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# Racial and ethnic disparities in the diagnosis of Parkinson's disease

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BOSTON UNIVERSITY  
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Thesis

**RACIAL AND ETHNIC DISPARITIES IN THE DIAGNOSIS  
OF PARKINSON'S DISEASE**

by

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B.S., Massachusetts Institute of Technology, 2018

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# **RACIAL AND ETHNIC DISPARITIES IN THE DIAGNOSIS**

## **OF PARKINSON'S DISEASE**

**KARINA BORISOVNA KALININA**

### **ABSTRACT**

The focus of this thesis is on investigating the basis for the racial/ethnic differences in Parkinson's disease (PD) diagnosis rates which have been cited in the literature (Dahodwala 2009a; Bailey 2020; Ben-Joseph 2020). In particular, a closer look is given to patient-dependent factors, such as patients' attitudes and health knowledge; provider-level bias and preconceptions; and systemic factors, with a particular focus on socioeconomic influences. Common themes are identified to shed light on potential areas that may benefit from intervention to address the persisting racial/ethnic disparities seen in PD diagnosis. Community-based educational initiatives and outreach efforts are discussed in this context as offering a particularly promising avenue to pursue, with the potential to lead to optimal and enduring impacts in helping to narrow the racial/ethnic divides related to PD.

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## **LIST OF ABBREVIATIONS**

AD	Alzheimer's disease
CSVD	Cerebral small-vessel disease
DBS	Deep brain stimulation
LBs	Lewy bodies
PD	Parkinson's disease
SES	Socