visits early in the fall and the lack of dramatic changes in visit rates the rest of the year.

Findings also indicated that psychiatric ED visits in the BMC system increased from 2010 to 2017, which is consistent with recent research documenting increases in psychiatric ED use among children and adolescents in both regional Canadian and nationally representative US samples (Gandhi et al., 2016; Kalb et al., 2019; Mapelli et al., 2015; Pittsenbarger & Mannix, 2014). Of note, the net increase in youth psychiatric ED visits at BMC from 2010-2017, 13.9%, was markedly lower than the estimated net increase in youth psychiatric ED visits from 2011-2015 in a nationally representative probability study using the National Hospital Ambulatory Medical Care Survey, 26.1% (Kalb et al., 2019). Consistent with the findings from Kalb and colleagues (2019), I found that increases in rates of psychiatric ED visits among youth were driven by youth of color; with the highest increases among Hispanic youth and smaller, but significant increases among Black youth. Like Kalb and colleagues (2019), I found that visit rates had not changed significantly across the study period for White youth or those from another racial/ethnic background. These findings are consistent with trends documented for the prior decade (2000-2010; Pittsenbarger & Mannix, 2014; Simon & Schoendorf, 2014). It is also possible that these changes are related to demographic shifts in the city of

Boston; according to a 2019 report by the Boston Planning and Development Agency, between 2010 and 2017 Boston's minority population increased significantly, particularly the Latino population, while the city's White population decreased. Furthermore, the population of Boston has increased by approximately 10% over the same period, which may account for some of the increase in youth psychiatric ED visits (Boston Planning and Development Agency, 2019).

In the current study, the most common reasons for psychiatric ED presentation were conduct disorders and mood disorders. This finding is consistent with Kalb and colleagues' (2019) finding that mood and anxiety disorders (combined into one category in their study) represented the most common reason for psychiatric ED presentation among 6-24 year olds; if mood and anxiety disorders were combined in the current study, they would represent the most common reason for psychiatric ED presentation. However, this study found that behavioral problems, defined as aggression or conduct problems, represented only a small portion of ED visits (Kalb et al., 2019). This may reflect the inclusion of young adults up to aged 24 in the study sample, given that the prevalence of conduct disorders declines with age, and is only specified for those under age 18 (Rowe et al., 2002). Also a likely a reflection of the age discrepancy between studies, substance use disorders were the second most common reason for ED presentation (Kalb et al., 2019). The results of the current study are inconsistent with a previous study conducted by Holder and colleagues (2017) among 5-18 year-olds at a hospital in the Southeastern US. In that study, anxiety disorders were the most prevalent diagnosis in psychiatric ED visits (Holder, Rogers, Peterson, & Ochonma, 2017); in comparison, in the current study,

anxiety disorders were not among the top five most prevalent diagnoses associated with psychiatric ED visits. In the 2017 study, a category including pervasive and developmental disorders, conduct disorders, and ADHD was associated with 26.5% of psychiatric ED presentations (Holder, Rogers, Peterson, & Ochonma, 2017); in the current study, those categories combined were associated with 58% of psychiatric ED visits. One possible explanation for these discrepancies is that Holder and colleagues (2017) examined psychiatric ED visits at a North Carolina hospital serving a suburban and rural area, with a predominantly White population.

One consistent trend in the current study was an over-representation of Black youth in psychiatric ED presentation. Although approximately 40% of youth with emotional and behavioral diagnoses in the BMC system were Black, over 50% of youth presenting in the ED for psychiatric reasons were Black. In comparison, presentation of Hispanic youth in the ED (26%) was commensurate with the percentage of Hispanic youth in the sample (28%). White youth and youth identified as multi-racial or from another racial/ethnic background were under-represented in ED presentation. This is consistent with previous research indicating that Black youth are more likely to utilize psychiatric ED services than their White peers (Bruckner et al., 2014; Snowden et al., 2008, 2009). Researchers have hypothesized that Black youth may be more reliant on ED services if they do not have access to needed outpatient care (Snowden et al., 2008, 2009); however, as we will see later in this chapter, Black youth in our sample were also over-represented in the use of outpatient specialty mental health care.

Research Question 2: Outpatient Specialty Mental Health Care.

The second research question addressed both seasonal and secular patterns in outpatient specialty mental healthcare among school-aged youth with emotional or behavioral disorders. To my knowledge, this is the first study to examine seasonal patterns in outpatient mental health care among youth. Results indicated that rates of outpatient specialty mental health visits had trends similar to those found for ED visits. Outpatient visits were lowest during the summer months and were significantly higher in the fall months; however, and unlike established patterns in ED visits, outpatient mental health visits stayed low during September and peaked later in the fall (November). Outpatient visit rates dropped in December and then rose steadily into the spring, reaching their highest point during the year in March; this differs from ED visits, which although they also peaked twice during the year (fall and spring), reached their highest point in the fall peak (October). Similar to ED visits, seasonal patterns among outpatient visits mirror the school calendar in the Boston area. Visits were lowest in July and August, when school is out for summer vacation, and also reached a comparatively lower in December, corresponding to the longest school break besides summer vacation.

One possible explanation for the seasonal patterns found in both ED and outpatient mental healthcare is that, as a number of researchers have previously hypothesized, school represents the major stressor in the lives of youth and may therefore exacerbate the symptoms of emotional and behavioral disorders (Ali et al., 2012; Goldstein et al., 2005; Holder, Rogers, Peterson, & Ochonma, 2017). Another possible contributor may be, as shown in previous literature, that school staff are instrumental in

referring youth for needed mental healthcare and facilitating their entry into care (Green et al., 2013; Wood et al., 2005). A lack of interaction with school staff during the summer may result in some youth not receiving access to needed care. It is also possible that the schedules of outpatient mental health providers align with the academic calendar; clinicians may themselves take vacations during school breaks for the holidays and summer vacation, resulting in fewer available appointments for youth in need. Family routines and patterns may also be better established during the school year, allowing youth more consistent access to outpatient services.

To further understand seasonal patterns in outpatient specialty mental health care, I examined these patterns in sub-samples stratified by race/ethnicity. Seasonal patterns in outpatient specialty mental health care are very similar for Black, Hispanic and White youth. As described in the paragraph above, visit rates are highest in March and November, and are lowest during the summer months. This presents a stark contrast to the racial/ethnic differences in seasonal patterns found in youth psychiatric ED visits; whatever is causing racial/ethnic disparities in seasonal patterns of ED visits does not seem to be having the same impact on seasonal patterns of outpatient service use. It is possible that although referrals by school staff are driving disparities in seasonal patterns of psychiatric ED visits, school referrals do not have the same impact on outpatient service use. Similarities in seasonal patterns of outpatient specialty mental healthcare across racial/ethnic sub-samples suggests that the school environment may not be an exacerbating factor for youth of color with emotional behavioral disorders, or, if it is, that youth are not receiving additional outpatient care as a result of this.

Results of the current study suggested significant changes in rates of outpatient specialty mental healthcare among youth with emotional and behavioral disorders between 2011 to 2017. Outpatient visit rates decreased significantly from 2011 to 2014 (63% net decrease) and then increased significantly from 2014 to 2017 (88% net increase). Overall, there was a 25% decrease in outpatient specialty mental health visits from 2011-2017. This is inconsistent with recent research that has found linear increases in rates of outpatient mental healthcare among school-aged youth in both Canada and the United States (Gandhi et al., 2016; Olfson et al., 2014, 2015). When I consulted with clinicians in the Department of Psychiatry at BMC, they indicated that the quadratic trend in outpatient service use was consistent with staffing and procedural changes within the department. In particular, the department began to institute screening policies that may have excluded youth from receiving outpatient care; turnover in leadership between 2013 and 2014 resulted in a change in these policies, potentially allowing more youth to access care. These findings raise questions about whether youth in need of mental health care, particularly those using Medicaid or health safety-net services (who were limited in their options to access care outside of the BMC system), may not have received needed outpatient specialty mental health treatment during the study period. Given that rates of outpatient service use have not yet reached parity with those from 2011, departmental policies may have impacted how and if parents and youth in the community entered mental healthcare.

Although the significant drop in service use from 2011 to 2014 was present across racial/ethnic categories, there were differences in how quickly service use increased after

2014. Rates of outpatient service use among White youth rebounded quite quickly, and there was a net increase from 2011 to 2017 in outpatient service use for these youth. Rates of service use rose more slowly among youth of color, in particular Black youth, who experienced a 42% net decrease in outpatient specialty mental health service use from 2011 to 2017. Rates of service use among Hispanic youth rebounded more quickly than those of Black youth, but slower than those of White youth, and rates in 2017 were almost at the same level as in 2011. These findings align with research showing that youth of color are less likely to access outpatient mental health care than White youth (Alegria et al., 2011; Cook et al., 2014; Cummings & Druss, 2011; Guo et al., 2014; Marrast et al., 2016; Olfson et al., 2015). Those who are less likely to seek care in the first place may be particularly discouraged by negative experiences with the mental healthcare system, whether they experience them personally or hear about them from others (Lindsey et al., 2013).

Although rates of outpatient specialty mental healthcare were slower to rebound among youth of color than among their White peers, overall, Black youth were over-represented in outpatient service use. Although approximately 40% of youth with emotional and behavioral diagnoses at BMC were Black, almost 50% of youth receiving outpatient specialty mental healthcare were Black. Hispanic youth made up almost a third of youth receiving outpatient mental health services at BMC (31%), which is slightly higher than the percentage of Hispanic youth in the study sample (28%). White youth and youth identified as multi-racial or from another racial/ethnic background were under-represented in the use of outpatient specialty mental health services at BMC (they may

have received outpatient specialty mental healthcare from another provider outside of BMC). This contrasts with previously cited research using nationally representative insurance claims data indicating that White youth are more likely to utilize outpatient specialty mental healthcare than youth of color (Cook et al., 2014; Cummings & Druss, 2011; Guo et al., 2014; Olfson et al., 2015).

Youth of color were significantly more likely to use Medicaid or health safety-net services to pay for mental health services. Youth using Medicaid or health safety-net care may have been limited in where they could receive outpatient specialty mental health care, because not all mental health professionals take Medicaid or offer safety-net options. White youth, who were more likely to have private insurance, may have been more likely to receive specialty outpatient mental healthcare outside the BMC system, and this may have contributed to lower visit rates among White youth.

The most common reasons for outpatient specialty mental health care were pervasive and developmental disorders (54.8%), ADHD (53.4%), and conduct disorders (51.9%). In comparison, a 2015 study using nationally representative data found that youth ages 2-21 were most likely to receive outpatient mental health treatment for ADHD, mood disorders, or anxiety disorders (this study did include pervasive and developmental disorders as well as conduct disorders; Anderson et al., 2015). Consistent with my results, a 2014 study that also used nationally representative data indicated that Disruptive Behavior Disorders were the most common diagnosis among youth accessing outpatient specialty mental health treatment (Olfson et al., 2014). Externalizing problems, such as ADHD or conduct disorder, may present particular challenges for youth and

parents that compel them to engage in outpatient specialty care.

Almost a third of youth utilizing outpatient specialty mental health care attended only one outpatient visit. This is consistent with a substantial body of literature documenting high rates of early dropout from mental health treatment among children and adolescents (de Haan et al., 2013; Gearing et al., 2014; McKay et al., 2002; McKay & Bannon, 2004; Schwalbe & Gearing, 2012). Although previous literature indicates that Black youth receive fewer outpatient mental health treatment sessions than their White peers (Alexandre et al., 2010; Cummings & Druss, 2011), I found that Black patients in the study sample received significantly more outpatient visits than youth from every other racial/ethnic category. The reasons for this are unclear, although it may be related to the fact that BMC serves a primarily non-White population and may be responsive to the cultural and practical needs of this population. In the next section, further findings related to outpatient specialty mental health care will be discussed, with a particular focus on racial/ethnic differences.

Continuity of Care

There were a number of distinct patterns in the way that different youth utilized care. For example, although male youth engaged in more treatment sessions than females, females engaged in longer treatment periods, with more visits and more frequent visits. This finding differs from some older studies that found males tended to engage in more treatment when they were receiving outpatient mental health services (Realmuto et al., 1992; Roghmann et al., 1982). Given that there are no more recent studies for comparison, the current study may reflect more recent trends in specialty outpatient

mental health service use. A number of other sociodemographic factors were associated with continuity of care. Youth who were older when treatment was initiated received more treatment periods than youth who were younger, and these treatment periods included more sessions spaced further apart. Older youth, who are more independent and can take a more active role in arranging and attending treatment sessions may experience fewer barriers to care than parents with young children who are less independent, and may actively resist attending treatment. Patients using Medicaid engaged in more treatment periods than patients using private insurance, and those treatment periods were longer in duration and involved less frequent visits. However, the number of visits in total and per treatment period were not significantly different based on insurance status. It is unclear how the experiences of families and youth with private insurance may be different from those with Medicaid at BMC, a healthcare system that serves large numbers of people with public insurance. Patients with comorbid disorders engaged in more total visits and more treatment periods than patients with diagnoses from only one disorder category; further these treatment periods were longer in duration and visits were less frequent. Conceptualizing comorbidity as an indicator of complexity and/or severity of symptoms, this finding is consistent with research indicating that youth with more severe impairment receive more treatment sessions than those with less severe impairment (Brookman-Frazee et al., 2008).

There were also significant differences in continuity of care based on race/ethnicity. Although, as mentioned earlier, Black youth received more visits in total than youth from another racial/ethnic background, these visits were spread across a

greater number of treatment periods than for White youth. Hispanic youth also engaged in more treatment sessions than White youth. In addition, Black and Hispanic youth received fewer outpatient specialty mental health visits per treatment period. These findings suggest that, as found in previous studies, youth of color may be more likely to drop out of treatment than their White peers (Gearing et al., 2014; Kazdin & Mazurick, 1994; Pellerin et al., 2010). If treatment is discontinued prior to an adequate resolution of symptoms (i.e., if there is poor continuity of care) the patient may be more likely to return for additional treatment periods. Future research should continue to explore the association between sociodemographic variables and continuity of care, to provide more insight into these findings.

Results indicated a number of seasonal patterns in continuity of care. Treatment initiated in May tended to be shorter in duration than treatment initiated during other times of the year. One reason for this might be that May is close to the start of summer vacation, when youth schedules may change and logistics around attendance at treatment may become more difficult. Treatment initiated in October tended to involve significantly more treatment sessions than treatment initiated during other times of the year. This finding is also potentially related to the school calendar; given that rates of outpatient visits decrease in the summer, it may be that beginning treatment in October allows for regular treatment sessions throughout the academic year, that become routine. Finally, treatment initiated in February through April tended to be less frequent than treatment initiated other times during the year. This could also be associated with the school calendar. Boston area schools have weeklong vacations in February and in April, which

have the potential to disrupt treatment that has not yet become routine. Further, summer break arrives only a few months later, when there is also the potential for treatment interruptions.

There were also racial/ethnic variations in these seasonal patterns. As we saw with ED visit and outpatient visit rates, continuity of care among youth of color seems to align more closely to the school calendar than among White youth. Black youth engage in shorter treatment periods when treatment is initiated in April through June; treatment periods are shorter among Hispanic youth when they are initiated in May or July. White youth, however, engage in shorter treatment periods when treatment is initiated in December through January, and March. There are fewer racial/ethnic differences in seasonal patterns for treatment quantity. Among Black, Hispanic, and White youth, treatment initiated in October tends to involve relatively more treatment sessions. Black youth also experience higher treatment quantity for treatment initiated in March, which corresponds with peaks in both psychiatric ED and outpatient specialty mental health visit rates. Hispanic and White youth have higher treatment quantity for treatment initiated in December. This is surprising given the holidays in December, which have the potential to disrupt schedules and interrupt treatment. Among Black youth, treatment initiated in February tends to be less frequent, while treatment initiated in September tends to be more frequent. Among Hispanic youth, treatment initiated in March tends to be less frequent. In regards to these findings, it is possible that treatment initiated in late winter or early spring becomes less frequent as the weather begins to warm up and youth have the opportunity to spend more time outdoors. This may be particularly important

among low-income youth, who may have fewer opportunities to be active during the winter. In the current study, this may be true for Black and Hispanic families, who were more likely to use Medicaid. For Black youth, it may be that treatment initiated in September and coinciding with the beginning of the school year is built into the regular routine of the family and/or patient, and therefore may be less likely to be inconsistent. These findings raise questions about how the academic calendar shapes mental health treatment for youth with emotional and behavioral disorders.

There were significant secular trends in continuity of care from 2011 to 2017. Although treatment quantity remained the same across the study period, treatment duration and the time between visits significantly increased. Essentially, youth with emotional and behavioral disorders are receiving the same amount of sessions within a given treatment period, but the sessions are spaced further apart. This may reflect families' increasingly busy schedules, but it could also be related to the availability of appointments. Outpatient specialty mental health providers are generally available during the school/work day, and it may be difficult for youth and families to attend appointments at these times.

Further examination of secular patterns in sub-samples stratified by race/ethnicity revealed disparities in continuity of care. For White youth, treatment quantity increased across the study period, such that White youth are receiving more visits in 2017 than 2011, albeit these visits are occurring significantly less frequently. In comparison, Black youth are receiving the same amount of visits, but visits are occurring significantly less frequently. Finally, Hispanic youth are receiving the same number of visits, but over a

significantly longer period of time, and visits are occurring less frequently. This is consistent with well-documented disparities in the provision and utilization of youth mental healthcare based on race/ethnicity (Alexandre et al., 2010; Cook et al., 2013, Cummings & Druss, 2011) In the next section, I will discuss the findings that address the association between outpatient specialty mental health care and psychiatric ED presentation.

Research Questions 3: Outpatient Care and Psychiatric ED Presentation

To answer my third research question, I examined the association between outpatient specialty mental healthcare and psychiatric ED presentation. Results indicated that any engagement in outpatient care was significantly associated with decreased odds of psychiatric ED presentation. Engagement in outpatient care was also significantly associated with fewer visits to the ED for psychiatric reasons. This suggests that engagement in outpatient care may help prevent patients from presenting in the ED with psychiatric problems. Two studies have found that over a third of youth psychiatric ED visits could have been handled in an outpatient setting, even if care was delayed (Sills & Bland, 2002; Soto et al., 2009). Ensuring that youth are connected with needed outpatient care prior to an emergency, or something that can be mistaken for one, may help reduce ED visits, particularly those that are non-urgent.

A number of additional factors were significantly associated with psychiatric ED presentation among youth in the study sample. Results indicated that females with emotional and behavioral disorders were more likely than males to present in the ED for psychiatric reasons. This is inconsistent with a recent study showing that males are at

higher risk for psychiatric ED presentation, although this study was conducted among a nationally representative sample of youth aged 6-24 (Kalb et al., 2019). My findings also differ from a study indicating significant sex differences in psychiatric ED visits among a nationally representative sample of youth under the age of 18 (Pittsenbarger & Mannix, 2014). However, my findings were consistent with those of Kalb and colleagues (2019) in that youth with comorbid diagnoses had increased odds of psychiatric ED presentation, despite the age discrepancy in the study samples (Kalb et al., 2019).

Consistent with previous research, youth of color were significantly more likely to present in the ED for psychiatric reasons and visited the ED more often than their White peers (Bruckner et al., 2014; Snowden et al., 2008, 2009). Furthermore, Hispanic youth and youth identified as multi-racial or from another racial/ethnic background were significantly more likely to visit the ED for psychiatric reasons than Black youth. This is consistent with a recent study indicating that Hispanic youth are more likely than youth from another racial/ethnic background to present in the psychiatric ED (Kalb et al., 2019). One reason why youth of color may present in the ED for psychiatric reasons more often than their White peers relates to disparities in inpatient admissions. Some research indicates that White youth are more likely to be admitted to the hospital after a psychiatric ED visit than youth of color (Soto et al., 2009); without needed inpatient care, youth of color may be more likely to have a return psychiatric visit to the ED (Soto et al., 2009). In light of research indicating racial bias in mental health assessment and intervention (Snowden, 2003), it is possible that Black youth receive less adequate care after psychiatric ED presentation, such as needed inpatient hospitalizations, and are

therefore more likely to return.

I also examined whether continuity of outpatient specialty mental health care was associated with subsequent psychiatric ED presentation, among the sample of youth who received any outpatient specialty mental healthcare. These analyses controlled for comorbidity, the number of previous psychiatric ED visits, and the number of previous outpatient treatment periods, all of which were significantly associated with greater likelihood of a subsequent psychiatric ED visit. These analyses also controlled for sex and insurance status, which are known to have important implications for youth mental health service use; neither sex nor insurance status were significantly associated with likelihood of a subsequent ED visit. In these analyses, youth of color who utilized outpatient care were at greater risk for psychiatric ED presentation than White youth who utilized outpatient care, even when controlling for continuity of care, a finding that is consistent with previous research (Bruckner et al., 2014; Snowden et al., 2008, 2009). Both treatment duration and treatment quantity were significantly associated with greater risk for a subsequent ED visit. These results contradict my hypothesis that improved continuity of care would be associated with lower risk for subsequent ED presentation. One possible explanation for these results is that treatment quantity in particular reflects disorder severity, which has been correlated with psychiatric ED presentation among youth (Kalb et al., 2019). Treatment frequency was not significantly associated with risk; however, when controlling for treatment quantity, longer time between outpatient visits was significantly associated with increased risk for subsequent ED presentation. Overall, findings indicate that the only aspect of continuity of care that may be positively

associated with subsequent ED presentation is frequency of outpatient specialty mental healthcare.

Limitations

This study provides insight into seasonal and secular trends in both ED visits and outpatient specialty mental healthcare for youth with psychiatric disorders, and how these patterns differ by race/ethnicity. It also explores whether outpatient care is associated with the use of psychiatric emergency services. The retrospective analysis of EHRs to examine these topics was non-invasive and presented minimal risk to patients. However, there are a number of important limitations to keep in mind.

The primary limitations associated with the use of EHRs is data quality and completeness. Clinicians and administrators vary in their comprehensiveness of recording information collected during patient visits and their accuracy in medical coding (Orueta et al., 2012; Spiranovic, Matthews, Scanlan, & Kirkby, 2016; Weiskopf & Weng, 2013). Because EHRs are compiled across healthcare systems, there also may be inconsistencies across multiple data sources, such as administrative data, clinical report, and assessment results (Orueta et al., 2012; Spiranovic et al., 2016; Weiskopf & Weng, 2013). One limitation I faced using EHRs at BMC was inconsistency in the way that gender is documented in the medical record. The software system currently used has a binary data field for gender, which is generally used to indicate sex at birth. There is no established procedure for providers to record transgender status, or non-binary gender identities. Although physicians utilize a range of strategies to manage this issue in records for specific patients, there is no systematic way to identify transgender and gender non-

conforming youth in the medical records system.

Second, a number of potentially useful variables were not available in the medical records. For example, the indicators of mental health service receipt in this study do not specify the quality or the nature of the services provided. It was not possible to determine whether a patient was receiving evidence-based treatment. This is a common issue in the study of routine mental health care (Garland et al., 2010). In addition, data did not allow for the identification of patients who terminated outpatient care because they completed treatment successfully versus those who dropped out of treatment prematurely. Additionally, there was no standard measure of symptom severity across the sample that could be used to account for the level of need or indicate whether treatment was effective.

Third, it is important to recognize that the guidelines for the treatment of psychiatric disorders vary greatly by disorder type and severity (American Academy of Child and Adolescent Psychiatry, 2020; American Psychiatric Association, 2020; American Psychological Association, 2020). This study attempts to look at mental health service use in a large sample of youth and across a wide variety of disorders. Because of this, it is difficult to draw conclusions about how appropriate the number of treatment sessions and the length of time over which they are applied may be. Further research examining treatment patterns for youth with specific disorders would provide additional insight into whether the temporal pattern of treatment that youth receive is aligned with what is recommended given their clinical profile.

Fourth, the EHRs used in this study reflect only healthcare that patients receive within the BMC system. Patients may have received additional treatment outside of the

BMC system, and it was impossible to account for outpatient or emergency services received at other locations. However, almost three-quarters of patients in the sample received care through Medicaid, and approximately 10% received health safety-net services during the study period. These patients were likely limited in their ability to seek care outside of BMC. Many community-based providers do not accept Medicaid or offer sliding scale payment options that could make care possible for those with public insurance or no insurance at all. Despite this, it is possible that some patients received emergency and/or outpatient care from other healthcare providers.

Finally, the data in this study are simply a snapshot of ED and outpatient visits that occurred between September 1, 2010 and May 3, 2018. Some patients in the sample likely received mental health service prior to the start or after the end of the study period. Particularly when examining continuity of care, I attempted to control for both left- and right-censoring of the data. For example, when appropriate, I excluded treatment periods that may have been initiated prior to the start of the study period. The use of survival analysis also helped account for the incomplete nature of the data. Future studies might utilize a prospective design that follows a cohort of youth across time, so that data would be more complete. Despite these limitations, this study can contribute to our understanding of how school-aged youth with emotional and behavioral disorders utilize both emergency and outpatient mental health services, and support researchers, clinicians, and healthcare systems in meeting patient needs.

Implications

Overall, results showed that the use of both emergency and outpatient mental

health services in the study sample increased from 2011–2018, and that these increases are larger than what might be expected based on Boston population's growth alone (Boston Planning and Development Agency, 2019). This may reflect higher incidence of emotional and behavioral disorders in youth (Bitsko et al., 2018; Twenge et al., 2019) and/or improving attitudes toward mental health treatment among the American public (Mojtabai, 2007; Parcesepe & Cabassa, 2013). Rising use of outpatient treatment may also reflect local institutional policies that increased the number of youth eligible to receive services within the BMC Department of Psychiatry. In addition, findings suggest that utilization of outpatient treatment is associated with decreased risk for psychiatric ED presentation.

The results of this study have a number of implications for clinicians, healthcare systems, and researchers, including (1) suggesting times during the year when preventive actions and programming may be particularly helpful, (2) informing collaboration both within healthcare systems and with local institutions, such as schools and mobile crisis units, (3) identifying at-risk communities that can be targeted for outreach and engagement efforts to increase continuity of outpatient care and decrease psychiatric ED visits, (4) informing collaboration efforts between healthcare systems, and (5) developing and evaluating evidence-based treatment options that align with how youth and families utilize services in real-time.

The current study finds clinically relevant information about seasonal patterns in mental healthcare among school-aged youth. Findings suggest that there will be predictable increases in the need for both psychiatric and outpatient services in the fall,

when youth return to school, and in the late winter/early spring. It may be helpful for primary care physicians, outpatient mental health providers and/or care coordinators to contact youth with emotional and behavioral disorders and their families late in the summer, or in January/February. Proactively checking in with youth and strategically scheduling follow-up appointments could preempt mental health problems from reaching crisis levels and support consistent care provision, which has the potential to improve outcomes (Adair et al., 2005; Brekke et al., 1999; Tait et al., 2004). Healthcare systems may want to offer support programs for youth and families late in the summer and early in the fall that provide psychoeducation related to management of the transition back to school and strategies for accessing different levels of mental health care when needed. Given that youth are more likely to visit the ED for psychiatric reasons during the academic year, training for teachers and other potential referral sources that will have contact with kids in the school setting in how to identify student mental health needs and initiate the referral process may help connect youth with outpatient care prior to the point where an ED visit is needed (Atkins et al., 2017; Green et al., 2013; Reinke et al., 2011).

Collaboration between different types of providers within healthcare systems may also help improve continuity of outpatient care and prevent psychiatric ED presentation. Approximately 25% of youth who visit the ED for psychiatric reasons do so multiple times; in light of this, it may be helpful to assign youth who access emergency mental health services case managers, who can facilitate transition to outpatient treatment and proactively contact youth families if such treatment is discontinued prematurely. A case manager could respond to specific barriers that patients and families might face in

regards to outpatient specialty mental health care. For example, this person might help connect a patient with a provider who has available appointments outside normal working hours or provide support if a patient does not develop a positive therapeutic alliance with their provider. A recent study found that case management services can reduce both psychiatric ED presentation and inpatient hospitalizations among children and adolescents (Tai et al., 2018), and research with adults has shown similar results (Kumar & Klein, 2013). Furthermore, one study among adolescents found that case management was also associated with greater use of outpatient mental health services (Bender et al., 2011). Case managers may also be helpful for youth who prematurely discontinue outpatient mental healthcare and/or engage in treatment inconsistently.

Given recent research suggesting that schools initiate a substantial portion of psychiatric ED visits and that these visits are less likely to be classified as appropriate or urgent (Grudnikoff et al., 2015), it may be helpful for healthcare institutions to develop collaborations that can prevent unnecessary emergency service use. Administrators might identify specific schools that are most likely to refer students to the ED for non-urgent psychiatric reasons, and develop more appropriate action plans. Some cities and towns have alternatives to the ED that specifically address psychiatric issues, such as mobile crisis units, which provide more cost efficient and clinically appropriate ways to connect youth with immediate psychiatric evaluation. Healthcare institutions could save valuable time and resources by connecting schools with these programs and investing in their improvement. Partnerships with community centers and local churches may also provide a platform to educate families and adults who work with youth about the types of services

available and how to access them. For example, healthcare systems could offer psychoeducation at these local institutions during times of the year when they have the potential to be most powerful, such as late summer. Furthermore, these events could be targeted in communities with youth from populations at greatest risk psychiatric ED use and outpatient treatment dropout.

The results of this study indicate that youth of color are more likely to utilize emergency mental health services and less likely to access consistent outpatient care. This is evident when we consider the sharp drop in outpatient treatment use from 2011-2014, which occurred alongside marked increase in psychiatric ED presentation from 2012-2014. Given that outpatient treatment rates among youth of color have been slower to rebound from the drop in 2014 than treatment rates among White youth, messaging and community outreach may be important to ensure families and youth of color know that they will not be turned away if they are seeking treatment and that BMC respects their experiences and needs (Harrison et al., 2004; Snowden, 1998; Staudt, 1999). It is worth noting that despite these trends, there have been fewer racial/ethnic disparities in access to outpatient specialty mental healthcare in the BMC system over the past decade than studies have found in other populations (Cook et al., 2014; Cummings & Druss, 2011; Guo et al., 2014; Olfson et al., 2015).

Hispanic youth may be a particular target for engagement efforts, as rates of psychiatric ED use are increasing more rapidly in this population. Recent work has identified a number of strategies specifically for improving access to and quality of mental health services among young Latinos. These include ensuring all aspects of

service provision, from outreach to assessment and treatment, are linguistically and culturally appropriate, and may require the use of bilingual materials, interpreters, and/or cultural brokers. Clinicians may find tools such as the Cultural Formation Interview, which is included in the DSM-5 manual (cite), helpful for implementing cultural understanding to inform diagnostic and treatment decisions. The National Council of La Raza recommends that clinicians recognize experiences that may be unique to young Latinos, such as discrimination, acculturation, and trauma related to migration (Foxen, 2016). It may be important for service providers to monitor symptoms of acculturative stress, a risk factor for depression and suicide in young Latinos (Foxen, 2016; Smokowski & Bacallao, 2007). Finally, healthcare systems which serve substantial numbers of young Latinos may want to train clinicians in a comprehensive framework such as the Multidimensional Ecological Comparative Approach, which seeks to reduce stereotyping and promote a strength-based approach for working with Latino families and communities (Falicov, 2014).

General patterns of outpatient care identified in this study suggest that many school-aged youth receive one, or only a few, total treatment sessions. Outpatient mental health clinicians at may want to consider, for example, that almost one-third of patients will only engage in one treatment session (this does not include intake and assessment appointments). Providers could be trained in single session interventions and subsequently provide them to new patients, when appropriate. A recent meta-analysis looking at 50 randomized controlled trials of single session youth mental health interventions found that youth receiving these interventions generally fared better than

youth receiving no treatment and at times fared better than youth receiving traditional treatment, although effects varied according to the type of mental disorder (Schleider & Weisz, 2017). Providers may also want to begin treatment with psychoeducation about mental health services, particularly information about how services are delivered (e.g., session frequency and length), the content of treatment, and the roles of both therapist and client (Lindsey et al., 2014). This knowledge prepares young people and families for treatment and encourages active participation. Psychoeducation has been identified as an effective strategy for engaging youth from underserved populations in mental health care, including young males of color (Lindsey et al., 2014).

Conclusion

Results from the current study contribute to the field in three main ways: (1) they replicate and extend knowledge related to the use of ED services for psychiatric reasons among school-aged youth, (2) they describe how youth utilize outpatient specialty mental health services throughout the year and over time, and (3) they provide insight into the association between outpatient specialty mental health service use and psychiatric ED presentation in a diverse urban healthcare system. These findings have implications for practitioners and healthcare systems seeking to engage youth with psychiatric disorders in outpatient mental health care and reduce psychiatric ED visits, which have a high cost for healthcare systems. By responding to predictable seasonable patterns in treatment utilization, collaborating with schools and community organizations for family outreach and psychoeducation, and proactively targeting at-risk youth (particularly youth of color) to engage them in preventive treatment, hospital systems like BMC can continue to

improve the mental health care they provide and support positive outcomes for youth with emotional and behavioral disorders. In addition, further development and evaluation of brief mental health interventions, and adaptation of existing evidence-based treatments that are designed to be provided over a greater number of sessions, can provide clinicians with viable options for engaging patients even in short periods of treatment, reflecting the way outpatient specialty mental health care is utilized in real-world clinical settings.

APPENDIX A

ICD-9 to ICD-10 Crosswalk (Developed by psychiatrists at BMC)

ICD 9	Description	ICD 10 code and description
Organic, including symptomatic, mental disorders		
29040	Vascular dementia without behavioral disturbance	F0150 Vascular dementia without behavioral disturbance
29041	Vascular dementia with behavioral disturbance	F0151 Vascular dementia with behavioral disturbance
29042	Vascular dementia with behavioral disturbance	F0151 Vascular dementia with behavioral disturbance
29043	Vascular dementia with behavioral disturbance	F0151 Vascular dementia with behavioral disturbance
29410	Dementia in other diseases classified elsewhere, without behavioral disturbance	F0280 Dementia in other diseases classified elsewhere, without behavioral disturbance
29411	Dementia in other diseases classified elsewhere, with behavioral disturbance	F0281 Dementia in other diseases classified elsewhere, with behavioral disturbance
2900	Dementia	F03 Unspecified Dementia
29010	Dementia	F03 Unspecified Dementia
29011	Dementia	F03 Unspecified Dementia
29013	Dementia	F03 Unspecified Dementia
29021	Dementia	F03 Unspecified Dementia
2908	Other specified senile psychotic conditions	F0390 Other specified senile psychotic conditions
2909	Unspecified senile psychotic conditions	F0390 Other specified senile psychotic conditions
2940	Amnestic disorder due to known physiological condition	F04 Amnestic disorder due to known physiological condition
2903	F05 Delirium due to known physiological condition	F05 Delirium due to known physiological condition
2930	Delirium due to known physiological condition	F05 Delirium due to known physiological condition
2931	Delirium due to known physiological condition	F05 Delirium due to known physiological condition

29012	F05 Delirium due to known physiological condition	F05 Delirium due to known physiological condition
29020	F05 Delirium due to known physiological condition	F05 Delirium due to known physiological condition
29382	Psychotic disorder with hallucinations due to known physiological condition	F060 Psychotic disorder with hallucinations due to known physiological condition
2948	Other specified mental disorders due to known physiological condition	F060 Psychotic disorder with hallucinations due to known physiological condition OR F068 Other specified mental disorders due to known physiological condition
2948	Catatonic disorder due to known physiological condition	F061 Catatonic disorder due to known physiological condition
29389	Puerperal psychosis	F061 Catatonic disorder due to known physiological condition OR F53 Puerperal psychosis
29381	Psychotic disorder with delusions due to known physiological condition	F062 Psychotic disorder with delusions due to known physiological condition
29383	Mood disorder due to known physiological condition, unspecified	F0630 Mood disorder due to known physiological condition, unspecified
29383	Mood disorder due to known physiological condition with mixed features	F0631 Mood disorder due to known physiological condition with depressive features OR F0632 Mood disorder due to known physiological condition with major depressive-like episode OR F0633 Mood disorder due to known physiological condition with manic features OR F0634 Mood disorder due to known physiological condition with mixed features
29384	Anxiety disorder due to known physiological condition	F064 Anxiety disorder due to known physiological condition
2939	Other specified mental disorders due to known physiological condition	F068 Other specified mental disorders due to known physiological condition
2949	Other specified mental disorders due to known physiological condition	F068 Other specified mental disorders due to known physiological condition
3100	Personality change due to known physiological condition	F070 Personality change due to known physiological condition
3101	Personality change due to known physiological condition	F070 Personality change due to known physiological condition
3102	Postconcussional syndrome	F0781 Postconcussional syndrome
31089	Other personality and behavioral disorders due to known physiological condition	F0789 Other personality and behavioral disorders due to known physiological condition
3109	Unspecified personality and behavioral disorder due to known physiological condition	F079 Unspecified personality and behavioral disorder due to known physiological condition

3109	Unspecified mental disorder due to known physiological condition	F09 Unspecified mental disorder due to known physiological condition
Substance Use		
30500	Alcohol abuse, uncomplicated	F1010 Alcohol abuse, uncomplicated
30501	Alcohol abuse, uncomplicated	F1010 Alcohol abuse, uncomplicated
30502	Alcohol abuse, uncomplicated	F1010 Alcohol abuse, uncomplicated
30503	Alcohol abuse, uncomplicated	F1010 Alcohol abuse, uncomplicated
30500	Alcohol abuse with intoxication, unspecified	F10120 Alcohol abuse with intoxication, uncomplicated OR F10129 Alcohol abuse with intoxication, unspecified
30501	Alcohol abuse with intoxication, unspecified	F10120 Alcohol abuse with intoxication, uncomplicated OR F10129 Alcohol abuse with intoxication, unspecified
30502	Alcohol abuse with intoxication, unspecified	F10120 Alcohol abuse with intoxication, uncomplicated OR F10129 Alcohol abuse with intoxication, unspecified
30503	Alcohol abuse with intoxication, unspecified	F10120 Alcohol abuse with intoxication, uncomplicated OR F10129 Alcohol abuse with intoxication, unspecified
2910	Alcohol use, unspecified with intoxication delirium	F10121 Alcohol abuse with intoxication delirium OR F10221 Alcohol dependence with intoxication delirium OR F10921 Alcohol use, unspecified with intoxication delirium
29189	Alcohol use, unspecified with other alcohol-induced disorder	F1014 Alcohol abuse with alcohol-induced mood disorder OR F1024 Alcohol dependence with alcohol-induced mood disorder OR F10981 Alcohol use, unspecified with alcohol-induced sexual dysfunction OR F10988 Alcohol use, unspecified with other alcohol-induced disorder
2915	Alcohol dependence with alcohol-induced psychotic disorder with delusions	F10150 Alcohol abuse with alcohol-induced psychotic disorder with delusions OR F10250 Alcohol dependence with alcohol-induced psychotic disorder with delusions
2913	Alcohol dependence with alcohol-induced psychotic disorder with hallucinations	F10151 Alcohol abuse with alcohol-induced psychotic disorder with hallucinations OR F10251 Alcohol dependence with alcohol-induced psychotic disorder with hallucinations
29189	Alcohol use, unspecified with alcohol-induced anxiety disorder	F10159 Alcohol abuse with alcohol-induced psychotic disorder, unspecified OR F10180 Alcohol abuse with alcohol-induced anxiety disorder OR F10181 Alcohol abuse with alcohol-induced sexual dysfunction OR F10188 Alcohol abuse with other alcohol-induced disorder OR F10259 Alcohol dependence with alcohol-induced psychotic disorder, unspecified OR F10280 Alcohol dependence with alcohol-induced anxiety disorder OR F10281 Alcohol dependence with alcohol-induced sexual dysfunction OR F10288 Alcohol dependence with other alcohol-induced disorder OR F10959 Alcohol use, unspecified with alcohol-induced psychotic disorder, unspecified OR F10980 Alcohol use, unspecified with alcohol-induced anxiety disorder

29182	Alcohol use, unspecified with alcohol-induced sleep disorder	F10182 Alcohol abuse with alcohol-induced sleep disorder OR F10282 Alcohol dependence with alcohol-induced sleep disorder OR F10982 Alcohol use, unspecified with alcohol-induced sleep disorder
2919	Alcohol use, unspecified with alcohol-induced mood disorder	F1019 Alcohol abuse with unspecified alcohol-induced disorder OR F1029 Alcohol dependence with unspecified alcohol-induced disorder OR F1094 Alcohol use, unspecified with alcohol-induced mood disorder
30390	Alcohol dependence, uncomplicated	F1020 Alcohol dependence, uncomplicated
30391	Alcohol dependence, uncomplicated	F1020 Alcohol dependence, uncomplicated
30392	Alcohol dependence, uncomplicated	F1020 Alcohol dependence, uncomplicated
30393	Alcohol dependence, in remission	F1021 Alcohol dependence, in remission
30300	Alcohol dependence with intoxication, uncomplicated	F10220 Alcohol dependence with intoxication, uncomplicated
30301	Alcohol dependence with intoxication, uncomplicated	F10220 Alcohol dependence with intoxication, uncomplicated
30302	Alcohol dependence with intoxication, uncomplicated	F10220 Alcohol dependence with intoxication, uncomplicated
30303	Alcohol dependence with intoxication, uncomplicated	F10220 Alcohol dependence with intoxication, uncomplicated
30300	Alcohol dependence with intoxication, unspecified	F10229 Alcohol dependence with intoxication, unspecified
30301	Alcohol dependence with intoxication, unspecified	F10229 Alcohol dependence with intoxication, unspecified
30302	Alcohol dependence with intoxication, unspecified	F10229 Alcohol dependence with intoxication, unspecified
30303	Alcohol dependence with intoxication, unspecified	F10229 Alcohol dependence with intoxication, unspecified
29181	Alcohol dependence with withdrawal with perceptual disturbance	F10230 Alcohol dependence with withdrawal, uncomplicated OR F10232 Alcohol dependence with withdrawal with perceptual disturbance
2910	Alcohol dependence with withdrawal delirium	F10231 Alcohol dependence with withdrawal delirium
29181	Alcohol dependence with withdrawal, unspecified	F10239 Alcohol dependence with withdrawal, unspecified
2911	Alcohol use, unspecified with alcohol-induced persisting dementia	F1026 Alcohol dependence with alcohol-induced persisting amnestic disorder OR F1097 Alcohol use, unspecified with alcohol-induced persisting dementia
2912	Alcohol dependence with alcohol-induced persisting dementia	F1027 Alcohol dependence with alcohol-induced persisting dementia

2914	Alcohol use, unspecified with intoxication, uncomplicated	F10920 Alcohol use, unspecified with intoxication, uncomplicated
2914	Alcohol use, unspecified with intoxication, unspecified	F10929 Alcohol use, unspecified with intoxication, unspecified
2915	Alcohol use, unspecified with alcohol-induced psychotic disorder with delusions	F10950 Alcohol use, unspecified with alcohol-induced psychotic disorder with delusions
2913	Alcohol use, unspecified with alcohol-induced psychotic disorder with hallucinations	F10951 Alcohol use, unspecified with alcohol-induced psychotic disorder with hallucinations
2911	Alcohol use, unspecified with alcohol-induced persisting amnestic disorder	F1096 Alcohol use, unspecified with alcohol-induced persisting amnestic disorder
2919	Alcohol use, unspecified with unspecified alcohol-induced disorder	F1099 Alcohol use, unspecified with unspecified alcohol-induced disorder
30550	Opioid abuse, uncomplicated	F1110 Opioid abuse, uncomplicated
30551	Opioid abuse, uncomplicated	F1110 Opioid abuse, uncomplicated
30552	Opioid abuse, uncomplicated	F1110 Opioid abuse, uncomplicated
30553	Opioid abuse, uncomplicated	F1110 Opioid abuse, uncomplicated
30551	Opioid abuse with intoxication, unspecified	F11120 Opioid abuse with intoxication, uncomplicated OR F11129 Opioid abuse with intoxication, unspecified
30552	Opioid abuse with intoxication, unspecified	F11120 Opioid abuse with intoxication, uncomplicated OR F11129 Opioid abuse with intoxication, unspecified
30553	Opioid abuse with intoxication, unspecified	F11120 Opioid abuse with intoxication, uncomplicated OR F11129 Opioid abuse with intoxication, unspecified
30550	Opioid use, unspecified, uncomplicated	F11120 Opioid abuse with intoxication, uncomplicated OR F11129 Opioid abuse with intoxication, unspecified OR F1190 Opioid use, unspecified, uncomplicated
29281	Other psychoactive substance dependence with intoxication delirium	F11121 Opioid abuse with intoxication delirium OR F11221 Opioid dependence with intoxication delirium OR F11921 Opioid use, unspecified with intoxication delirium OR F12121 Cannabis abuse with intoxication delirium OR F12221 Cannabis dependence with intoxication delirium OR F12921 Cannabis use, unspecified with intoxication delirium OR F13121 Sedative, hypnotic or anxiolytic abuse with intoxication delirium OR F13221 Sedative, hypnotic or anxiolytic dependence with intoxication delirium OR F13921 Sedative, hypnotic or anxiolytic use, unspecified with intoxication delirium OR F14121 Cocaine abuse with intoxication with delirium OR F14221 Cocaine dependence with intoxication delirium OR F14921 Cocaine use, unspecified with intoxication delirium OR F15121 Other stimulant abuse with intoxication delirium OR F15221 Other stimulant dependence with intoxication delirium OR F15921 Other stimulant use, unspecified with

		intoxication delirium OR F16121 Hallucinogen abuse with intoxication with delirium OR F16221 Hallucinogen dependence with intoxication with delirium OR F16921 Hallucinogen use, unspecified with intoxication with delirium OR F18121 Inhalant abuse with intoxication delirium OR F18221 Inhalant dependence with intoxication delirium OR F18921 Inhalant use, unspecified with intoxication with delirium OR F19121 Other psychoactive substance abuse with intoxication delirium OR F19221 Other psychoactive substance dependence with intoxication delirium
29282	Other psychoactive substance dependence with psychoactive substance-induced persisting dementia	F11122 Opioid abuse with intoxication with perceptual disturbance OR F1327 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced pe OR F1397 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F1817 Inhalant abuse with inhalant-induced dementia OR F1827 Inhalant dependence with inhalant-induced dementia OR F1897 Inhalant use, unspecified with inhalant-induced persisting dementia OR F1917 Other psychoactive substance abuse with psychoactive substance-induced persisting dementia OR F1927 Other psychoactive substance dependence with psychoactive substance-induced persisting demen
29284	Other psychoactive substance dependence with psychoactive substance-induced mood disorder	F1114 Opioid abuse with opioid-induced mood disorder OR F1124 Opioid dependence with opioid-induced mood disorder OR F1194 Opioid use, unspecified with opioid-induced mood disorder OR F1314 Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced mood di OR F1324 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced mo OR F1394 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F1414 Cocaine abuse with cocaine-induced mood disorder OR F1424 Cocaine dependence with cocaine-induced mood disorder OR F1494 Cocaine use, unspecified with cocaine-induced mood disorder OR F1514 Other stimulant abuse with stimulant-induced mood disorder OR F1524 Other stimulant dependence with stimulant-induced mood disorder OR F1594 Other stimulant use, unspecified with stimulant-induced mood disorder OR F1614 Hallucinogen abuse with hallucinogen-induced mood disorder OR F1624 Hallucinogen dependence with hallucinogen-induced mood disorder OR F1694 Hallucinogen use, unspecified with hallucinogen-induced mood disorder OR F1814 Inhalant abuse with inhalant-induced mood disorder OR F1824 Inhalant dependence with inhalant-induced mood disorder OR F1894 Inhalant use, unspecified with inhalant-induced mood disorder OR F1914 Other psychoactive substance abuse with psychoactive substance-induced mood disorder OR F1924 Other psychoactive substance dependence with psychoactive substance-induced mood disorder
29211	Other psychoactive substance dependence with psychoactive substance-induced psychotic disord	F11150 Opioid abuse with opioid-induced psychotic disorder with delusions OR F11250 Opioid dependence with opioid-induced psychotic disorder with delusions OR F11950 Opioid use, unspecified with opioid-induced psychotic disorder with delusions OR F12150 Cannabis abuse with psychotic disorder with delusions OR F12250 Cannabis dependence with psychotic disorder with delusions OR F12950 Cannabis use, unspecified with psychotic disorder with delusions OR F13150 Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychot OR

		F13250 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced ps OR F13950 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F14150 Cocaine abuse with cocaine-induced psychotic disorder with delusions OR F14250 Cocaine dependence with cocaine-induced psychotic disorder with delusions OR F14950 Cocaine use, unspecified with cocaine-induced psychotic disorder with delusions OR F15150 Other stimulant abuse with stimulant-induced psychotic disorder with delusions OR F15250 Other stimulant dependence with stimulant-induced psychotic disorder with delusions OR F15950 Other stimulant use, unspecified with stimulant-induced psychotic disorder with delusions OR F16150 Hallucinogen abuse with hallucinogen-induced psychotic disorder with delusions OR F16250 Hallucinogen dependence with hallucinogen-induced psychotic disorder with delusions OR F16950 Hallucinogen use, unspecified with hallucinogen-induced psychotic disorder with delusions OR F18150 Inhalant abuse with inhalant-induced psychotic disorder with delusions OR F18250 Inhalant dependence with inhalant-induced psychotic disorder with delusions OR F18950 Inhalant use, unspecified with inhalant-induced psychotic disorder with delusions OR F19150 Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder wi OR F19250 Other psychoactive substance dependence with psychoactive substance-induced psychotic disord
29212	Other psychoactive substance dependence with psychoactive substance-induced psychotic disord	F11151 Opioid abuse with opioid-induced psychotic disorder with hallucinations OR F11251 Opioid dependence with opioid-induced psychotic disorder with hallucinations OR F11951 Opioid use, unspecified with opioid-induced psychotic disorder with hallucinations OR F12151 Cannabis abuse with psychotic disorder with hallucinations OR F12251 Cannabis dependence with psychotic disorder with hallucinations OR F12951 Cannabis use, unspecified with psychotic disorder with hallucinations OR F13151 Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychot OR F13251 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced ps OR F13951 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F14151 Cocaine abuse with cocaine-induced psychotic disorder with hallucinations OR F14251 Cocaine dependence with cocaine-induced psychotic disorder with hallucinations OR F14951 Cocaine use, unspecified with cocaine-induced psychotic disorder with hallucinations OR F15151 Other stimulant abuse with stimulant-induced psychotic disorder with hallucinations OR F15251 Other stimulant dependence with stimulant-induced psychotic disorder with hallucinations OR F15951 Other stimulant use, unspecified with stimulant-induced psychotic disorder with hallucinatio OR F16151 Hallucinogen abuse with hallucinogen-induced psychotic disorder with hallucinations OR F16251 Hallucinogen dependence with hallucinogen-induced psychotic disorder with hallucinations OR F16951 Hallucinogen use, unspecified with hallucinogen-induced psychotic disorder with hallucinatio OR F18151 Inhalant abuse with inhalant-induced psychotic disorder with hallucinations OR F18251 Inhalant dependence with inhalant-induced psychotic disorder with hallucinations OR F18951 Inhalant use, unspecified

		with inhalant-induced psychotic disorder with hallucinations OR F19151 Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder wi OR F19251 Other psychoactive substance dependence with psychoactive substance-induced psychotic disord
29289	Other psychoactive substance use, unspecified with other psychoactive substance-induced diso	F11159 Opioid abuse with opioid-induced psychotic disorder, unspecified OR F11181 Opioid abuse with opioid-induced sexual dysfunction OR F11188 Opioid abuse with other opioid-induced disorder OR F11222 Opioid dependence with intoxication with perceptual disturbance OR F11259 Opioid dependence with opioid-induced psychotic disorder, unspecified OR F11281 Opioid dependence with opioid-induced sexual dysfunction OR F11288 Opioid dependence with other opioid-induced disorder OR F11922 Opioid use, unspecified with intoxication with perceptual disturbance OR F11959 Opioid use, unspecified with opioid-induced psychotic disorder, unspecified OR F11981 Opioid use, unspecified with opioid-induced sexual dysfunction OR F11988 Opioid use, unspecified with other opioid-induced disorder OR F12122 Cannabis abuse with intoxication with perceptual disturbance OR F12159 Cannabis abuse with psychotic disorder, unspecified OR F12180 Cannabis abuse with cannabis-induced anxiety disorder OR F12188 Cannabis abuse with other cannabis-induced disorder OR F12222 Cannabis dependence with intoxication with perceptual disturbance OR F12259 Cannabis dependence with psychotic disorder, unspecified OR F12280 Cannabis dependence with cannabis-induced anxiety disorder OR F12288 Cannabis dependence with other cannabis-induced disorder OR F12922 Cannabis use, unspecified with intoxication with perceptual disturbance OR F12959 Cannabis use, unspecified with psychotic disorder, unspecified OR F12980 Cannabis use, unspecified with anxiety disorder OR F12988 Cannabis use, unspecified with other cannabis-induced disorder OR F13159 Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychot OR F13180 Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced anxiety OR F13181 Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced sexual OR F13188 Sedative, hypnotic or anxiolytic abuse with other sedative, hypnotic or anxiolytic-induced d OR F13259 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced ps OR F13280 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced an OR F13281 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced se OR F13288 Sedative, hypnotic or anxiolytic dependence with other sedative, hypnotic or anxiolytic-indu OR F13959 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F13980 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F13981 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F13988 Sedative, hypnotic or anxiolytic use, unspecified with other sedative, hypnotic or anxiolyti OR F14122 Cocaine abuse with intoxication with perceptual disturbance OR F14159 Cocaine abuse with cocaine-induced psychotic disorder, unspecified OR F14180 Cocaine abuse with cocaine-induced anxiety disorder OR F14181 Cocaine abuse with cocaine-induced sexual dysfunction OR F14188 Cocaine abuse with other cocaine-

		induced disorder OR F14222 Cocaine dependence with intoxication with perceptual disturbance OR F14259 Cocaine dependence with cocaine-induced psychotic disorder, unspecified OR F14280 Cocaine dependence with cocaine-induced anxiety disorder OR F14281 Cocaine dependence with cocaine-induced sexual dysfunction OR F14288 Cocaine dependence with other cocaine-induced disorder OR F14922 Cocaine use, unspecified with intoxication with perceptual disturbance OR F14959 Cocaine use, unspecified with cocaine-induced psychotic disorder, unspecified OR F14980 Cocaine use, unspecified with cocaine-induced anxiety disorder OR F14981 Cocaine use, unspecified with cocaine-induced sexual dysfunction OR F14988 Cocaine use, unspecified with other cocaine-induced disorder OR F15122 Other stimulant abuse with intoxication with perceptual disturbance OR F15159 Other stimulant abuse with stimulant-induced psychotic disorder, unspecified OR F15180 Other stimulant abuse with stimulant-induced anxiety disorder OR F15181 Other stimulant abuse with stimulant-induced sexual dysfunction OR F15188 Other stimulant abuse with other stimulant-induced disorder OR F15222 Other stimulant dependence with intoxication with perceptual disturbance OR F15259 Other stimulant dependence with stimulant-induced psychotic disorder, unspecified OR F15280 Other stimulant dependence with stimulant-induced anxiety disorder OR F15281 Other stimulant dependence with stimulant-induced sexual dysfunction OR F15288 Other stimulant dependence with other stimulant-induced disorder OR F15922 Other stimulant use, unspecified with intoxication with perceptual disturbance OR F15959 Other stimulant use, unspecified with stimulant-induced psychotic disorder, unspecified OR F15980 Other stimulant use, unspecified with stimulant-induced anxiety disorder OR F15981 Other stimulant use, unspecified with stimulant-induced sexual dysfunction OR F15988 Other stimulant use, unspecified with other stimulant-induced disorder OR F16122 Hallucinogen abuse with intoxication with perceptual disturbance OR F16159 Hallucinogen abuse with hallucinogen-induced psychotic disorder, unspecified OR F16180 Hallucinogen abuse with hallucinogen-induced anxiety disorder OR F16183 Hallucinogen abuse with hallucinogen persisting perception disorder (flashbacks) OR F16188 Hallucinogen abuse with other hallucinogen-induced disorder OR F16259 Hallucinogen dependence with hallucinogen-induced psychotic disorder, unspecified OR F16280 Hallucinogen dependence with hallucinogen-induced anxiety disorder OR F16283 Hallucinogen dependence with hallucinogen persisting perception disorder (flashbacks) OR F16288 Hallucinogen dependence with other hallucinogen-induced disorder OR F16959 Hallucinogen use, unspecified with hallucinogen-induced psychotic disorder, unspecified OR F16980 Hallucinogen use, unspecified with hallucinogen-induced anxiety disorder OR F16983 Hallucinogen use, unspecified with hallucinogen persisting perception disorder (flashbacks) OR F16988 Hallucinogen use, unspecified with other hallucinogen-induced disorder OR F17208 Nicotine dependence, unspecified, with other nicotine-induced disorders OR F17218 Nicotine dependence, cigarettes, with other nicotine-induced disorders OR F17228 Nicotine dependence, chewing tobacco, with other nicotine-induced disorders OR F17298 Nicotine dependence, other tobacco product, with other nicotine-induced disorders OR

		F18159 Inhalant abuse with inhalant-induced psychotic disorder, unspecified OR F18180 Inhalant abuse with inhalant-induced anxiety disorder OR F18188 Inhalant abuse with other inhalant-induced disorder OR F18259 Inhalant dependence with inhalant-induced psychotic disorder, unspecified OR F18280 Inhalant dependence with inhalant-induced anxiety disorder OR F18288 Inhalant dependence with other inhalant-induced disorder OR F18959 Inhalant use, unspecified with inhalant-induced psychotic disorder, unspecified OR F18980 Inhalant use, unspecified with inhalant-induced anxiety disorder OR F18988 Inhalant use, unspecified with other inhalant-induced disorder OR F19122 Other psychoactive substance abuse with intoxication with perceptual disturbances OR F19159 Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder, u OR F19180 Other psychoactive substance abuse with psychoactive substance-induced anxiety disorder OR F19181 Other psychoactive substance abuse with psychoactive substance-induced sexual dysfunction OR F19188 Other psychoactive substance abuse with other psychoactive substance-induced disorder OR F19222 Other psychoactive substance dependence with intoxication with perceptual disturbance OR F19259 Other psychoactive substance dependence with psychoactive substance-induced psychotic disord OR F19280 Other psychoactive substance dependence with psychoactive substance-induced anxiety disorder OR F19281 Other psychoactive substance dependence with psychoactive substance-induced sexual dysfuncti OR F19288 Other psychoactive substance dependence with other psychoactive substance-induced disorder OR F19922 Other psychoactive substance use, unspecified with intoxication with perceptual disturbance OR F19959 Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic OR F19980 Other psychoactive substance use, unspecified with psychoactive substance-induced anxiety di OR F19981 Other psychoactive substance use, unspecified with psychoactive substance-induced sexual dys OR F19988 Other psychoactive substance use, unspecified with other psychoactive substance-induced diso
29285	Other psychoactive substance use, unspecified with psychoactive substance-induced sleep diso	F11182 Opioid abuse with opioid-induced sleep disorder OR F11282 Opioid dependence with opioid-induced sleep disorder OR F11982 Opioid use, unspecified with opioid-induced sleep disorder OR F13182 Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced sleep d OR F13282 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced sl OR F13982 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F14182 Cocaine abuse with cocaine-induced sleep disorder OR F14282 Cocaine dependence with cocaine-induced sleep disorder OR F14982 Cocaine use, unspecified with cocaine-induced sleep disorder OR F15182 Other stimulant abuse with stimulant-induced sleep disorder OR F15282 Other stimulant dependence with stimulant-induced sleep disorder OR F15982 Other stimulant use, unspecified with stimulant-induced sleep disorder OR F19182 Other psychoactive substance abuse with psychoactive substance-induced sleep disorder OR F19282 Other psychoactive substance dependence with psychoactive substance-induced sleep

		disorder OR F19982 Other psychoactive substance use, unspecified with psychoactive substance-induced sleep diso
2929	Other psychoactive substance dependence with unspecified psychoactive substance-induced diso	F1119 Opioid abuse with unspecified opioid-induced disorder OR F1129 Opioid dependence with unspecified opioid-induced disorder OR F1199 Opioid use, unspecified with unspecified opioid-induced disorder OR F1219 Cannabis abuse with unspecified cannabis-induced disorder OR F1229 Cannabis dependence with unspecified cannabis-induced disorder OR F1299 Cannabis use, unspecified with unspecified cannabis-induced disorder OR F1319 Sedative, hypnotic or anxiolytic abuse with unspecified sedative, hypnotic or anxiolytic-ind OR F1329 Sedative, hypnotic or anxiolytic dependence with unspecified sedative, hypnotic or anxiolyti OR F1399 Sedative, hypnotic or anxiolytic use, unspecified with unspecified sedative, hypnotic or anx OR F1419 Cocaine abuse with unspecified cocaine-induced disorder OR F1429 Cocaine dependence with unspecified cocaine-induced disorder OR F1499 Cocaine use, unspecified with unspecified cocaine-induced disorder OR F1519 Other stimulant abuse with unspecified stimulant-induced disorder OR F1529 Other stimulant dependence with unspecified stimulant-induced disorder OR F1599 Other stimulant use, unspecified with unspecified stimulant-induced disorder OR F1619 Hallucinogen abuse with unspecified hallucinogen-induced disorder OR F1629 Hallucinogen dependence with unspecified hallucinogen-induced disorder OR F1699 Hallucinogen use, unspecified with unspecified hallucinogen-induced disorder OR F17209 Nicotine dependence, unspecified, with unspecified nicotine-induced disorders OR F17219 Nicotine dependence, cigarettes, with unspecified nicotine-induced disorders OR F17229 Nicotine dependence, chewing tobacco, with unspecified nicotine-induced disorders OR F17299 Nicotine dependence, other tobacco product, with unspecified nicotine-induced disorders OR F1819 Inhalant abuse with unspecified inhalant-induced disorder OR F1829 Inhalant dependence with unspecified inhalant-induced disorder OR F1899 Inhalant use, unspecified with unspecified inhalant-induced disorder OR F1919 Other psychoactive substance abuse with unspecified psychoactive substance-induced disorder OR F1929 Other psychoactive substance dependence with unspecified psychoactive substance-induced diso
30400	Opioid dependence, uncomplicated	F1120 Opioid dependence, uncomplicated
30401	Opioid dependence, uncomplicated	F1120 Opioid dependence, uncomplicated
30402	Opioid dependence, uncomplicated	F1120 Opioid dependence, uncomplicated
30403	Opioid dependence, in remission	F1121 Opioid dependence, in remission
30400	Opioid dependence with unspecified opioid-induced disorder	F11220 Opioid dependence with intoxication, uncomplicated OR F11221 Opioid dependence with intoxication delirium OR F11222 Opioid dependence with intoxication with perceptual disturbance OR F11229 Opioid dependence with intoxication, unspecified OR F1123 Opioid dependence with withdrawal OR F1124 Opioid dependence with opioid-induced mood disorder OR F11250 Opioid dependence with opioid-induced psychotic disorder with delusions OR F11251 Opioid dependence with opioid-induced psychotic disorder with hallucinations OR F11259 Opioid dependence with opioid-induced psychotic disorder, unspecified OR F11281 Opioid dependence with opioid-induced

		sexual dysfunction OR F11282 Opioid dependence with opioid-induced sleep disorder OR F11288 Opioid dependence with other opioid-induced disorder OR F1129 Opioid dependence with unspecified opioid-induced disorder
2922	Other psychoactive substance use, unspecified with intoxication, unspecified	F11220 Opioid dependence with intoxication, uncomplicated OR F11229 Opioid dependence with intoxication, unspecified OR F11920 Opioid use, unspecified with intoxication, uncomplicated OR F11929 Opioid use, unspecified with intoxication, unspecified OR F12120 Cannabis abuse with intoxication, uncomplicated OR F12129 Cannabis abuse with intoxication, unspecified OR F12220 Cannabis dependence with intoxication, uncomplicated OR F12229 Cannabis dependence with intoxication, unspecified OR F12920 Cannabis use, unspecified with intoxication, uncomplicated OR F12929 Cannabis use, unspecified with intoxication, unspecified OR F13129 Sedative, hypnotic or anxiolytic abuse with intoxication, unspecified OR F13220 Sedative, hypnotic or anxiolytic dependence with intoxication, uncomplicated OR F13229 Sedative, hypnotic or anxiolytic dependence with intoxication, unspecified OR F13920 Sedative, hypnotic or anxiolytic use, unspecified with intoxication, uncomplicated OR F13929 Sedative, hypnotic or anxiolytic use, unspecified with intoxication, unspecified OR F14129 Cocaine abuse with intoxication, unspecified OR F14220 Cocaine dependence with intoxication, uncomplicated OR F14229 Cocaine dependence with intoxication, unspecified OR F14920 Cocaine use, unspecified with intoxication, uncomplicated OR F14929 Cocaine use, unspecified with intoxication, unspecified OR F15129 Other stimulant abuse with intoxication, unspecified OR F15220 Other stimulant dependence with intoxication, uncomplicated OR F15229 Other stimulant dependence with intoxication, unspecified OR F15929 Other stimulant use, unspecified with intoxication, unspecified OR F16129 Hallucinogen abuse with intoxication, unspecified OR F16220 Hallucinogen dependence with intoxication, uncomplicated OR F16229 Hallucinogen dependence with intoxication, unspecified OR F16920 Hallucinogen use, unspecified with intoxication, uncomplicated OR F16929 Hallucinogen use, unspecified with intoxication, unspecified OR F18120 Inhalant abuse with intoxication, uncomplicated OR F18129 Inhalant abuse with intoxication, unspecified OR F18220 Inhalant dependence with intoxication, uncomplicated OR F18229 Inhalant dependence with intoxication, unspecified OR F18920 Inhalant use, unspecified with intoxication, uncomplicated OR F18929 Inhalant use, unspecified with intoxication, unspecified OR F19129 Other psychoactive substance abuse with intoxication, unspecified OR F19220 Other psychoactive substance dependence with intoxication, uncomplicated OR F19229 Other psychoactive substance dependence with intoxication, unspecified OR F19920 Other psychoactive substance use, unspecified with intoxication, uncomplicated OR F19929 Other psychoactive substance use, unspecified with intoxication, unspecified
2920	Other psychoactive substance use, unspecified with withdrawal with perceptual disturbance	F1123 Opioid dependence with withdrawal OR F1193 Opioid use, unspecified with withdrawal OR F13230 Sedative, hypnotic or anxiolytic dependence with withdrawal, uncomplicated OR F13231 Sedative, hypnotic or anxiolytic dependence with withdrawal delirium OR F13232 Sedative,

		hypnotic or anxiolytic dependence with withdrawal with perceptual disturbance OR F13239 Sedative, hypnotic or anxiolytic dependence with withdrawal, unspecified OR F13930 Sedative, hypnotic or anxiolytic use, unspecified with withdrawal, uncomplicated OR F13931 Sedative, hypnotic or anxiolytic use, unspecified with withdrawal delirium OR F13932 Sedative, hypnotic or anxiolytic use, unspecified with withdrawal with perceptual disturbanc OR F13939 Sedative, hypnotic or anxiolytic use, unspecified with withdrawal, unspecified OR F1423 Cocaine dependence with withdrawal OR F1523 Other stimulant dependence with withdrawal OR F1593 Other stimulant use, unspecified with withdrawal OR F17203 Nicotine dependence unspecified, with withdrawal OR F17213 Nicotine dependence, cigarettes, with withdrawal OR F17223 Nicotine dependence, chewing tobacco, with withdrawal OR F17293 Nicotine dependence, other tobacco product, with withdrawal OR F19230 Other psychoactive substance dependence with withdrawal, uncomplicated OR F19231 Other psychoactive substance dependence with withdrawal delirium OR F19232 Other psychoactive substance dependence with withdrawal with perceptual disturbance OR F19239 Other psychoactive substance dependence with withdrawal, unspecified OR F19930 Other psychoactive substance use, unspecified with withdrawal, uncomplicated OR F19931 Other psychoactive substance use, unspecified with withdrawal delirium OR F19932 Other psychoactive substance use, unspecified with withdrawal with perceptual disturbance
30520	Cannabis abuse, uncomplicated	F1210 Cannabis abuse, uncomplicated
30521	Cannabis use, unspecified, uncomplicated	F1210 Cannabis abuse, uncomplicated OR F1290 Cannabis use, unspecified, uncomplicated
30522	Cannabis use, unspecified, uncomplicated	F1210 Cannabis abuse, uncomplicated OR F1290 Cannabis use, unspecified, uncomplicated
30523	Cannabis use, unspecified, uncomplicated	F1210 Cannabis abuse, uncomplicated OR F1290 Cannabis use, unspecified, uncomplicated
30430	Cannabis dependence, uncomplicated	F1220 Cannabis dependence, uncomplicated
30431	Cannabis dependence, uncomplicated	F1220 Cannabis dependence, uncomplicated
30432	Cannabis dependence, uncomplicated	F1220 Cannabis dependence, uncomplicated
30433	Cannabis dependence, in remission	F1221 Cannabis dependence, in remission
30430	Cannabis dependence with unspecified cannabis-induced disorder	F12220 Cannabis dependence with intoxication, uncomplicated OR F12221 Cannabis dependence with intoxication delirium OR F12222 Cannabis dependence with intoxication with perceptual disturbance OR F12229 Cannabis dependence with intoxication, unspecified OR F12250 Cannabis dependence with psychotic disorder with delusions OR F12251 Cannabis dependence with psychotic disorder with hallucinations OR F12259 Cannabis dependence with psychotic disorder, unspecified OR F12280 Cannabis dependence with cannabis-induced anxiety disorder OR F12288 Cannabis dependence with other cannabis-induced disorder OR F1229 Cannabis dependence with unspecified cannabis-induced disorder

30520	Cannabis use, unspecified, uncomplicated	F1290 Cannabis use, unspecified, uncomplicated
30540	Sedative, hypnotic or anxiolytic abuse, uncomplicated	F1310 Sedative, hypnotic or anxiolytic abuse, uncomplicated
30541	Sedative, hypnotic or anxiolytic abuse, uncomplicated	F1310 Sedative, hypnotic or anxiolytic abuse, uncomplicated
30542	Sedative, hypnotic or anxiolytic abuse, uncomplicated	F1310 Sedative, hypnotic or anxiolytic abuse, uncomplicated
30543	Sedative, hypnotic or anxiolytic abuse, uncomplicated	F1310 Sedative, hypnotic or anxiolytic abuse, uncomplicated
30541	Sedative, hypnotic or anxiolytic abuse with intoxication, uncomplicated	F13120 Sedative, hypnotic or anxiolytic abuse with intoxication, uncomplicated
30542	Sedative, hypnotic or anxiolytic abuse with intoxication, uncomplicated	F13120 Sedative, hypnotic or anxiolytic abuse with intoxication, uncomplicated
30543	Sedative, hypnotic or anxiolytic abuse with intoxication, uncomplicated	F13120 Sedative, hypnotic or anxiolytic abuse with intoxication, uncomplicated
30540	Sedative, hypnotic, or anxiolytic use, unspecified, uncomplicated	F13120 Sedative, hypnotic or anxiolytic abuse with intoxication, uncomplicated OR F1390 Sedative, hypnotic, or anxiolytic use, unspecified, uncomplicated
30410	Sedative, hypnotic or anxiolytic dependence, uncomplicated	F1320 Sedative, hypnotic or anxiolytic dependence, uncomplicated
30411	Sedative, hypnotic or anxiolytic dependence, uncomplicated	F1320 Sedative, hypnotic or anxiolytic dependence, uncomplicated
30412	Sedative, hypnotic or anxiolytic dependence, uncomplicated	F1320 Sedative, hypnotic or anxiolytic dependence, uncomplicated
30413	Sedative, hypnotic or anxiolytic dependence, in remission	F1321 Sedative, hypnotic or anxiolytic dependence, in remission
30410	Sedative, hypnotic or anxiolytic dependence with unspecified sedative, hypnotic or anxiolyti	F13220 Sedative, hypnotic or anxiolytic dependence with intoxication, uncomplicated OR F13221 Sedative, hypnotic or anxiolytic dependence with intoxication delirium OR F13229 Sedative, hypnotic or anxiolytic dependence with intoxication, unspecified OR F13230 Sedative, hypnotic or anxiolytic dependence with withdrawal, uncomplicated OR F13231 Sedative, hypnotic or anxiolytic dependence with withdrawal delirium OR F13232 Sedative, hypnotic or anxiolytic dependence with withdrawal with perceptual disturbance OR F13239 Sedative, hypnotic or anxiolytic dependence with withdrawal, unspecified OR F1324 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced mo OR F13250 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced ps OR F13251 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced ps OR F13259 Sedative, hypnotic or anxiolytic

		dependence with sedative, hypnotic or anxiolytic-induced ps OR F1326 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced pe OR F1327 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced pe OR F13280 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced an OR F13281 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced se OR F13282 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced sl OR F13288 Sedative, hypnotic or anxiolytic dependence with other sedative, hypnotic or anxiolytic-indu OR F1329 Sedative, hypnotic or anxiolytic dependence with unspecified sedative, hypnotic or anxiolyti
29283	Other psychoactive substance dependence with psychoactive substance-induced persisting amnes	F1326 Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced pe OR F1396 Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-indu OR F1916 Other psychoactive substance abuse with psychoactive substance-induced persisting amnestic d OR F1926 Other psychoactive substance dependence with psychoactive substance-induced persisting amnes
30560	Cocaine abuse, uncomplicated	F1410 Cocaine abuse, uncomplicated
30561	Cocaine abuse, uncomplicated	F1410 Cocaine abuse, uncomplicated
30562	Cocaine abuse, uncomplicated	F1410 Cocaine abuse, uncomplicated
30563	Cocaine abuse, uncomplicated	F1410 Cocaine abuse, uncomplicated
30561	Cocaine abuse with intoxication, uncomplicated	F14120 Cocaine abuse with intoxication, uncomplicated
30562	Cocaine abuse with intoxication, uncomplicated	F14120 Cocaine abuse with intoxication, uncomplicated
30563	Cocaine abuse with intoxication, uncomplicated	F14120 Cocaine abuse with intoxication, uncomplicated
30560	Cocaine use, unspecified, uncomplicated	F14120 Cocaine abuse with intoxication, uncomplicated OR F1490 Cocaine use, unspecified, uncomplicated
30420	Cocaine dependence, uncomplicated	F1420 Cocaine dependence, uncomplicated
30421	Cocaine dependence, uncomplicated	F1420 Cocaine dependence, uncomplicated
30422	Cocaine dependence, uncomplicated	F1420 Cocaine dependence, uncomplicated
30423	Cocaine dependence, in remission	F1421 Cocaine dependence, in remission
30420	Cocaine dependence with unspecified cocaine-induced disorder	F14220 Cocaine dependence with intoxication, uncomplicated OR F14221 Cocaine dependence with intoxication delirium OR F14222 Cocaine dependence with intoxication with perceptual disturbance OR F14229 Cocaine dependence with intoxication, unspecified OR F1423 Cocaine dependence with withdrawal OR F1424 Cocaine dependence with cocaine-induced mood disorder OR F14250 Cocaine dependence with cocaine-induced psychotic disorder with delusions OR F14251 Cocaine dependence with cocaine-induced psychotic disorder with hallucinations OR

		F14259 Cocaine dependence with cocaine-induced psychotic disorder, unspecified OR F14280 Cocaine dependence with cocaine-induced anxiety disorder OR F14281 Cocaine dependence with cocaine-induced sexual dysfunction OR F14282 Cocaine dependence with cocaine-induced sleep disorder OR F14288 Cocaine dependence with other cocaine-induced disorder OR F1429 Cocaine dependence with unspecified cocaine-induced disorder
30570	Other stimulant abuse, uncomplicated	F1510 Other stimulant abuse, uncomplicated
30571	Other stimulant abuse, uncomplicated	F1510 Other stimulant abuse, uncomplicated
30572	Other stimulant abuse, uncomplicated	F1510 Other stimulant abuse, uncomplicated
30573	Other stimulant abuse, uncomplicated	F1510 Other stimulant abuse, uncomplicated
30571	Other stimulant abuse with intoxication, uncomplicated	F15120 Other stimulant abuse with intoxication, uncomplicated
30572	Other stimulant abuse with intoxication, uncomplicated	F15120 Other stimulant abuse with intoxication, uncomplicated
30573	Other stimulant abuse with intoxication, uncomplicated	F15120 Other stimulant abuse with intoxication, uncomplicated
30570	Other stimulant use, unspecified, uncomplicated	F15120 Other stimulant abuse with intoxication, uncomplicated OR F1590 Other stimulant use, unspecified, uncomplicated
30440	Other stimulant dependence, uncomplicated	F1520 Other stimulant dependence, uncomplicated
30441	Other stimulant dependence, uncomplicated	F1520 Other stimulant dependence, uncomplicated
30442	Other stimulant dependence, uncomplicated	F1520 Other stimulant dependence, uncomplicated
30443	Other stimulant dependence, in remission	F1521 Other stimulant dependence, in remission
30440	Other stimulant dependence with unspecified stimulant-induced disorder	F15220 Other stimulant dependence with intoxication, uncomplicated OR F15221 Other stimulant dependence with intoxication delirium OR F15222 Other stimulant dependence with intoxication with perceptual disturbance OR F15229 Other stimulant dependence with intoxication, unspecified OR F1523 Other stimulant dependence with withdrawal OR F1524 Other stimulant dependence with stimulant-induced mood disorder OR F15250 Other stimulant dependence with stimulant-induced psychotic disorder with delusions OR F15251 Other stimulant dependence with stimulant-induced psychotic disorder with hallucinations OR F15259 Other stimulant dependence with stimulant-induced psychotic disorder, unspecified OR F15280 Other stimulant dependence with stimulant-induced anxiety disorder OR F15281 Other stimulant dependence with stimulant-induced sexual dysfunction OR F15282 Other stimulant dependence with stimulant-induced sleep disorder

		OR F15288 Other stimulant dependence with other stimulant-induced disorder OR F1529 Other stimulant dependence with unspecified stimulant-induced disorder
2922	Other stimulant use, unspecified with intoxication, uncomplicated	F15920 Other stimulant use, unspecified with intoxication, uncomplicated
30530	Hallucinogen abuse, uncomplicated	F1610 Hallucinogen abuse, uncomplicated
30531	Hallucinogen abuse, uncomplicated	F1610 Hallucinogen abuse, uncomplicated
30532	Hallucinogen abuse, uncomplicated	F1610 Hallucinogen abuse, uncomplicated
30533	Hallucinogen abuse, uncomplicated	F1610 Hallucinogen abuse, uncomplicated
30531	Hallucinogen abuse with intoxication, uncomplicated	F16120 Hallucinogen abuse with intoxication, uncomplicated
30532	Hallucinogen abuse with intoxication, uncomplicated	F16120 Hallucinogen abuse with intoxication, uncomplicated
30533	Hallucinogen abuse with intoxication, uncomplicated	F16120 Hallucinogen abuse with intoxication, uncomplicated
30530	Hallucinogen use, unspecified, uncomplicated	F16120 Hallucinogen abuse with intoxication, uncomplicated OR F1690 Hallucinogen use, unspecified, uncomplicated
30450	Hallucinogen dependence, uncomplicated	F1620 Hallucinogen dependence, uncomplicated
30451	Hallucinogen dependence, uncomplicated	F1620 Hallucinogen dependence, uncomplicated
30452	Hallucinogen dependence, uncomplicated	F1620 Hallucinogen dependence, uncomplicated
30453	Hallucinogen dependence, in remission	F1621 Hallucinogen dependence, in remission
30450	Hallucinogen dependence with unspecified hallucinogen-induced disorder	F16220 Hallucinogen dependence with intoxication, uncomplicated OR F16221 Hallucinogen dependence with intoxication with delirium OR F16229 Hallucinogen dependence with intoxication, unspecified OR F1624 Hallucinogen dependence with hallucinogen-induced mood disorder OR F16250 Hallucinogen dependence with hallucinogen-induced psychotic disorder with delusions OR F16251 Hallucinogen dependence with hallucinogen-induced psychotic disorder with hallucinations OR F16259 Hallucinogen dependence with hallucinogen-induced psychotic disorder, unspecified OR F16280 Hallucinogen dependence with hallucinogen-induced anxiety disorder OR F16283 Hallucinogen dependence with hallucinogen persisting perception disorder (flashbacks) OR F16288 Hallucinogen dependence with other hallucinogen-induced disorder OR F1629 Hallucinogen dependence with unspecified hallucinogen-induced disorder
3051	Nicotine dependence, unspecified, uncomplicated	F17200 Nicotine dependence, unspecified, uncomplicated

3051	Nicotine dependence, other tobacco product, in remission	F17201 Nicotine dependence, unspecified, in remission OR F17210 Nicotine dependence, cigarettes, uncomplicated OR F17211 Nicotine dependence, cigarettes, in remission OR F17220 Nicotine dependence, chewing tobacco, uncomplicated OR F17221 Nicotine dependence, chewing tobacco, in remission OR F17290 Nicotine dependence, other tobacco product, uncomplicated OR F17291 Nicotine dependence, other tobacco product, in remission
30590	Inhalant abuse, uncomplicated	F1810 Inhalant abuse, uncomplicated
30591	Inhalant abuse, uncomplicated	F1810 Inhalant abuse, uncomplicated
30592	Inhalant abuse, uncomplicated	F1810 Inhalant abuse, uncomplicated
30593	Inhalant abuse, uncomplicated	F1810 Inhalant abuse, uncomplicated
30590	Abuse of other non-psychoactive substances	F18120 Inhalant abuse with intoxication, uncomplicated OR F1890 Inhalant use, unspecified, uncomplicated OR F550 Abuse of antacids OR F551 Abuse of herbal or folk remedies OR F552 Abuse of laxatives OR F553 Abuse of steroids or hormones OR F554 Abuse of vitamins OR F558 Abuse of other non-psychoactive substances
30591	Abuse of other non-psychoactive substances	F18120 Inhalant abuse with intoxication, uncomplicated OR F550 Abuse of antacids OR F551 Abuse of herbal or folk remedies OR F552 Abuse of laxatives OR F553 Abuse of steroids or hormones OR F554 Abuse of vitamins OR F558 Abuse of other non-psychoactive substances
30592	Abuse of other non-psychoactive substances	F18120 Inhalant abuse with intoxication, uncomplicated OR F550 Abuse of antacids OR F551 Abuse of herbal or folk remedies OR F552 Abuse of laxatives OR F553 Abuse of steroids or hormones OR F554 Abuse of vitamins OR F558 Abuse of other non-psychoactive substances
30593	Abuse of other non-psychoactive substances	F18120 Inhalant abuse with intoxication, uncomplicated OR F550 Abuse of antacids OR F551 Abuse of herbal or folk remedies OR F552 Abuse of laxatives OR F553 Abuse of steroids or hormones OR F554 Abuse of vitamins OR F558 Abuse of other non-psychoactive substances
30460	Other psychoactive substance dependence with unspecified psychoactive substance-induced diso	F1820 Inhalant dependence, uncomplicated OR F18220 Inhalant dependence with intoxication, uncomplicated OR F18221 Inhalant dependence with intoxication delirium OR F18229 Inhalant dependence with intoxication, unspecified OR F1824 Inhalant dependence with inhalant-induced mood disorder OR F18250 Inhalant dependence with inhalant-induced psychotic disorder with delusions OR F18251 Inhalant dependence with inhalant-induced psychotic disorder with hallucinations OR F18259 Inhalant dependence with inhalant-induced psychotic disorder, unspecified OR F1827 Inhalant dependence with inhalant-induced dementia OR F18280 Inhalant dependence with inhalant-induced anxiety disorder OR F18288 Inhalant dependence with other inhalant-induced disorder OR F1829 Inhalant dependence with unspecified inhalant-induced disorder OR F19220 Other psychoactive substance dependence with intoxication, uncomplicated OR F19221 Other psychoactive substance dependence with intoxication delirium OR F19222 Other psychoactive substance dependence with intoxication with perceptual disturbance OR F19229 Other psychoactive substance dependence with intoxication, unspecified OR F19230 Other psychoactive substance dependence with withdrawal, uncomplicated OR F19231 Other psychoactive substance dependence with withdrawal delirium OR F19232 Other psychoactive substance dependence with

		withdrawal with perceptual disturbance OR F19239 Other psychoactive substance dependence with withdrawal, unspecified OR F1924 Other psychoactive substance dependence with psychoactive substance-induced mood disorder OR F19250 Other psychoactive substance dependence with psychoactive substance-induced psychotic disord OR F19251 Other psychoactive substance dependence with psychoactive substance-induced psychotic disord OR F19259 Other psychoactive substance dependence with psychoactive substance-induced psychotic disord OR F1926 Other psychoactive substance dependence with psychoactive substance-induced persisting amnes OR F1927 Other psychoactive substance dependence with psychoactive substance-induced persisting demen OR F19280 Other psychoactive substance dependence with psychoactive substance-induced anxiety disorder OR F19281 Other psychoactive substance dependence with psychoactive substance-induced sexual dysfuncti OR F19282 Other psychoactive substance dependence with psychoactive substance-induced sleep disorder OR F19288 Other psychoactive substance dependence with other psychoactive substance-induced disorder OR F1929 Other psychoactive substance dependence with unspecified psychoactive substance-induced diso
30463	Inhalant dependence, in remission	F1821 Inhalant dependence, in remission
30580	Other psychoactive substance abuse, uncomplicated	F1910 Other psychoactive substance abuse, uncomplicated
30581	Other psychoactive substance abuse, uncomplicated	F1910 Other psychoactive substance abuse, uncomplicated
30582	Other psychoactive substance abuse, uncomplicated	F1910 Other psychoactive substance abuse, uncomplicated
30583	Other psychoactive substance abuse, uncomplicated	F1910 Other psychoactive substance abuse, uncomplicated
30581	Other psychoactive substance abuse with intoxication, uncomplicated	F19120 Other psychoactive substance abuse with intoxication, uncomplicated
30582	Other psychoactive substance abuse with intoxication, uncomplicated	F19120 Other psychoactive substance abuse with intoxication, uncomplicated
30583	Other psychoactive substance abuse with intoxication, uncomplicated	F19120 Other psychoactive substance abuse with intoxication, uncomplicated
30580	Other psychoactive substance use, unspecified, uncomplicated	F19120 Other psychoactive substance abuse with intoxication, uncomplicated OR F1990 Other psychoactive substance use, unspecified, uncomplicated
30460	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30461	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated

30462	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30470	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30471	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30472	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30480	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30481	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30482	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30490	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30491	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
30492	Other psychoactive substance dependence, uncomplicated	F1920 Other psychoactive substance dependence, uncomplicated
29285	Other psychoactive substance dependence, in remission	F1921 Other psychoactive substance dependence, in remission
30463	Other psychoactive substance dependence, in remission	F1921 Other psychoactive substance dependence, in remission
30473	Other psychoactive substance dependence, in remission	F1921 Other psychoactive substance dependence, in remission
30483	Other psychoactive substance dependence, in remission	F1921 Other psychoactive substance dependence, in remission
30493	Other psychoactive substance dependence, in remission	F1921 Other psychoactive substance dependence, in remission
29281	Other psychoactive substance use, unspecified with intoxication with delirium	F19921 Other psychoactive substance use, unspecified with intoxication with delirium
2920	Other psychoactive substance use, unspecified with withdrawal, unspecified	F19939 Other psychoactive substance use, unspecified with withdrawal, unspecified

29284	Other psychoactive substance use, unspecified with psychoactive substance-induced mood disor	F1994 Other psychoactive substance use, unspecified with psychoactive substance-induced mood disor
29211	Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic	F19950 Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic
29212	Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic	F19951 Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic
29283	Other psychoactive substance use, unspecified with psychoactive substance-induced persisting	F1996 Other psychoactive substance use, unspecified with psychoactive substance-induced persisting
29282	Other psychoactive substance use, unspecified with psychoactive substance-induced persisting	F1997 Other psychoactive substance use, unspecified with psychoactive substance-induced persisting
2929	Other psychoactive substance use, unspecified with unspecified psychoactive substance-induce	F1999 Other psychoactive substance use, unspecified with unspecified psychoactive substance-induce
Schizophrenia, Schizotypal and delusional disorders		
29530	Paranoid schizophrenia	F200 Paranoid schizophrenia
29531	Paranoid schizophrenia	F200 Paranoid schizophrenia
29532	Paranoid schizophrenia	F200 Paranoid schizophrenia
29533	Paranoid schizophrenia	F200 Paranoid schizophrenia
29534	Paranoid schizophrenia	F200 Paranoid schizophrenia
29535	Paranoid schizophrenia	F200 Paranoid schizophrenia
29510	Disorganized schizophrenia	F201 Disorganized schizophrenia
29511	Disorganized schizophrenia	F201 Disorganized schizophrenia
29512	Disorganized schizophrenia	F201 Disorganized schizophrenia
29513	Disorganized schizophrenia	F201 Disorganized schizophrenia
29514	Disorganized schizophrenia	F201 Disorganized schizophrenia
29515	Disorganized schizophrenia	F201 Disorganized schizophrenia
29520	Catatonic schizophrenia	F202 Catatonic schizophrenia
29521	Catatonic schizophrenia	F202 Catatonic schizophrenia
29522	Catatonic schizophrenia	F202 Catatonic schizophrenia
29523	Catatonic schizophrenia	F202 Catatonic schizophrenia
29524	Catatonic schizophrenia	F202 Catatonic schizophrenia

29525	Catatonic schizophrenia	F202 Catatonic schizophrenia
29590	Undifferentiated schizophrenia	F203 Undifferentiated schizophrenia
29560	Residual schizophrenia	F205 Residual schizophrenia
29561	Residual schizophrenia	F205 Residual schizophrenia
29562	Residual schizophrenia	F205 Residual schizophrenia
29563	Residual schizophrenia	F205 Residual schizophrenia
29564	Residual schizophrenia	F205 Residual schizophrenia
29565	Residual schizophrenia	F205 Residual schizophrenia
29540	Schizophreniform disorder	F2081 Schizophreniform disorder
29541	Schizophreniform disorder	F2081 Schizophreniform disorder
29542	Schizophreniform disorder	F2081 Schizophreniform disorder
29543	Schizophreniform disorder	F2081 Schizophreniform disorder
29544	Schizophreniform disorder	F2081 Schizophreniform disorder
29545	Schizophreniform disorder	F2081 Schizophreniform disorder
29500	Other schizophrenia	F2089 Other schizophrenia
29501	Other schizophrenia	F2089 Other schizophrenia
29502	Other schizophrenia	F2089 Other schizophrenia
29503	Other schizophrenia	F2089 Other schizophrenia
29504	Other schizophrenia	F2089 Other schizophrenia
29505	Other schizophrenia	F2089 Other schizophrenia
29550	Other schizophrenia	F2089 Other schizophrenia
29551	Other schizophrenia	F2089 Other schizophrenia
29552	Other schizophrenia	F2089 Other schizophrenia
29553	Other schizophrenia	F2089 Other schizophrenia
29554	Other schizophrenia	F2089 Other schizophrenia
29555	Other schizophrenia	F2089 Other schizophrenia
29580	Other schizophrenia	F2089 Other schizophrenia
29581	Other schizophrenia	F2089 Other schizophrenia
29582	Other schizophrenia	F2089 Other schizophrenia
29583	Other schizophrenia	F2089 Other schizophrenia
29584	Other schizophrenia	F2089 Other schizophrenia
29585	Other schizophrenia	F2089 Other schizophrenia
29590	Schizophrenia, unspecified	F209 Schizophrenia, unspecified
29591	Schizophrenia, unspecified	F209 Schizophrenia, unspecified
29592	Schizophrenia, unspecified	F209 Schizophrenia, unspecified

29593	Schizophrenia, unspecified	F209 Schizophrenia, unspecified
29594	Schizophrenia, unspecified	F209 Schizophrenia, unspecified
29595	Schizophrenia, unspecified	F209 Schizophrenia, unspecified
30122	Schizotypal disorder	F21 Schizotypal disorder
2970	Delusional disorders	F22 Delusional disorders
2971	Delusional disorders	F22 Delusional disorders
2972	Delusional disorders	F22 Delusional disorders
2978	Delusional disorders	F22 Delusional disorders
2979	Brief psychotic disorder	F23 Brief psychotic disorder
2983	Brief psychotic disorder	F23 Brief psychotic disorder
2984	Brief psychotic disorder	F23 Brief psychotic disorder
2988	Brief psychotic disorder	F23 Brief psychotic disorder
2973	Shared psychotic disorder	F24 Shared psychotic disorder
29570	Other schizoaffective disorders	F250 Schizoaffective disorder, bipolar type OR F251 Schizoaffective disorder, depressive type OR F258 Other schizoaffective disorders
29570	Schizoaffective disorder, unspecified	F259 Schizoaffective disorder, unspecified
29571	Schizoaffective disorder, unspecified	F259 Schizoaffective disorder, unspecified
29572	Schizoaffective disorder, unspecified	F259 Schizoaffective disorder, unspecified
29573	Schizoaffective disorder, unspecified	F259 Schizoaffective disorder, unspecified
29574	Schizoaffective disorder, unspecified	F259 Schizoaffective disorder, unspecified
29575	Schizoaffective disorder, unspecified	F259 Schizoaffective disorder, unspecified
2981	Other psychotic disorder not due to a substance or known physiological condition	F28 Other psychotic disorder not due to a substance or known physiological condition
2989	Other psychotic disorder not due to a substance or known physiological condition	F28 Other psychotic disorder not due to a substance or known physiological condition
2989	Unspecified psychosis not due to a substance or known physiological condition	F29 Unspecified psychosis not due to a substance or known physiological condition
Mood Disorders		
29600	Manic episode without psychotic symptoms, unspecified	F3010 Manic episode without psychotic symptoms, unspecified
29610	Manic episode without psychotic symptoms, unspecified	F3010 Manic episode without psychotic symptoms, unspecified

29601	Manic episode without psychotic symptoms, mild	F3011 Manic episode without psychotic symptoms, mild
29611	Manic episode without psychotic symptoms, mild	F3011 Manic episode without psychotic symptoms, mild
29602	Manic episode without psychotic symptoms, moderate	F3012 Manic episode without psychotic symptoms, moderate
29612	Manic episode without psychotic symptoms, moderate	F3012 Manic episode without psychotic symptoms, moderate
29603	Manic episode, severe, without psychotic symptoms	F3013 Manic episode, severe, without psychotic symptoms
29613	Manic episode, severe, without psychotic symptoms	F3013 Manic episode, severe, without psychotic symptoms
29604	Manic episode, severe with psychotic symptoms	F302 Manic episode, severe with psychotic symptoms
29614	Manic episode, severe with psychotic symptoms	F302 Manic episode, severe with psychotic symptoms
29605	Manic episode in partial remission	F303 Manic episode in partial remission
29615	Manic episode in partial remission	F303 Manic episode in partial remission
29606	Manic episode in full remission	F304 Manic episode in full remission
29616	Manic episode in full remission	F304 Manic episode in full remission
29681	Other manic episodes	F308 Other manic episodes
29600	Manic episode, unspecified	F309 Manic episode, unspecified
29640	Other bipolar disorder	F310 Bipolar disorder, current episode hypomanic OR F3189 Other bipolar disorder
29640	Bipolar disorder, current episode manic without psychotic features, unspecified	F3110 Bipolar disorder, current episode manic without psychotic features, unspecified
29641	Bipolar disorder, current episode manic without psychotic features, mild	F3111 Bipolar disorder, current episode manic without psychotic features, mild
29642	Bipolar disorder, current episode manic without psychotic features, moderate	F3112 Bipolar disorder, current episode manic without psychotic features, moderate
29643	Bipolar disorder, current episode manic without psychotic features, severe	F3113 Bipolar disorder, current episode manic without psychotic features, severe
29644	Bipolar disorder, current episode manic severe with psychotic features	F312 Bipolar disorder, current episode manic severe with psychotic features

29650	Bipolar disorder, current episode depressed, mild or moderate severity, unspecified	F3130 Bipolar disorder, current episode depressed, mild or moderate severity, unspecified
29651	Bipolar disorder, current episode depressed, mild	F3131 Bipolar disorder, current episode depressed, mild
29652	Bipolar disorder, current episode depressed, moderate	F3132 Bipolar disorder, current episode depressed, moderate
29653	Bipolar disorder, current episode depressed, severe, without psychotic features	F314 Bipolar disorder, current episode depressed, severe, without psychotic features
29654	Bipolar disorder, current episode depressed, severe, with psychotic features	F315 Bipolar disorder, current episode depressed, severe, with psychotic features
29660	Bipolar disorder, current episode mixed, unspecified	F3160 Bipolar disorder, current episode mixed, unspecified
29661	Bipolar disorder, current episode mixed, mild	F3161 Bipolar disorder, current episode mixed, mild
29662	Bipolar disorder, current episode mixed, moderate	F3162 Bipolar disorder, current episode mixed, moderate
29663	Bipolar disorder, current episode mixed, severe, without psychotic features	F3163 Bipolar disorder, current episode mixed, severe, without psychotic features
29664	Bipolar disorder, current episode mixed, severe, with psychotic features	F3164 Bipolar disorder, current episode mixed, severe, with psychotic features
2967	Bipolar disorder, in full remission, most recent episode hypomanic	F3170 Bipolar disorder, currently in remission, most recent episode unspecified OR F3171 Bipolar disorder, in partial remission, most recent episode hypomanic OR F3172 Bipolar disorder, in full remission, most recent episode hypomanic
29645	Bipolar disorder, in partial remission, most recent episode manic	F3173 Bipolar disorder, in partial remission, most recent episode manic
29646	Bipolar disorder, in full remission, most recent episode manic	F3174 Bipolar disorder, in full remission, most recent episode manic
29655	Bipolar disorder, in partial remission, most recent episode depressed	F3175 Bipolar disorder, in partial remission, most recent episode depressed
29656	Bipolar disorder, in full remission, most recent episode depressed	F3176 Bipolar disorder, in full remission, most recent episode depressed

29665	Bipolar disorder, in partial remission, most recent episode mixed	F3177 Bipolar disorder, in partial remission, most recent episode mixed
29666	Bipolar disorder, in full remission, most recent episode mixed	F3178 Bipolar disorder, in full remission, most recent episode mixed
29689	Bipolar II disorder	F3181 Bipolar II disorder
2967	Bipolar disorder, unspecified	F319 Bipolar disorder, unspecified
29680	Bipolar disorder, unspecified	F319 Bipolar disorder, unspecified
29621	Major depressive disorder, single episode, mild	F320 Major depressive disorder, single episode, mild
29622	Major depressive disorder, single episode, moderate	F321 Major depressive disorder, single episode, moderate
29623	Major depressive disorder, single episode, severe without psychotic features	F322 Major depressive disorder, single episode, severe without psychotic features
29624	Major depressive disorder, single episode, severe with psychotic features	F323 Major depressive disorder, single episode, severe with psychotic features
2980	Major depressive disorder, recurrent, severe with psychotic symptoms	F323 Major depressive disorder, single episode, severe with psychotic features OR F333 Major depressive disorder, recurrent, severe with psychotic symptoms
29625	Major depressive disorder, single episode, in partial remission	F324 Major depressive disorder, single episode, in partial remission
29626	Major depressive disorder, single episode, in full remission	F325 Major depressive disorder, single episode, in full remission
29682	Other depressive episodes	F328 Other depressive episodes
311	Major depressive disorder, single episode, unspecified	F329 Major depressive disorder, single episode, unspecified
29620	Major depressive disorder, single episode, unspecified	F329 Major depressive disorder, single episode, unspecified
29631	Major depressive disorder, recurrent, mild	F330 Major depressive disorder, recurrent, mild
29632	Major depressive disorder, recurrent, moderate	F331 Major depressive disorder, recurrent, moderate
29633	Major depressive disorder, recurrent severe without psychotic features	F332 Major depressive disorder, recurrent severe without psychotic features
29634	Major depressive disorder, recurrent, severe with psychotic symptoms	F333 Major depressive disorder, recurrent, severe with psychotic symptoms

29630	Major depressive disorder, recurrent, in remission, unspecified	F3340 Major depressive disorder, recurrent, in remission, unspecified
29635	Major depressive disorder, recurrent, in partial remission	F3341 Major depressive disorder, recurrent, in partial remission
29636	Major depressive disorder, recurrent, in full remission	F3342 Major depressive disorder, recurrent, in full remission
29699	Persistent mood [affective] disorder, unspecified	F338 Other recurrent depressive disorders OR F349 Persistent mood [affective] disorder, unspecified
29630	Major depressive disorder, recurrent, unspecified	F339 Major depressive disorder, recurrent, unspecified
30110	Cyclothymic disorder	F340 Cyclothymic disorder
30113	Cyclothymic disorder	F340 Cyclothymic disorder
3004	Dysthymic disorder	F341 Dysthymic disorder
30112	Dysthymic disorder	F341 Dysthymic disorder
29699	Other persistent mood [affective] disorders	F348 Other persistent mood [affective] disorders
29690	Unspecified mood [affective] disorder	F39 Unspecified mood [affective] disorder
Anxiety, stress-related and somatoform disorders		
30022	Agoraphobia, unspecified	F4000 Agoraphobia, unspecified
30021	Agoraphobia with panic disorder	F4001 Agoraphobia with panic disorder
30022	Agoraphobia without panic disorder	F4002 Agoraphobia without panic disorder
30023	Social phobia, unspecified	F4010 Social phobia, unspecified
30023	Social phobia, generalized	F4011 Social phobia, generalized
30029	Other specified phobia	F40210 Arachnophobia OR F40220 Fear of thunderstorms OR F40228 Other natural environment type phobia OR F40230 Fear of blood OR F40231 Fear of injections and transfusions OR F40232 Fear of other medical care OR F40233 Fear of injury OR F40242 Fear of bridges OR F40243 Fear of flying OR F40248 Other situational type phobia OR F40290 Androphobia OR F40291 Gynephobia OR F40298 Other specified phobia
30029	Other phobic anxiety disorders	F40218 Other animal type phobia OR F40240 Claustrophobia OR F40241 Acrophobia OR F408 Other phobic anxiety disorders
30020	Phobic anxiety disorder, unspecified	F409 Phobic anxiety disorder, unspecified
30001	Panic disorder [episodic paroxysmal anxiety] without agoraphobia	F410 Panic disorder [episodic paroxysmal anxiety] without agoraphobia
30002	Generalized anxiety disorder	F411 Generalized anxiety disorder
30009	Other mixed anxiety disorders	F413 Other mixed anxiety disorders
30009	Other specified anxiety disorders	F418 Other specified anxiety disorders

30000	Anxiety disorder, unspecified	F419 Anxiety disorder, unspecified
3003	Obsessive-compulsive disorder	F42 Obsessive-compulsive disorder
3080	Acute stress reaction	F430 Acute stress reaction
3081	Acute stress reaction	F430 Acute stress reaction
3082	Acute stress reaction	F430 Acute stress reaction
3083	Acute stress reaction	F430 Acute stress reaction
3084	Acute stress reaction	F430 Acute stress reaction
3089	State of emotional shock and stress, unspecified	F430 Acute stress reaction OR R457 State of emotional shock and stress, unspecified
30981	Post-traumatic stress disorder, chronic	F4310 Post-traumatic stress disorder, unspecified OR F4312 Post-traumatic stress disorder, chronic
30981	Post-traumatic stress disorder, acute	F4311 Post-traumatic stress disorder, acute
3099	Adjustment disorder, unspecified	F4320 Adjustment disorder, unspecified
3090	Adjustment disorder with depressed mood	F4321 Adjustment disorder with depressed mood
3091	Adjustment disorder with depressed mood	F4321 Adjustment disorder with depressed mood
30924	Adjustment disorder with anxiety	F4322 Adjustment disorder with anxiety
30928	Adjustment disorder with mixed anxiety and depressed mood	F4323 Adjustment disorder with mixed anxiety and depressed mood
3093	Adjustment disorder with disturbance of conduct	F4324 Adjustment disorder with disturbance of conduct
3094	Adjustment disorder with mixed disturbance of emotions and conduct	F4325 Adjustment disorder with mixed disturbance of emotions and conduct
30929	Other childhood disorders of social functioning	F4329 Adjustment disorder with other symptoms OR F948 Other childhood disorders of social functioning
30982	Other reactions to severe stress	F438 Other reactions to severe stress
30983	Other reactions to severe stress	F438 Other reactions to severe stress
30989	Other reactions to severe stress	F438 Other reactions to severe stress
3099	Reaction to severe stress, unspecified	F439 Reaction to severe stress, unspecified
30012	Dissociative amnesia	F440 Dissociative amnesia
30013	Dissociative fugue	F441 Dissociative fugue
30019	Dissociative stupor	F442 Dissociative stupor
30011	Conversion disorder with sensory symptom or deficit	F444 Conversion disorder with motor symptom or deficit OR F446 Conversion disorder with sensory symptom or deficit
30011	Conversion disorder with mixed symptom presentation	F445 Conversion disorder with seizures or convulsions OR F447 Conversion disorder with mixed symptom presentation

30014	Dissociative identity disorder	F4481 Dissociative identity disorder
2982	Other dissociative and conversion disorders	F4489 Other dissociative and conversion disorders
30016	Factitious disorder with predominantly psychological signs and symptoms	F4489 Other dissociative and conversion disorders OR F6811 Factitious disorder with predominantly psychological signs and symptoms
30010	Dissociative and conversion disorder, unspecified	F449 Dissociative and conversion disorder, unspecified
30015	Dissociative and conversion disorder, unspecified	F449 Dissociative and conversion disorder, unspecified
30081	Somatization disorder	F450 Somatization disorder
30082	Somatoform disorder, unspecified	F451 Undifferentiated somatoform disorder OR F459 Somatoform disorder, unspecified
3007	Other hypochondriacal disorders	F4520 Hypochondriacal disorder, unspecified OR F4529 Other hypochondriacal disorders
3007	Body dysmorphic disorder	F4521 Hypochondriasis OR F4522 Body dysmorphic disorder
30780	Pain disorder exclusively related to psychological factors	F4541 Pain disorder exclusively related to psychological factors
30781	Tension Headache	G44209 Tension-type headache, unspecified, not intractable
30789	Pain disorder with related psychological factors	F4542 Pain disorder with related psychological factors
3060	Other somatoform disorders	F458 Other somatoform disorders
3061	Other somatoform disorders	F458 Other somatoform disorders
3062	Other somatoform disorders	F458 Other somatoform disorders
3063	Other somatoform disorders	F458 Other somatoform disorders
3064	Other somatoform disorders	F458 Other somatoform disorders
3066	Other somatoform disorders	F458 Other somatoform disorders
3067	Other somatoform disorders	F458 Other somatoform disorders
30650	Other somatoform disorders	F458 Other somatoform disorders
30652	Other somatoform disorders	F458 Other somatoform disorders
30653	Other somatoform disorders	F458 Other somatoform disorders
30659	Other somatoform disorders	F458 Other somatoform disorders
30089	Other specified nonpsychotic mental disorders	F458 Other somatoform disorders OR F488 Other specified nonpsychotic mental disorders
3068	Unspecified behavioral syndromes associated with physiological disturbances and physical fac	F458 Other somatoform disorders OR F59 Unspecified behavioral syndromes associated with physiological disturbances and physical fac
3069	Somatoform disorder, unspecified	F459 Somatoform disorder, unspecified

3006	Depersonalization-derealization syndrome	F481 Depersonalization-derealization syndrome
31081	Pseudodobullar Affect	F482
3005	Other specified nonpsychotic mental disorders (Neurasthenia)	F488 Other specified anxiety mental disorders
3079	Restlessness and agitation	R4581 Low self-esteem OR R4582 Worries
3009	Mental disorder, not otherwise specified	F489 Nonpsychotic mental disorder, unspecified OR F99 Mental disorder, not otherwise specified
Behavioral disorders associated with physiological factors		
3071	Anorexia nervosa, unspecified	F5000 Anorexia nervosa, unspecified
3071	Anorexia nervosa, binge eating/purging type	F5001 Anorexia nervosa, restricting type OR F5002 Anorexia nervosa, binge eating/purging type
30751	Bulimia nervosa	F502 Bulimia nervosa
30754	Other eating disorders	F508 Other eating disorders
30759	Other feeding disorders of infancy and early childhood	F508 Other eating disorders OR F9829 Other feeding disorders of infancy and early childhood
30750	Eating disorder, unspecified	F509 Eating disorder, unspecified
30742	Other insomnia not due to a substance or known physiological condition	F5101 Primary insomnia OR F5103 Paradoxical insomnia OR F5109 Other insomnia not due to a substance or known physiological condition
30741	Other insomnia not due to a substance or known physiological condition	F5102 Adjustment insomnia OR F5109 Other insomnia not due to a substance or known physiological condition
30744	Other hypersomnia not due to a substance or known physiological condition	F5111 Primary hypersomnia OR F5112 Insufficient sleep syndrome OR F5119 Other hypersomnia not due to a substance or known physiological condition
30743	Other hypersomnia not due to a substance or known physiological condition	F5119 Other hypersomnia not due to a substance or known physiological condition
30746	Sleepwalking [somnambulism]	F513 Sleepwalking [somnambulism]
30746	Sleep terrors [night terrors]	F514 Sleep terrors [night terrors]
30747	Nightmare disorder	F515 Nightmare disorder
30745	Other sleep disorders not due to a substance or known physiological condition	F518 Other sleep disorders not due to a substance or known physiological condition
30747	Other sleep disorders not due to a substance or known physiological condition	F518 Other sleep disorders not due to a substance or known physiological condition

30748	Other sleep disorders not due to a substance or known physiological condition	F518 Other sleep disorders not due to a substance or known physiological condition
30749	Other sleep disorders not due to a substance or known physiological condition	F518 Other sleep disorders not due to a substance or known physiological condition
30740	Sleep disorder not due to a substance or known physiological condition, unspecified	F519 Sleep disorder not due to a substance or known physiological condition, unspecified
30271	Hypoactive sexual desire disorder	F520 Hypoactive sexual desire disorder
30279	Other sexual dysfunction not due to a substance or known physiological condition	F521 Sexual aversion disorder OR F528 Other sexual dysfunction not due to a substance or known physiological condition
30272	Other sexual dysfunction not due to a substance or known physiological condition	F5221 Male erectile disorder OR F528 Other sexual dysfunction not due to a substance or known physiological condition
30272	Female sexual arousal disorder	F5222 Female sexual arousal disorder
30273	Female orgasmic disorder	F5231 Female orgasmic disorder
30274	Male orgasmic disorder	F5232 Male orgasmic disorder
30275	Premature ejaculation	F524 Premature ejaculation
30651	Vaginismus not due to a substance or known physiological condition	F525 Vaginismus not due to a substance or known physiological condition
30276	Dyspareunia not due to a substance or known physiological condition	F526 Dyspareunia not due to a substance or known physiological condition
30270	Unspecified sexual dysfunction not due to a substance or known physiological condition	F529 Unspecified sexual dysfunction not due to a substance or known physiological condition or R37
316	Psychological and behavioral factors associated with disorders or diseases classified elsewh	F54 Psychological and behavioral factors associated with disorders or diseases classified elsewh
Adult personality and behavior disorders		
3010	Paranoid personality disorder	F600 Paranoid personality disorder
30120	Schizoid personality disorder	F601 Schizoid personality disorder
30121	Schizoid personality disorder	F601 Schizoid personality disorder
3017	Antisocial personality disorder	F602 Antisocial personality disorder
3013	Borderline personality disorder	F603 Borderline personality disorder

30183	Borderline personality disorder	F603 Borderline personality disorder
30150	Histrionic personality disorder	F604 Histrionic personality disorder
30159	Histrionic personality disorder	F604 Histrionic personality disorder
3014	Obsessive-compulsive personality disorder	F605 Obsessive-compulsive personality disorder
30182	Avoidant personality disorder	F606 Avoidant personality disorder
3016	Dependent personality disorder	F607 Dependent personality disorder
30181	Narcissistic personality disorder	F6081 Narcissistic personality disorder
30111	Other specific personality disorders	F6089 Other specific personality disorders
30184	Other specific personality disorders	F6089 Other specific personality disorders
30189	Other specific personality disorders	F6089 Other specific personality disorders
3019	Personality disorder, unspecified	F609 Personality disorder, unspecified
31231	Pathological gambling	F630 Pathological gambling
31233	Pyromania	F631 Pyromania
31232	Kleptomania	F632 Kleptomania
31239	Other impulse disorders	F633 Trichotillomania OR F6389 Other impulse disorders
31234	Intermittent explosive disorder	F6381 Intermittent explosive disorder
31235	Intermittent explosive disorder	F6381 Intermittent explosive disorder
31230	Impulse disorder, unspecified	F639 Impulse disorder, unspecified
30251	Gender identity disorder in adolescence and adulthood	F641 Gender identity disorder in adolescence and adulthood
30252	Gender identity disorder in adolescence and adulthood	F641 Gender identity disorder in adolescence and adulthood
30253	Gender identity disorder in adolescence and adulthood	F641 Gender identity disorder in adolescence and adulthood
30285	Gender identity disorder in adolescence and adulthood	F641 Gender identity disorder in adolescence and adulthood
30250	Personal history of sex reassignment	F641 Gender identity disorder in adolescence and adulthood OR Z87890 Personal history of sex reassignment
3026	Gender identity disorder of childhood	F642 Gender identity disorder of childhood
3026	Gender identity disorder, unspecified	F648 Other gender identity disorders OR F649 Gender identity disorder, unspecified
30281	Fetishism	F650 Fetishism
3023	Transvestic fetishism	F651 Transvestic fetishism
3024	Exhibitionism	F652 Exhibitionism
30282	Voyeurism	F653 Voyeurism
3022	Pedophilia	F654 Pedophilia

30284	Sadomasochism, unspecified	F6550 Sadomasochism, unspecified
30283	Sexual masochism	F6551 Sexual masochism
30284	Sexual sadism	F6552 Sexual sadism
30289	Other sexual disorders	F6581 Frotteurism OR F6589 Other paraphilias OR F66 Other sexual disorders
3021	Other paraphilias	F6589 Other paraphilias
3029	Paraphilia, unspecified	F659 Paraphilia, unspecified
3020	Other sexual disorders	F66 Other sexual disorders
30151	Factitious disorder with combined psychological and physical signs and symptoms	F6810 Factitious disorder, unspecified OR F6813 Factitious disorder with combined psychological and physical signs and symptoms
30151	Factitious disorder with predominantly physical signs and symptoms	F6812 Factitious disorder with predominantly physical signs and symptoms
30016	Factitious disorder with combined psychological and physical signs and symptoms	F6813 Factitious disorder with combined psychological and physical signs and symptoms
30019	Other specified disorders of adult personality and behavior	F688 Other specified disorders of adult personality and behavior
3019	Unspecified disorder of adult personality and behavior	F69 Unspecified disorder of adult personality and behavior
Psychological development disorders		
31539	Other fluency disorder	F800 Phonological disorder OR F8089
31531	Expressive language disorder	F801 Expressive language disorder
31532	Central auditory processing disorder	F802 Mixed receptive-expressive language disorder OR H9325 Central auditory processing disorder
31534	Speech and language development delay due to hearing loss	F804 Speech and language development delay due to hearing loss
31535	Childhood onset fluency disorder	F8081
31539	Developmental disorder of speech or language, unspecified	F809 Developmental disorder of speech or language, unspecified
31500	Specific reading disorder	F810 Specific reading disorder
31501	Dyslexia and alexia	R480 Dyslexia and alexia
31502	Specific reading disorder	F810 Specific reading disorder
3151	Mathematics disorder	F812 Mathematics disorder
31509	Disorder of written expression	F8181 Disorder of written expression
3152	Other developmental disorders of scholastic skills	F8181 Disorder of written expression OR F8189 Other developmental disorders of scholastic skills

3159	Unspecified disorder of psychological development	F819 Developmental disorder of scholastic skills, unspecified OR F89 Unspecified disorder of psychological development
3154	Specific developmental disorder of motor function	F82 Specific developmental disorder of motor function
3155	Specific developmental disorder of motor function	F82 Specific developmental disorder of motor function
29900	Autistic disorder	F840 Autistic disorder
29901	Autistic disorder	F840 Autistic disorder
29910	Other childhood disintegrative disorder	F843 Other childhood disintegrative disorder
29911	Other childhood disintegrative disorder	F843 Other childhood disintegrative disorder
29980	Other pervasive developmental disorders	F845 Asperger's syndrome OR F848 Other pervasive developmental disorders
29981	Other pervasive developmental disorders	F845 Asperger's syndrome OR F848 Other pervasive developmental disorders
29990	Pervasive developmental disorder, unspecified	F849 Pervasive developmental disorder, unspecified
29991	Pervasive developmental disorder, unspecified	F849 Pervasive developmental disorder, unspecified
3158	Other disorders of psychological development	F88 Other disorders of psychological development
Childhood onset emotional and behavioral disorders		
31401	Attention-deficit hyperactivity disorder, unspecified type	F900 Attention-deficit hyperactivity disorder, predominantly inattentive type OR F901 Attention-deficit hyperactivity disorder, predominantly hyperactive type OR F902 Attention-deficit hyperactivity disorder, combined type OR F909 Attention-deficit hyperactivity disorder, unspecified type
3141	Attention-deficit hyperactivity disorder, other type	F908 Attention-deficit hyperactivity disorder, other type
3142	Attention-deficit hyperactivity disorder, other type	F908 Attention-deficit hyperactivity disorder, other type
3148	Attention-deficit hyperactivity disorder, other type	F908 Attention-deficit hyperactivity disorder, other type
31401	Attention-deficit hyperactivity disorder, other type	F908 Attention-deficit hyperactivity disorder, other type
3149	Attention-deficit hyperactivity disorder, unspecified type	F909 Attention-deficit hyperactivity disorder, unspecified type

31400	Attention-deficit hyperactivity disorder, unspecified type	F909 Attention-deficit hyperactivity disorder, unspecified type
31289	Conduct disorder confined to family context	F910 Conduct disorder confined to family context
31200	Conduct disorder, childhood-onset type	F911 Conduct disorder, childhood-onset type
31201	Conduct disorder, childhood-onset type	F911 Conduct disorder, childhood-onset type
31202	Conduct disorder, childhood-onset type	F911 Conduct disorder, childhood-onset type
31203	Conduct disorder, childhood-onset type	F911 Conduct disorder, childhood-onset type
31281	Conduct disorder, childhood-onset type	F911 Conduct disorder, childhood-onset type
31220	Conduct disorder, adolescent-onset type	F912 Conduct disorder, adolescent-onset type
31221	Conduct disorder, adolescent-onset type	F912 Conduct disorder, adolescent-onset type
31222	Conduct disorder, adolescent-onset type	F912 Conduct disorder, adolescent-onset type
31223	Conduct disorder, adolescent-onset type	F912 Conduct disorder, adolescent-onset type
31282	Conduct disorder, adolescent-onset type	F912 Conduct disorder, adolescent-onset type
31381	Oppositional defiant disorder	F913 Oppositional defiant disorder
3124	Other conduct disorders	F918 Other conduct disorders
31210	Other conduct disorders	F918 Other conduct disorders
31211	Other conduct disorders	F918 Other conduct disorders
31212	Other conduct disorders	F918 Other conduct disorders
31213	Other conduct disorders	F918 Other conduct disorders
31289	Other conduct disorders	F918 Other conduct disorders
3129	Conduct disorder, unspecified	F919 Conduct disorder, unspecified
30921	Separation anxiety disorder of childhood	F930 Separation anxiety disorder of childhood
3130	Other childhood emotional disorders	F938 Other childhood emotional disorders
3131	Other childhood emotional disorders	F938 Other childhood emotional disorders

3133	Other childhood emotional disorders	F938 Other childhood emotional disorders
31321	Other childhood emotional disorders	F938 Other childhood emotional disorders
31322	Other childhood emotional disorders	F938 Other childhood emotional disorders
31382	Other childhood emotional disorders	F938 Other childhood emotional disorders
31383	Other childhood emotional disorders	F938 Other childhood emotional disorders
31389	Other specified behavioral and emotional disorders with onset usually occurring in childhood	F938 Other childhood emotional disorders OR F941 Reactive attachment disorder of childhood OR F988 Other specified behavioral and emotional disorders with onset usually occurring in childhood
3139	Unspecified behavioral and emotional disorders with onset usually occurring in childhood and	F939 Childhood emotional disorder, unspecified OR F948 Other childhood disorders of social functioning OR F989 Unspecified behavioral and emotional disorders with onset usually occurring in childhood and
31323	Selective mutism	F940 Selective mutism
31389	Childhood disorder of social functioning, unspecified	F942 Disinhibited attachment disorder of childhood OR F949 Childhood disorder of social functioning, unspecified
30922	Other childhood disorders of social functioning	F948 Other childhood disorders of social functioning
30923	Other childhood disorders of social functioning	F948 Other childhood disorders of social functioning
30721	Transient tic disorder	F950 Transient tic disorder
30722	Chronic motor or vocal tic disorder	F951 Chronic motor or vocal tic disorder
30723	Tourette's disorder	F952 Tourette's disorder
30720	Other tic disorders	F958 Other tic disorders
30720	Tic disorder, unspecified	F959 Tic disorder, unspecified
3076	Enuresis not due to a substance or known physiological condition	F980 Enuresis not due to a substance or known physiological condition
3077	Encopresis not due to a substance or known physiological condition	F981 Encopresis not due to a substance or known physiological condition
30753	Rumination disorder of infancy	F9821 Rumination disorder of infancy
30752	Pica of infancy and childhood	F983 Pica of infancy and childhood
3073	Stereotyped movement disorders	F984 Stereotyped movement disorders
3070	Stuttering [stammering]	F985 Stuttering [stammering]
Other Mental Disorder NOS		
V71.09		F99 Mental disorder, not otherwise specified

APPENDIX B

Racial/ethnic differences in number of disorder categories: One-way ANOVA with imputed data

	Race/ethnicity	N	Mean	SD	F
Original Data	Black	8534	2.1376	1.52138	91.33***
	White	5972	2.0070	1.37566	
	Hispanic	5508	1.8197	1.16233	
	Multi-racial/other	1065	1.5915	1.07489	
Imputation 1	Black	9988	2.1235	1.49488	90.51***
	White	7088	1.9931	1.35774	
	Hispanic	7144	1.8491	1.17056	
	Multi-racial/other	1325	1.6249	1.05748	
Imputation 2	Black	9958	2.1275	1.49983	97.06***
	White	7237	1.9979	1.35242	
	Hispanic	7048	1.8367	1.16028	
	Multi-racial/other	1302	1.6206	1.07181	
Imputation 3	Black	10015	2.1237	1.49654	95.58***
	White	7129	2.0004	1.35851	
	Hispanic	7120	1.8413	1.16214	
	Multi-racial/other	1281	1.6081	1.05522	
Imputation 4	Black	9949	2.1237	1.49798	93.45***
	White	7154	2.0028	1.35772	
	Hispanic	7130	1.8374	1.15611	
	Multi-racial/other	1312	1.6326	1.10367	
Imputation 5	Black	10030	2.1220	1.49931	95.41***
	White	7154	2.0031	1.35288	
	Hispanic	7078	1.8401	1.16354	
	Multi-racial/other	1283	1.6072	1.04725	
Imputation 6	Black	9974	2.1204	1.49676	95.93***
	White	7161	2.0084	1.35735	
	Hispanic	7122	1.8402	1.16376	
	Multi-racial/other	1288	1.6017	1.05875	
Imputation 7	Black	10004	2.1200	1.49557	93.92***
	White	7159	2.0024	1.35956	
	Hispanic	7086	1.8469	1.16227	
	Multi-racial/other	1296	1.5972	1.06025	
Imputation 8	Black	9955	2.1202	1.49519	94.84***
	White	7170	2.0082	1.36332	
	Hispanic	7117	1.8404	1.16129	
	Multi-racial/other	1303	1.6086	1.05617	
Imputation 9	Black	10029	2.1276	1.49892	99.95***
	White	7115	1.9962	1.35445	
	Hispanic	7101	1.8430	1.16316	
	Multi-racial/other	1300	1.5938	1.04242	
Imputation 10	Black	10030	2.1229	1.49321	98.77***
	White	7090	2.0039	1.36848	
	Hispanic	7093	1.8439	1.15922	
	Multi-racial/other	1332	1.5916	1.03936	

Post-hoc comparisons: Tukey HSD

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Original data	Black	Hispanic	.13053*	.02316	.000
	Black	White	.31785*	.02373	.000
	Black	Multi-racial/other	.54602*	.04461	.000
	Hispanic	White	.18732*	.02565	.000
	Hispanic	Multi-racial/other	.41548*	.04566	.000
	White	Multi-racial/other	.22817*	.04595	.000
Imputation 1	Black	Hispanic	.13046*	.02099	.000
	Black	White	.27444*	.02094	.000
	Black	Multi-racial/other	.49864*	.03951	.000
	Hispanic	White	.14398*	.02266	.000
	Hispanic	Multi-racial/other	.36818*	.04045	.000
	White	Multi-racial/other	.22420*	.04042	.000
Imputation 2	Black	Hispanic	.12961*	.02087	.000
	Black	White	.29084*	.02103	.000
	Black	Multi-racial/other	.50695*	.03981	.000
	Hispanic	White	.16124*	.02261	.000
	Hispanic	Multi-racial/other	.37734*	.04067	.000
	White	Multi-racial/other	.21611*	.04075	.000
Imputation 3	Black	Hispanic	.12329*	.02094	.000
	Black	White	.28242*	.02094	.000
	Black	Multi-racial/other	.51560*	.04009	.000
	Hispanic	White	.15913*	.02264	.000
	Hispanic	Multi-racial/other	.39230*	.04100	.000
	White	Multi-racial/other	.23317*	.04100	.000
Imputation 4	Black	Hispanic	.12094*	.02095	.000
	Black	White	.28628*	.02097	.000
	Black	Multi-racial/other	.49111*	.03969	.000
	Hispanic	White	.16535*	.02261	.000
	Hispanic	Multi-racial/other	.37017*	.04058	.000
	White	Multi-racial/other	.20483*	.04059	.000
Imputation 5	Black	Hispanic	.11896*	.02091	.000
	Black	White	.28197*	.02097	.000
	Black	Multi-racial/other	.51486*	.04006	.000
	Hispanic	White	.16301*	.02265	.000
	Hispanic	Multi-racial/other	.39590*	.04096	.000
	White	Multi-racial/other	.23290*	.04100	.000
Imputation 6	Black	Hispanic	.11203*	.02093	.000
	Black	White	.28020*	.02096	.000
	Black	Multi-racial/other	.51870*	.04000	.000
	Hispanic	White	.16817*	.02261	.000
	Hispanic	Multi-racial/other	.40667*	.04089	.000
	White	Multi-racial/other	.23851*	.04091	.000

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Imputation 7	Black	Hispanic	.11758*	.02092	.000
	Black	White	.27307*	.02098	.000
	Black	Multi-racial/other	.52273*	.03989	.000
	Hispanic	White	.15549*	.02264	.000
	Hispanic	Multi-racial/other	.40515*	.04079	.000
	White	Multi-racial/other	.24966*	.04082	.000
Imputation 8	Black	Hispanic	.11201*	.02093	.000
	Black	White	.27986*	.02097	.000
	Black	Multi-racial/other	.51165*	.03980	.000
	Hispanic	White	.16785*	.02261	.000
	Hispanic	Multi-racial/other	.39963*	.04069	.000
	White	Multi-racial/other	.23179*	.04071	.000
Imputation 9	Black	Hispanic	.13142*	.02094	.000
	Black	White	.28465*	.02095	.000
	Black	Multi-racial/other	.53378*	.03982	.000
	Hispanic	White	.15323*	.02266	.000
	Hispanic	Multi-racial/other	.40236*	.04074	.000
	White	Multi-racial/other	.24913*	.04075	.000
Imputation 10	Black	Hispanic	.11898*	.02096	.000
	Black	White	.27900*	.02096	.000
	Black	Multi-racial/other	.53134*	.03939	.000
	Hispanic	White	.16002*	.02269	.000
	Hispanic	Multi-racial/other	.41236*	.04034	.000
	White	Multi-racial/other	.25234*	.04034	.000

APPENDIX C

Racial/ethnic differences in lifetime Medicaid use: Chi-square and post-hoc comparisons with imputed data

	Race/ethnicity 1	% using Medicaid	Race/ethnicity 2	% using Medicaid	Chi-square	df	Sig.
Original data	Overall				3725.61	3	.000
	Black	83.8%	Hispanic	87.2%	32.06	1	.000
	Black	83.8%	White	41.5%	2592.90	1	.000
	Black	83.8%	Multi-racial/other	61.1%	307.76	1	.000
	Hispanic	87.2%	White	41.5%	2509.10	1	.000
	Hispanic	87.2%	Multi-racial/other	61.1%	425.08	1	.000
	White	41.5%	Multi-racial/other	61.1%	132.96	1	.000
Imputation 1	Overall				4798.97	3	.000
	Black	83.3%	Hispanic	86.9%	41.15	1	.000
	Black	83.3%	White	41.1%	3288.27	1	.000
	Black	83.3%	Multi-racial/other	60.5%	389.46	1	.000
	Hispanic	86.9%	White	41.1%	3229.89	1	.000
	Hispanic	86.9%	Multi-racial/other	60.5%	543.57	1	.000
	White	41.1%	Multi-racial/other	60.5%	170.09	1	.000
Imputation 2	Overall				4890.93	3	.000
	Black	83.2%	Hispanic	86.9%	44.00	1	.000
	Black	83.2%	White	40.5%	3334.15	1	.000
	Black	83.2%	Multi-racial/other	61.3%	356.64	1	.000
	Hispanic	86.9%	White	40.5%	3336.99	1	.000
	Hispanic	86.9%	Multi-racial/other	61.3%	514.51	1	.000
	White	40.5%	Multi-racial/other	61.3%	192.33	1	.000
Imputation 3	Overall				4698.85	3	.000
	Black	83.1%	Hispanic	86.8%	45.92	1	.000
	Black	83.1%	White	41.5%	3198.16	1	.000
	Black	83.1%	Multi-racial/other	60.3%	372.92	1	.000
	Hispanic	86.8%	White	41.5%	3190.71	1	.000
	Hispanic	86.8%	Multi-racial/other	60.3%	535.56	1	.000
	White	41.5%	Multi-racial/other	60.3%	156.85	1	.000

	Race/ethnicity 1	% using Medicaid	Race/ethnicity 2	% using Medicaid	Chi-square	df	Sig.
Imputation 4	Overall				4748.33	3	.000
	Black	83.2%	Hispanic	87.0%	47.67	1	.000
	Black	83.2%	White	41.4%	3217.73	1	.000
	Black	83.2%	Multi-racial/other	60.7%	371.38	1	.000
	Hispanic	87.0%	White	41.4%	3235.41	1	.000
	Hispanic	87.0%	Multi-racial/other	60.7%	539.84	1	.000
	White	41.4%	Multi-racial/other	60.7%	168.47	1	.000
Imputation 5	Overall				4645.57	3	.000
	Black	83.2%	Hispanic	86.4%	31.81	1	.000
	Black	83.2%	White	41.5%	3219.40	1	.000
	Black	83.2%	Multi-racial/other	61.0%	362.57	1	.000
	Hispanic	86.4%	White	41.5%	3114.13	1	.000
	Hispanic	86.4%	Multi-racial/other	61.0%	487.84	1	.000
	White	41.5%	Multi-racial/other	61.0%	166.49	1	.000
Imputation 6	Overall				4771.08	3	.000
	Black	83.3%	Hispanic	86.6%	35.04	1	.000
	Black	83.3%	White	41.2%	3279.92	1	.000
	Black	83.3%	Multi-racial/other	59.9%	402.88	1	.000
	Hispanic	86.6%	White	41.2%	3200.81	1	.000
	Hispanic	86.6%	Multi-racial/other	59.9%	543.42	1	.000
	White	41.2%	Multi-racial/other	59.9%	154.40	1	.000
Imputation 7	Overall				4816.61	3	.000
	Black	83.2%	Hispanic	86.8%	40.82	1	.000
	Black	83.2%	White	40.8%	3304.63	1	.000
	Black	83.2%	Multi-racial/other	61.2%	357.78	1	.000
	Hispanic	86.8%	White	40.8%	3260.01	1	.000
	Hispanic	86.8%	Multi-racial/other	61.2%	506.33	1	.000
	White	40.8%	Multi-racial/other	61.2%	184.10	1	.000

	Race/ethnicity 1	% using Medicaid	Race/ethnicity 2	% using Medicaid	Chi-square	df	Sig.
Imputation 8	Overall				4768.91	3	.000
	Black	83.4%	Hispanic	86.5%	31.56	1	.000
	Black	83.4%	White	41.1%	3291.73	1	.000
	Black	83.4%	Multi-racial/other	60.1%	401.69	1	.000
	Hispanic	86.5%	White	41.1%	3190.15	1	.000
	Hispanic	86.5%	Multi-racial/other	60.1%	532.79	1	.000
	White	41.1%	Multi-racial/other	60.1%	160.47	1	.000
Imputation 9	Overall				4779.10	3	.000
	Black	83.2%	Hispanic	86.7%	38.60	1	.000
	Black	83.2%	White	41.0%	3290.19	1	.000
	Black	83.2%	Multi-racial/other	60.5%	377.44	1	.000
	Hispanic	86.7%	White	41.0%	3216.35	1	.000
	Hispanic	86.7%	Multi-racial/other	60.5%	522.54	1	.000
	White	41.0%	Multi-racial/other	60.5%	171.10	1	.000
Imputation 10	Overall				4735.55	3	.000
	Black	83.5%	Hispanic	86.5%	29.62	1	.000
	Black	83.5%	White	41.3%	3293.26	1	.000
	Black	83.5%	Multi-racial/other	60.4%	404.63	1	.000
	Hispanic	86.5%	White	41.3%	3141.72	1	.000
	Hispanic	86.5%	Multi-racial/other	60.4%	528.49	1	.000
	White	41.3%	Multi-racial/other	60.4%	164.95	1	.000

APPENDIX D

Racial/ethnic differences in lifetime health safety-net use: Chi-square and post-hoc comparisons with imputed data

	Race/ethnicity 1	% using health safety-net	Race/ethnicity 2	% using health safety-net	Chi-square	df	Sig.
Original data	Overall				289.00	3	.000
	Black	17.1%	Hispanic	10.5%	119.23	1	.000
	Black	17.1%	White	7.7%	236.56	1	.000
	Black	17.1%	Multi-racial/other	10.7%	26.81	1	.000
	Hispanic	10.5%	White	7.7%	24.36	1	.000
	Hispanic	10.5%	Multi-racial/other	10.7%	.05	1	.817
	White	7.7%	Multi-racial/other	10.7%	10.04	1	.002
Imputation 1	Overall				386.24	3	.000
	Black	16.7%	Hispanic	10.2%	145.06	1	.000
	Black	16.7%	White	7.3%	326.82	1	.000
	Black	16.7%	Multi-racial/other	9.7%	43.30	1	.000
	Hispanic	10.2%	White	7.3%	36.55	1	.000
	Hispanic	10.2%	Multi-racial/other	9.7%	.36	1	.550
	White	7.3%	Multi-racial/other	9.7%	8.51	1	.004
Imputation 2	Overall				395.34	3	.000
	Black	16.7%	Hispanic	9.8%	166.97	1	.000
	Black	16.7%	White	7.3%	322.69	1	.000
	Black	16.7%	Multi-racial/other	9.8%	40.22	1	.000
	Hispanic	9.8%	White	7.3%	27.62	1	.000
	Hispanic	9.8%	Multi-racial/other	9.8%	.00	1	.957
	White	7.3%	Multi-racial/other	9.8%	9.73	1	.002
Imputation 3	Overall				402.29	3	.000
	Black	16.7%	Hispanic	10.1%	148.81	1	.000
	Black	16.7%	White	7.1%	343.67	1	.000
	Black	16.7%	Multi-racial/other	9.8%	39.92	1	.000
	Hispanic	10.1%	White	7.1%	41.22	1	.000
	Hispanic	10.1%	Multi-racial/other	9.8%	.11	1	.738
	White	7.1%	Multi-racial/other	9.8%	11.49	1	.001

	Race/ethnicity 1	% using health safety-net	Race/ethnicity 2	% using health safety-net	Chi-square	df	Sig.
Imputation 4	Overall				410.62	3	.000
	Black	16.7%	Hispanic	10.0%	157.62	1	.000
	Black	16.7%	White	7.0%	350.01	1	.000
	Black	16.7%	Multi-racial/other	10.3%	35.48	1	.000
	Hispanic	10.0%	White	7.0%	39.28	1	.000
	Hispanic	10.0%	Multi-racial/other	10.3%	.13	1	.720
	White	7.0%	Multi-racial/other	10.3%	16.77	1	.000
Imputation 5	Overall				378.84	3	.000
	Black	16.6%	Hispanic	10.1%	143.53	1	.000
	Black	16.6%	White	7.2%	324.42	1	.000
	Black	16.6%	Multi-racial/other	10.3%	33.55	1	.000
	Hispanic	10.1%	White	7.2%	37.66	1	.000
	Hispanic	10.1%	Multi-racial/other	10.3%	.02	1	.878
	White	7.2%	Multi-racial/other	10.3%	14.10	1	.000
Imputation 6	Overall				377.16	3	.000
	Black	16.5%	Hispanic	10.3%	133.41	1	.000
	Black	16.5%	White	7.1%	331.22	1	.000
	Black	16.5%	Multi-racial/other	10.4%	31.53	1	.000
	Hispanic	10.3%	White	7.1%	45.28	1	.000
	Hispanic	10.3%	Multi-racial/other	10.4%	.02	1	.891
	White	7.1%	Multi-racial/other	10.4%	16.88	1	.000
Imputation 7	Overall				428.35	3	.000
	Black	16.9%	Hispanic	10.0%	167.88	1	.000
	Black	16.9%	White	7.1%	359.87	1	.000
	Black	16.9%	Multi-racial/other	10.1%	39.37	1	.000
	Hispanic	10.0%	White	7.1%	38.13	1	.000
	Hispanic	10.0%	Multi-racial/other	10.1%	.03	1	.870
	White	7.1%	Multi-racial/other	10.1%	14.50	1	.000

	Race/ethnicity 1	% using health safety-net	Race/ethnicity 2	% using health safety-net	Chi-square	df	Sig.
Imputation 8	Overall				412.56	3	.000
	Black	16.9%	Hispanic	9.9%	168.30	1	.000
	Black	16.9%	White	7.3%	340.86	1	.000
	Black	16.9%	Multi-racial/other	9.9%	41.98	1	.000
	Hispanic	9.9%	White	7.3%	31.52	1	.000
	Hispanic	9.9%	Multi-racial/other	9.9%	.00	1	.961
	White	7.3%	Multi-racial/other	9.9%	10.42	1	.001
Imputation 9	Overall				401.65	3	.000
	Black	16.7%	Hispanic	9.9%	165.23	1	.000
	Black	16.7%	White	7.3%	331.83	1	.000
	Black	16.7%	Multi-racial/other	10.1%	38.08	1	.000
	Hispanic	9.9%	White	7.3%	29.66	1	.000
	Hispanic	9.9%	Multi-racial/other	10.1%	.06	1	.803
	White	7.3%	Multi-racial/other	10.1%	11.93	1	.001
Imputation 10	Overall				409.58	3	.000
	Black	16.6%	Hispanic	10.2%	142.09	1	.000
	Black	16.6%	White	7.0%	348.94	1	.000
	Black	16.6%	Multi-racial/other	9.0%	51.62	1	.000
	Hispanic	10.2%	White	7.0%	46.66	1	.000
	Hispanic	10.2%	Multi-racial/other	9.0%	1.84	1	.175
	White	7.0%	Multi-racial/other	9.0%	6.62	1	.010

APPENDIX E

Racial/ethnic differences in lifetime private health insurance use: Chi-square and post-hoc comparisons with imputed data

	Race/ethnicity 1	% using private insurance	Race/ethnicity 2	% using private insurance	Chi-square	df	Sig.
Original data	Overall				1620.88	3	.000
	Black	34.6%	Hispanic	22.6%	232.41	1	.000
	Black	34.6%	White	59.3%	790.38	1	.000
	Black	34.6%	Multi-racial/other	42.4%	24.50	1	.000
	Hispanic	22.6%	White	59.3%	1522.33	1	.000
	Hispanic	22.6%	Multi-racial/other	42.4%	178.95	1	.000
	White	59.3%	Multi-racial/other	42.4%	99.52	1	.000
Imputation 1	Overall				2194.87	3	.000
	Black	34.7%	Hispanic	22.7%	286.67	1	.000
	Black	34.7%	White	59.9%	1068.79	1	.000
	Black	34.7%	Multi-racial/other	57.4%	32.41	1	.000
	Hispanic	22.7%	White	59.9%	2032.97	1	.000
	Hispanic	22.7%	Multi-racial/other	57.4%	232.84	1	.000
	White	59.9%	Multi-racial/other	57.4%	135.70	1	.000
Imputation 2	Overall				2289.38	3	.000
	Black	34.6%	Hispanic	22.5%	296.14	1	.000
	Black	34.6%	White	60.5%	1113.91	1	.000
	Black	34.6%	Multi-racial/other	42.9%	34.59	1	.000
	Hispanic	22.5%	White	60.5%	2126.39	1	.000
	Hispanic	22.5%	Multi-racial/other	42.9%	241.54	1	.000
	White	60.5%	Multi-racial/other	42.9%	138.98	1	.000
Imputation 3	Overall				2172.29	3	.000
	Black	34.8%	Hispanic	22.6%	297.64	1	.000
	Black	34.8%	White	59.7%	1037.31	1	.000
	Black	34.8%	Multi-racial/other	43.4%	36.43	1	.000
	Hispanic	22.6%	White	59.7%	2021.33	1	.000
	Hispanic	22.6%	Multi-racial/other	43.4%	245.75	1	.000
	White	59.7%	Multi-racial/other	43.4%	117.23	1	.000

	Race/ethnicity 1	% using private insurance	Race/ethnicity 2	% using private insurance	Chi-square	df	Sig.
Imputation 4	Overall				2173.99	3	.000
	Black	34.9%	Hispanic	22.5%	304.33	1	.000
	Black	34.9%	White	59.6%	1024.02	1	.000
	Black	34.9%	Multi-racial/other	43.6%	38.03	1	.000
	Hispanic	22.5%	White	59.6%	2028.30	1	.000
	Hispanic	22.5%	Multi-racial/other	43.6%	256.58	1	.000
	White	59.6%	Multi-racial/other	43.6%	116.17	1	.000
Imputation 5	Overall				2073.81	3	.000
	Black	34.6%	Hispanic	23.4%	247.46	1	.000
	Black	34.6%	White	59.5%	1041.51	1	.000
	Black	34.6%	Multi-racial/other	43.0%	35.44	1	.000
	Hispanic	23.4%	White	59.5%	1908.18	1	.000
	Hispanic	23.4%	Multi-racial/other	43.0%	214.98	1	.000
	White	59.5%	Multi-racial/other	43.0%	120.18	1	.000
Imputation 6	Overall				2146.57	3	.000
	Black	34.5%	Hispanic	23.1%	263.53	1	.000
	Black	34.5%	White	59.7%	1061.98	1	.000
	Black	34.5%	Multi-racial/other	43.6%	41.06	1	.000
	Hispanic	23.1%	White	59.7%	1977.66	1	.000
	Hispanic	23.1%	Multi-racial/other	43.6%	239.12	1	.000
	White	59.7%	Multi-racial/other	43.6%	115.07	1	.000
Imputation 7	Overall				2192.17	3	.000
	Black	34.7%	Hispanic	22.8%	282.13	1	.000
	Black	34.7%	White	60.0%	1073.92	1	.000
	Black	34.7%	Multi-racial/other	42.1%	27.67	1	.000
	Hispanic	22.8%	White	60.0%	2033.50	1	.000
	Hispanic	22.8%	Multi-racial/other	42.1%	214.10	1	.000
	White	60.0%	Multi-racial/other	42.1%	143.28	1	.000

	Race/ethnicity 1	% using private insurance	Race/ethnicity 2	% using private insurance	Chi-square	df	Sig.
Imputation 8	Overall				2156.79	3	.000
	Black	34.6%	Hispanic	23.1%	267.07	1	.000
	Black	34.6%	White	59.8%	1062.76	1	.000
	Black	34.6%	Multi-racial/other	43.7%	41.56	1	.000
	Hispanic	23.1%	White	59.8%	1989.73	1	.000
	Hispanic	23.1%	Multi-racial/other	43.7%	243.51	1	.000
	White	59.8%	Multi-racial/other	43.7%	116.47	1	.000
Imputation 9	Overall				2150.94	3	.000
	Black	34.6%	Hispanic	23.0%	267.09	1	.000
	Black	34.6%	White	59.9%	1068.44	1	.000
	Black	34.6%	Multi-racial/other	42.7%	32.57	1	.000
	Hispanic	23.0%	White	59.9%	1984.93	1	.000
	Hispanic	23.0%	Multi-racial/other	42.7%	219.96	1	.000
	White	59.9%	Multi-racial/other	42.7%	132.37	1	.000
Imputation 10	Overall				2141.89	3	.000
	Black	34.5%	Hispanic	22.9%	265.69	1	.000
	Black	34.5%	White	59.7%	1063.97	1	.000
	Black	34.5%	Multi-racial/other	43.1%	37.86	1	.000
	Hispanic	22.9%	White	59.7%	1973.00	1	.000
	Hispanic	22.9%	Multi-racial/other	43.1%	235.74	1	.000
	White	59.7%	Multi-racial/other	43.1%	125.90	1	.000

APPENDIX F

Racial/ethnic differences in number of ED visits: One-way ANOVA

	Race/ethnicity	N	Mean	SD	F
Original Data	Black	2728	1.85	1.951	49.40***
	White	1565	1.57	1.337	
	Hispanic	1180	1.27	1.045	
	Multi-racial/other	322	1.13	.521	
Imputation 1	Black	2852	1.83	1.923	49.82***
	White	1649	1.55	1.316	
	Hispanic	1247	1.27	1.044	
	Multi-racial/other	343	1.15	.553	
Imputation 2	Black	2849	1.83	1.925	49.93***
	White	1665	1.56	1.320	
	Hispanic	1240	1.27	1.034	
	Multi-racial/other	337	1.13	.513	
Imputation 3	Black	2860	1.82	1.915	47.58***
	White	1650	1.56	1.327	
	Hispanic	1244	1.28	1.062	
	Multi-racial/other	337	1.13	.510	
Imputation 4	Black	2863	1.83	1.921	50.60***
	White	1643	1.56	1.328	
	Hispanic	1252	1.26	1.021	
	Multi-racial/other	333	1.14	.525	
Imputation 5	Black	2858	1.83	1.923	51.23***
	White	1645	1.57	1.327	
	Hispanic	1247	1.26	1.025	
	Multi-racial/other	341	1.13	.508	
Imputation 6	Black	2860	1.83	1.922	49.86***
	White	1656	1.56	1.323	
	Hispanic	1239	1.26	1.027	
	Multi-racial/other	336	1.14	.537	
Imputation 7	Black	2861	1.83	1.921	50.42***
	White	1645	1.56	1.325	
	Hispanic	1250	1.27	1.031	
	Multi-racial/other	335	1.13	.512	
Imputation 8	Black	2851	1.83	1.918	49.20***
	White	1658	1.57	1.338	
	Hispanic	1244	1.27	1.031	
	Multi-racial/other	338	1.14	.524	
Imputation 9	Black	2865	1.83	1.919	48.40***
	White	1646	1.56	1.321	
	Hispanic	1240	1.27	1.032	
	Multi-racial/other	340	1.16	.629	
Imputation 10	Black	2856	1.83	1.923	49.71***
	White	1650	1.56	1.319	
	Hispanic	1239	1.27	1.032	
	Multi-racial/other	346	1.14	.597	

Post-hoc comparisons: Tukey HSD

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Original data	Black	Hispanic	.281*	.050	.000
	Black	White	.583*	.055	.000
	Black	Multi-racial/other	.719*	.093	.000
	Hispanic	White	.302*	.061	.000
	Hispanic	Multi-racial/other	.438*	.097	.000
	White	Multi-racial/other	.136	.100	.522
Imputation 1	Black	White	.283*	.048	.000
	Black	Hispanic	.562*	.053	.000
	Black	Multi-racial/other	.689*	.089	.000
	Hispanic	White	.279*	.059	.000
	Hispanic	Multi-racial/other	.406*	.093	.000
	White	Multi-racial/other	.127	.095	.543
Imputation 2	Black	Hispanic	.269*	.048	.000
	Black	White	.563*	.053	.000
	Black	Multi-racial/other	.701*	.090	.000
	Hispanic	White	.294*	.059	.000
	Hispanic	Multi-racial/other	.432*	.093	.000
	White	Multi-racial/other	.137	.096	.481
Imputation 3	Black	Hispanic	.262*	.048	.000
	Black	White	.544*	.053	.000
	Black	Multi-racial/other	.697*	.090	.000
	Hispanic	White	.282*	.059	.000
	Hispanic	Multi-racial/other	.435*	.093	.000
	White	Multi-racial/other	.153	.096	.383
Imputation 4	Black	Hispanic	.268*	.048	.000
	Black	White	.570*	.053	.000
	Black	Multi-racial/other	.694*	.090	.000
	Hispanic	White	.302*	.059	.000
	Hispanic	Multi-racial/other	.425*	.094	.000
	White	Multi-racial/other	.123	.096	.577
Imputation 5	Black	Hispanic	.266*	.048	.000
	Black	White	.570*	.053	.000
	Black	Multi-racial/other	.706*	.089	.000
	Hispanic	White	.304*	.059	.000
	Hispanic	Multi-racial/other	.440*	.093	.000
	White	Multi-racial/other	.136	.095	.483
Imputation 6	Black	Hispanic	.268*	.048	.000
	Black	White	.566*	.053	.000
	Black	Multi-racial/other	.691*	.090	.000
	Hispanic	White	.298*	.059	.000
	Hispanic	Multi-racial/other	.422*	.093	.000
	White	Multi-racial/other	.124	.096	.569

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Imputation 7	Black	Hispanic	.271*	.048	.000
	Black	White	.565*	.053	.000
	Black	Multi-racial/other	.704*	.090	.000
	Hispanic	White	.294*	.059	.000
	Hispanic	Multi-racial/other	.433*	.094	.000
	White	Multi-racial/other	.139	.096	.472
Imputation 8	Black	Hispanic	.262*	.048	.000
	Black	White	.562*	.053	.000
	Black	Multi-racial/other	.689*	.090	.000
	Hispanic	White	.299*	.059	.000
	Hispanic	Multi-racial/other	.427*	.093	.000
	White	Multi-racial/other	.128	.096	.542
Imputation 9	Black	Hispanic	.267*	.048	.000
	Black	White	.562*	.053	.000
	Black	Multi-racial/other	.666*	.090	.000
	Hispanic	White	.295*	.059	.000
	Hispanic	Multi-racial/other	.399*	.093	.000
	White	Multi-racial/other	.104	.096	.695
Imputation 10	Black	Hispanic	.274*	.048	.000
	Black	White	.563*	.053	.000
	Black	Multi-racial/other	.687*	.089	.000
	Hispanic	White	.289*	.059	.000
	Hispanic	Multi-racial/other	.414*	.092	.000
	White	Multi-racial/other	.124	.095	.558

APPENDIX G

Racial/ethnic variations in seasonal psychiatric ED patterns: GLMs with 95% confidence intervals

	Black		Hispanic		White		Multi-racial/other	
	(*n*=5054)		(*n*=2459)		(*n*=1498)		(*n*=365)	
Month	Mean rate ratio	95% CI	Mean rate ratio	95% CI	Mean rate ratio	95% CI	Mean rate ratio	95% CI
January	ref	-	ref	-	ref	-	ref	-
February	.95	.83, 1.09	1.15	.95, 1.38	1.09	.86, 1.39	1.79*	1.07, 2.97
March	1.24***	1.09, 1.25	1.18	.98, 1.41	1.08	.85, 1.37	1.04	.59, 1.82
April	1.10	.96, 1.25	1.17	.97, 1.40	.92	.71, 1.17	1.33	.78, 2.27
May	1.36***	1.20, 1.55	1.23*	1.02, 1.48	.71*	.54, .93	1.13	.64, 2.00
June	1.01	.88, 1.16	.87	.71, 1.07	.80	.61, 1.05	.83	.45, 1.55
July	.68***	.58, .79	.62***	.49, .78	.60***	.45, .80	.52	.25, 1.06
August	.77***	.66, .89	.65***	.52, .81	.69**	.52, .91	.62	.31, 1.21
September	.92	.81, 1.06	1.01	.83, 1.23	1.44**	1.15, 1.80	2.19**	1.35, 3.57
October	1.10	.97, 1.25	1.24*	1.03, 1.49	1.57***	1.26, 1.95	2.16**	1.33, 3.52
November	1.12	.98, 1.27	1.25*	1.04, 1.50	1.07	.84, 1.36	1.80*	1.08, 2.98
December	1.01	.89, 1.16	.97	.80, 1.18	.77*	.60, 1.00	1.61	.97, 2.69

APPENDIX H

Racial/ethnic differences in number of ED visits: One-way ANOVA

	Race/ethnicity	N	Mean	SD	F
Original Data	Black	1572	10.42	17.125	10.09***
	White	1021	7.71	12.240	
	Hispanic	562	7.61	16.234	
	Multi-racial/other	113	5.73	8.188	
Imputation 1	Black	1792	10.10	17.088	16.90***
	White	1173	7.26	11.685	
	Hispanic	781	6.55	14.269	
	Multi-racial/other	147	5.00	7.428	
Imputation 2	Black	1788	9.97	16.889	14.52***
	White	1189	7.46	12.174	
	Hispanic	769	6.49	14.284	
	Multi-racial/other	147	5.43	7.798	
Imputation 3	Black	1811	9.99	16.985	14.69***
	White	1184	7.27	11.732	
	Hispanic	768	6.59	14.371	
	Multi-racial/other	130	5.53	7.827	
Imputation 4	Black	1790	9.97	16.603	14.87***
	White	1188	7.52	12.853	
	Hispanic	771	6.40	14.133	
	Multi-racial/other	144	5.32	7.528	
Imputation 5	Black	1787	9.97	16.710	14.20***
	White	1195	7.28	11.588	
	Hispanic	773	6.78	15.468	
	Multi-racial/other	138	5.20	7.574	
Imputation 6	Black	1797	9.89	16.841	13.71***
	White	1177	7.56	12.313	
	Hispanic	778	6.51	14.180	
	Multi-racial/other	141	5.25	7.544	
Imputation 7	Black	1805	10.00	17.027	15.08***
	White	1183	7.32	11.751	
	Hispanic	764	6.53	14.326	
	Multi-racial/other	141	5.44	7.647	
Imputation 8	Black	1793	9.89	16.465	13.04***
	White	1196	7.35	12.045	
	Hispanic	755	6.83	15.644	
	Multi-racial/other	149	5.33	7.644	
Imputation 9	Black	1814	9.78	16.407	12.06***
	White	1170	7.60	12.916	
	Hispanic	773	6.63	14.490	
	Multi-racial/other	136	5.28	7.614	
Imputation 10	Black	1805	9.92	16.605	13.43***
	White	1179	7.31	11.784	
	Hispanic	768	6.73	15.413	
	Multi-racial/other	141	5.55	7.978	

Post-hoc comparisons: Tukey HSD

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Original data	Black	Hispanic	2.706	.617	.000
	Black	White	2.805	.754	.001
	Black	Multi-racial/other	4.691	1.495	.009
	Hispanic	White	.099	.806	.999
	Hispanic	Multi-racial/other	1.985	1.522	.560
	White	Multi-racial/other	1.886	1.582	.632
Imputation 1	Black	White	2.846	.555	.000
	Black	Hispanic	3.550	.634	.000
	Black	Multi-racial/other	5.104	1.268	.000
	Hispanic	White	.704	.683	.731
	Hispanic	Multi-racial/other	2.258	1.293	.300
	White	Multi-racial/other	1.554	1.329	.646
Imputation 2	Black	Hispanic	2.507	.554	.000
	Black	White	3.478	.638	.000
	Black	Multi-racial/other	4.537	1.270	.002
	Hispanic	White	.972	.685	.487
	Hispanic	Multi-racial/other	2.031	1.294	.396
	White	Multi-racial/other	1.059	1.332	.857
Imputation 3	Black	Hispanic	2.713	.553	.000
	Black	White	3.401	.637	.000
	Black	Multi-racial/other	4.456	1.343	.005
	Hispanic	White	.688	.685	.748
	Hispanic	Multi-racial/other	1.743	1.367	.579
	White	Multi-racial/other	1.055	1.403	.876
Imputation 4	Black	Hispanic	2.449	.554	.000
	Black	White	3.570	.637	.000
	Black	Multi-racial/other	4.649	1.281	.002
	Hispanic	White	1.121	.684	.357
	Hispanic	Multi-racial/other	2.200	1.305	.332
	White	Multi-racial/other	1.079	1.343	.853
Imputation 5	Black	Hispanic	2.691	.553	.000
	Black	White	3.186	.637	.000
	Black	Multi-racial/other	4.774	1.307	.002
	Hispanic	White	.495	.683	.887
	Hispanic	Multi-racial/other	2.083	1.330	.398
	White	Multi-racial/other	1.588	1.367	.651
Imputation 6	Black	Hispanic	2.335	.555	.000
	Black	White	3.385	.635	.000
	Black	Multi-racial/other	4.644	1.294	.002
	Hispanic	White	1.050	.684	.417
	Hispanic	Multi-racial/other	2.309	1.319	.298
	White	Multi-racial/other	1.259	1.355	.789

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Imputation 7	Black	Hispanic	2.681	.553	.000
	Black	White	3.470	.638	.000
	Black	Multi-racial/other	4.563	1.294	.002
	Hispanic	White	.789	.687	.659
	Hispanic	Multi-racial/other	1.882	1.318	.482
	White	Multi-racial/other	1.093	1.356	.852
Imputation 8	Black	Hispanic	2.541	.553	.000
	Black	White	3.067	.642	.000
	Black	Multi-racial/other	4.563	1.262	.002
	Hispanic	White	.526	.688	.870
	Hispanic	Multi-racial/other	2.022	1.286	.395
	White	Multi-racial/other	1.496	1.327	.673
Imputation 9	Black	Hispanic	2.176	.555	.001
	Black	White	3.152	.636	.000
	Black	Multi-racial/other	4.500	1.317	.004
	Hispanic	White	.975	.686	.486
	Hispanic	Multi-racial/other	2.323	1.342	.307
	White	Multi-racial/other	1.348	1.377	.762
Imputation 10	Black	Hispanic	2.609	.554	.000
	Black	White	3.185	.638	.000
	Black	Multi-racial/other	4.365	1.294	.004
	Hispanic	White	.577	.686	.835
	Hispanic	Multi-racial/other	1.756	1.319	.543
	White	Multi-racial/other	1.180	1.356	.820

APPENDIX I

Racial/ethnic variations in seasonal outpatient treatment patterns: GLMs with 95% confidence intervals

	Black		Hispanic		White		Multi-racial/other	
	(*n*=5054)		(*n*=2459)		(*n*=1498)		(*n*=365)	
Month	Mean rate ratio	95% CI	Mean rate ratio	95% CI	Mean rate ratio	95% CI	Mean rate ratio	95% CI
January	1.03	.96, 1.11	1.10	.98, 1.22	1.12	.97, 1.29	.96	.65, 1.40
February	1.08*	1.00, 1.16	1.21***	1.08, 1.34	1.17*	1.02, 1.35	.95	.64, 1.41
March	1.23***	1.14, 1.31	1.26***	1.13, 1.40	1.23**	1.07, 1.41	.96	.65, 1.40
April	1.11**	1.03, 1.19	1.23***	1.11, 1.37	1.02	.88, 1.17	1.01	.69, 1.48
May	1.08*	1.00, 1.16	1.18**	1.06, 1.32	.96	.83, 1.12	1.25	.86, 1.80
June	.98	.91, 1.06	1.07	.96, 1.20	.95	.82, 1.11	.85	.56, 1.28
July	.87***	.80, .94	.97	.86, 1.09	.77**	.65, .90	1.12	.77, 1.64
August	.87***	.81, .93	.91	.81, 1.02	.87	.74, 1.01	1.09	.76, 1.58
September	.83***	.77, .89	.92	.82, 1.04	.91	.78, 1.06	.96	.65, 1.41
October	.95	.88, 1.02	1.07	.96, 1.19	.97	.84, 1.13	1.19	.83, 1.70
November	1.01	.94, 1.09	1.15**	1.04, 1.29	1.15	.99, 1.32	1.24	.87, 1.78
December	ref	-	ref	-	ref	-	ref	-

APPENDIX J

Racial/ethnic differences in number of outpatient treatment periods: One-way ANOVA

	Race/ethnicity	N	Mean	SD	F
Original Data	Black	1158	2.4836	2.21864	13.25***
	White	714	2.2255	1.95414	
	Hispanic	387	1.8346	1.33837	
	Multi-racial/other	74	1.6486	.71063	
Imputation 1	Black	1301	2.4443	2.15963	19.17***
	White	814	2.1634	1.89687	
	Hispanic	531	1.7759	1.33341	
	Multi-racial/other	94	1.5851	.72453	
Imputation 2	Black	1303	2.4244	2.15710	16.49***
	White	825	2.1709	1.90264	
	Hispanic	514	1.7899	1.33283	
	Multi-racial/other	98	1.6633	.75905	
Imputation 3	Black	1318	2.4074	2.14016	15.00***
	White	828	2.1812	1.92320	
	Hispanic	509	1.7839	1.30431	
	Multi-racial/other	85	1.7176	.90779	
Imputation 4	Black	1310	2.4305	2.15715	19.10***
	White	815	2.1926	1.91745	
	Hispanic	518	1.7490	1.28326	
	Multi-racial/other	97	1.6082	.68552	
Imputation 5	Black	1295	2.4247	2.15662	18.37***
	White	825	2.2024	1.93937	
	Hispanic	528	1.7595	1.25077	
	Multi-racial/other	92	1.5978	.71190	
Imputation 6	Black	1305	2.4077	2.13845	17.67***
	White	823	2.2272	1.97629	
	Hispanic	520	1.7442	1.22040	
	Multi-racial/other	92	1.6413	.73502	
Imputation 7	Black	1312	2.4146	2.14331	16.48***
	White	816	2.1936	1.90621	
	Hispanic	519	1.7592	1.30702	
	Multi-racial/other	93	1.7419	1.23273	
Imputation 8	Black	1315	2.4076	2.13607	15.68***
	White	818	2.1944	1.92455	
	Hispanic	512	1.7852	1.35511	
	Multi-racial/other	95	1.6632	.78021	
Imputation 9	Black	1329	2.4048	2.14466	16.66***
	White	799	2.2103	1.93914	
	Hispanic	524	1.7786	1.27958	
	Multi-racial/other	88	1.5795	.69019	
Imputation 10	Black	1307	2.4323	2.16168	19.13***
	White	819	2.1905	1.90748	
	Hispanic	525	1.7429	1.27235	
	Multi-racial/other	89	1.6292	.77433	

Post-hoc comparisons: Tukey HSD

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Original data	Black	Hispanic	.25810	.09429	.032
	Black	White	.64897	.11636	.000
	Black	Multi-racial/other	.83494	.23761	.003
	Hispanic	White	.39086	.12509	.010
	Hispanic	Multi-racial/other	.57684	.24201	.081
	White	Multi-racial/other	.18598	.25143	.881
Imputation 1	Black	White	.28088	.08535	.006
	Black	Hispanic	.66838	.09835	.000
	Black	Multi-racial/other	.85917	.20398	.000
	Hispanic	White	.38750	.10654	.002
	Hispanic	Multi-racial/other	.57828	.20805	.028
	White	Multi-racial/other	.19079	.21371	.809
Imputation 2	Black	Hispanic	.25350	.08510	.015
	Black	White	.63452	.09962	.000
	Black	Multi-racial/other	.76114	.20034	.001
	Hispanic	White	.38103	.10747	.002
	Hispanic	Multi-racial/other	.50764	.20435	.063
	White	Multi-racial/other	.12662	.21082	.932
Imputation 3	Black	Hispanic	.22628	.08488	.039
	Black	White	.62355	.09989	.000
	Black	Multi-racial/other	.68979	.21421	.007
	Hispanic	White	.39727	.10781	.001
	Hispanic	Multi-racial/other	.46351	.21801	.145
	White	Multi-racial/other	.06624	.22428	.991
Imputation 4	Black	Hispanic	.23790	.08521	.027
	Black	White	.68150	.09913	.000
	Black	Multi-racial/other	.82229	.20097	.000
	Hispanic	White	.44360	.10732	.000
	Hispanic	Multi-racial/other	.58439	.20514	.023
	White	Multi-racial/other	.14079	.21130	.910
Imputation 5	Black	Hispanic	.22229	.08511	.045
	Black	White	.66524	.09866	.000
	Black	Multi-racial/other	.82688	.20616	.000
	Hispanic	White	.44295	.10649	.000
	Hispanic	Multi-racial/other	.60460	.21001	.021
	White	Multi-racial/other	.16164	.21586	.877
Imputation 6	Black	Hispanic	.18045	.08508	.147
	Black	White	.66343	.09912	.000
	Black	Multi-racial/other	.76636	.20618	.001
	Hispanic	White	.48299	.10707	.000
	Hispanic	Multi-racial/other	.58591	.21012	.027
	White	Multi-racial/other	.10293	.21619	.964

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Imputation 7	Black	Hispanic	.22101	.08527	.047
	Black	White	.65548	.09918	.000
	Black	Multi-racial/other	.67270	.20524	.006
	Hispanic	White	.43448	.10738	.000
	Hispanic	Multi-racial/other	.45169	.20933	.135
	White	Multi-racial/other	.01722	.21537	1.000
Imputation 8	Black	Hispanic	.21323	.08521	.060
	Black	White	.62245	.09968	.000
	Black	Multi-racial/other	.74445	.20328	.001
	Hispanic	White	.40922	.10783	.001
	Hispanic	Multi-racial/other	.53122	.20740	.051
	White	Multi-racial/other	.12200	.21375	.941
Imputation 9	Black	Hispanic	.19455	.08561	.105
	Black	White	.62619	.09865	.000
	Black	Multi-racial/other	.82527	.21051	.001
	Hispanic	White	.43164	.10750	.000
	Hispanic	Multi-racial/other	.63072	.21480	.018
	White	Multi-racial/other	.19908	.22032	.803
Imputation 10	Black	Hispanic	.24181	.08512	.023
	Black	White	.68943	.09869	.000
	Black	Multi-racial/other	.80307	.20923	.001
	Hispanic	White	.44762	.10678	.000
	Hispanic	Multi-racial/other	.56126	.21316	.042
	White	Multi-racial/other	.11364	.21894	.955

APPENDIX K

Secular trends in median treatment duration estimates: sensitivity analysis

	Median estimate	95% CI
2011	14.00	9.37, 18.63
2012	34.00	20.78, 47.22
2013	54.00	43.05, 64.95
2014	55.00	43.37, 66.63
2015	63.00	53.53, 72.47
2016	49.00	40.46, 57.55
2017	61.00	53.89, 68.11

APPENDIX L

Racial/ethnic differences in frequency of treatment: One-way ANOVA

	Race/ethnicity	N	Mean	SD	F
Original Data	Black	1830	21.6019	10.19552	3.77*
	White	1055	21.4873	10.19964	
	Hispanic	462	21.1030	9.83419	
	Multi-racial/other	69	17.5270	8.12283	
Imputation 1	Black	2014	21.6196	10.21464	3.53*
	White	1164	21.4064	10.13013	
	Hispanic	604	20.5963	10.14780	
	Multi-racial/other	88	18.7374	9.45862	
Imputation 2	Black	2004	21.5377	10.26408	2.30
	White	1185	21.3977	10.13053	
	Hispanic	589	20.8477	10.04043	
	Multi-racial/other	92	19.0323	9.27677	
Imputation 3	Black	2018	21.5482	10.20990	3.97**
	White	1179	21.5087	10.27747	
	Hispanic	591	20.6742	9.95287	
	Multi-racial/other	82	18.1285	8.60274	
Imputation 4	Black	2013	21.6445	10.20417	5.62**
	White	1177	21.4419	10.21217	
	Hispanic	591	20.5904	10.05475	
	Multi-racial/other	89	17.6581	8.80616	
Imputation 5	Black	1988	21.5961	10.25428	5.83**
	White	1196	21.5263	10.18548	
	Hispanic	604	20.6075	9.97551	
	Multi-racial/other	82	17.3488	8.34281	
Imputation 6	Black	1993	21.5174	10.20533	4.81**
	White	1196	21.6898	10.20050	
	Hispanic	593	20.4134	10.02865	
	Multi-racial/other	88	18.3819	9.29737	
Imputation 7	Black	2014	21.4989	10.18963	2.24
	White	1170	21.4819	10.25695	
	Hispanic	592	20.8030	10.06719	
	Multi-racial/other	94	19.1495	9.13921	
Imputation 8	Black	2015	21.4939	10.16755	4.15**
	White	1183	21.5233	10.27639	
	Hispanic	579	20.9155	10.05528	
	Multi-racial/other	93	17.9092	9.08624	
Imputation 9	Black	2031	21.5568	10.22353	6.07***
	White	1160	21.4896	10.17833	
	Hispanic	596	20.8615	10.07036	
	Multi-racial/other	83	16.9247	8.47449	
Imputation 10	Black	2011	21.6485	10.21503	4.75**
	White	1180	21.3865	10.26815	
	Hispanic	594	20.6237	9.94247	
	Multi-racial/other	85	17.9565	8.60248	

Post-hoc comparisons: Tukey HSD

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Original data	Black	Hispanic	.11462	.39087	.991
	Black	White	.49894	.52647	.779
	Black	Multi-racial/other	4.07495	1.24000	.006
	Hispanic	White	.38432	.56410	.904
	Hispanic	Multi-racial/other	3.96033	1.25644	.009
	White	Multi-racial/other	3.57601	1.30501	.031
Imputation 1	Black	White	.21323	.37417	.941
	Black	Hispanic	1.02334	.47145	.132
	Black	Multi-racial/other	2.88226	1.10673	.046
	Hispanic	White	.81011	.50962	.385
	Hispanic	Multi-racial/other	2.66903	1.12352	.082
	White	Multi-racial/other	1.85892	1.15955	.377
Imputation 2	Black	Hispanic	.14001	.37258	.982
	Black	White	.68993	.47654	.470
	Black	Multi-racial/other	2.50536	1.08406	.096
	Hispanic	White	.54992	.51258	.706
	Hispanic	Multi-racial/other	2.36534	1.10038	.138
	White	Multi-racial/other	1.81543	1.13979	.383
Imputation 3	Black	Hispanic	.03947	.37246	1.000
	Black	White	.87400	.47523	.255
	Black	Multi-racial/other	3.41969	1.14463	.015
	Hispanic	White	.83453	.51210	.362
	Hispanic	Multi-racial/other	3.38022	1.16042	.019
	White	Multi-racial/other	2.54569	1.19737	.145
Imputation 4	Black	Hispanic	.20257	.37259	.948
	Black	White	1.05407	.47506	.118
	Black	Multi-racial/other	3.98636	1.09988	.002
	Hispanic	White	.85151	.51192	.343
	Hispanic	Multi-racial/other	3.78379	1.11630	.004
	White	Multi-racial/other	2.93228	1.15455	.054
Imputation 5	Black	Hispanic	.06988	.37156	.998
	Black	White	.98869	.47174	.155
	Black	Multi-racial/other	4.24738	1.14414	.001
	Hispanic	White	.91881	.50683	.267
	Hispanic	Multi-racial/other	4.17750	1.15905	.002
	White	Multi-racial/other	3.25869	1.19494	.033
Imputation 6	Black	Hispanic	-.17239	.37153	.967
	Black	White	1.10398	.47513	.093
	Black	Multi-racial/other	3.13553	1.10643	.024
	Hispanic	White	1.27637	.51015	.060
	Hispanic	Multi-racial/other	3.30792	1.12191	.017
	White	Multi-racial/other	2.03155	1.16034	.298

	Race/ethnicity 1	Race/ethnicity 2	Mean difference	Std. Error	Sig.
Imputation 7	Black	Hispanic	.01701	.37375	1.000
	Black	White	.69596	.47535	.459
	Black	Multi-racial/other	2.34938	1.07289	.126
	Hispanic	White	.67895	.51282	.548
	Hispanic	Multi-racial/other	2.33237	1.09001	.141
	White	Multi-racial/other	1.65342	1.12889	.459
Imputation 8	Black	Hispanic	-.02939	.37214	1.000
	Black	White	.57847	.47907	.622
	Black	Multi-racial/other	3.58478	1.07758	.005
	Hispanic	White	.60785	.51530	.640
	Hispanic	Multi-racial/other	3.61417	1.09417	.005
	White	Multi-racial/other	3.00632	1.13500	.040
Imputation 9	Black	Hispanic	.06718	.37364	.998
	Black	White	.69528	.47296	.456
	Black	Multi-racial/other	4.63214	1.13692	.000
	Hispanic	White	.62811	.51166	.609
	Hispanic	Multi-racial/other	4.56497	1.15355	.000
	White	Multi-racial/other	3.93686	1.18944	.005
Imputation 10	Black	Hispanic	.26207	.37248	.896
	Black	White	1.02480	.47435	.135
	Black	Multi-racial/other	3.69199	1.12479	.006
	Hispanic	White	.76273	.51101	.442
	Hispanic	Multi-racial/other	3.42992	1.14074	.014
	White	Multi-racial/other	2.66719	1.17794	.107

APPENDIX M

Seasonal patterns in treatment frequency: GLM with imputed data

	Model 1
	Pooled B (SE)
Month	
January	-.86 (.76)
February	-1.82 (.79)*
March	-1.77 (.73)*
April	-1.93 (.78)*
May	-.42 (.79)
June	-.60 (.85)
July	-.91 (.84)
August	.28 (.73)
September	1.17 (.74)
October	-.41 (.74)
November	.40 (.76)
December	ref
Year	.73 (.06)***
Age	-.39 (.04)***
Female	-2.32 (.33)***
Race/Ethnicity	
Black	ref
Hispanic	-.42 (.39)
White	-.27 (.50)
Multi-racial/other	-3.08 (1.31)*
Insurance	
Medicaid	ref
HSN	-2.86 (1.25)*
Private	-1.48 (.41)***
Comorbidity	.43 (.09)***

APPENDIX N

Association between any outpatient treatment and psychiatric ED presentation: Pooled results from binary logistic regressions with imputed data

	Model 1		Model 2	
	OR	95% CI	OR	95% CI
Female	1.39***	1.31, 1.47	1.39***	1.31, 1.48
Race/ethnicity				
Black	ref	-	ref	-
Hispanic	.79***	.73, .85	.79***	.73, .85
White	.59***	.54, .64	.58***	.54, .63
Multi-racial/other	1.02	.89, 1.18	1.02	.88, 1.18
Lifetime use of Medicaid	.87**	.80, .94	.89**	.81, .96
Lifetime use of safety-net care	1.77***	1.63, 1.93	1.79***	1.64, 1.95
Lifetime use of private insurance	.85***	.79, .92	.87***	.81, .94
Comorbidity	1.23***	1.21, 1.26	1.28***	1.25, 1.31
Outpatient service use			.70	.64, .76

APPENDIX O

Association between any outpatient treatment and number of psychiatric ED visits: Pooled results from linear regression models with imputed data

	Model 1		Model 2	
	B	SE	B	SE
Female	.10***	.01	.10***	.01
Race/ethnicity				
Black	ref	-	ref	-
Hispanic	-.13***	.02	-.13***	.02
White	-.20***	.02	-.21***	.02
Multi-racial/other	-.09**	.03	-.09**	.03
Lifetime use of Medicaid	.02	.02	.03	.02
Lifetime use of safety-net care	.15***	.02	.15***	.02
Lifetime use of private insurance	-.03	.02	-.02	.02
Comorbidity	.22***	.01	.24***	.01
Outpatient service use			-.14***	.02

APPENDIX P

Psychiatric ED presentation among youth who received outpatient treatment: Pooled results from Cox proportional hazards models with imputed data

	Model 1		Model 2	
	λ	95% CI	λ	95% CI
Age	1.00	.98, 1.02	.98	.96, 1.00
Female	1.24**	1.06, 1.45	1.28**	1.10, 1.50
Race/ethnicity				
Black	ref	-	ref	-
Hispanic	.99	.83, 1.18	1.02	.85, 1.21
White	.67**	.51, .89	.68**	.51, .90
Multi-racial/other	.66	.37, 1.17	.70	.39, 1.24
Insurance				
Medicaid	ref	-	ref	-
Health safety-net	1.18	.68, 2.05	1.31	.75, 2.27
Private	.67***	.54, .82	.71**	.57, .88
Comorbidity	1.50***	1.45, 1.56	1.47***	1.41, 1.52
# previous ED visits			1.42***	1.33, 1.52

APPENDIX Q

Continuity of outpatient treatment and subsequent psychiatric ED presentation: Pooled results from Cox proportional hazards models with imputed data

	Model 1		Model 2	
	λ	95% CI	λ	95% CI
Age	1.00	.98, 1.02	1.00	.98, 1.02
Female	1.40***	1.20, 1.64	1.39***	1.19, 1.63
Race/ethnicity				
Black	ref	-	ref	-
Hispanic	1.01	.85, 1.21	1.03	.86, 1.22
White	.73*	.55, .98	.70*	.53, .94
Multi-racial/other	.80	.45, 1.43	.80	.45, 1.42
Insurance				
Medicaid	ref	-	ref	-
Health safety-net	1.29	.74, 2.24	1.30	.75, 2.25
Private	.78*	.63, .97	.77*	.62, .96
Comorbidity	1.36***	1.30, 1.41	1.36***	1.31, 1.41
# previous ED visits	1.44***	1.35, 1.55	1.45***	1.35, 1.55
# previous treatment periods	1.25***	1.21, 1.29	1.25***	1.22, 1.29
Treatment duration (days)	1.00***	1.00, 1.00		
Treatment quantity (visits)			1.02***	1.02, 1.02

APPENDIX R

Continuity of outpatient care and subsequent psychiatric ED presentation: Pooled results from Cox proportional hazards models with imputed data

	Model 3		Model 4	
	λ	95% CI	λ	95% CI
Age	1.01	.99, 1.04	1.01	.99, 1.04
Female	1.20	.99, 1.47	1.20	.99, 1.47
Race/ethnicity				
Black	ref	-	ref	-
Hispanic	.79	.63, 1.01	.80	.62, 1.01
White	.65*	.45, .92	.62**	.43, .88
Multi-racial/other	1.07	.53, 2.17	.59	.26, 1.34
Insurance				
Medicaid	ref	-	ref	
Health safety-net	1.07	.53, 2.17	1.15	.57, 2.32
Private	.82	.61, 1.09	.81	.61, 1.08
Comorbidity	1.36***	1.29, 1.44	1.32***	1.25, 1.40
# previous ED visits	1.34***	1.22, 1.47	1.36***	1.24, 1.49
# previous treatment periods	1.18***	1.13, 1.23	1.20***	1.15, 1.25
Treatment quantity (visits)			1.02***	1.01, 1.02
Treatment frequency (days)	1.01	1.00, 1.02	1.01*	1.00, 1.02

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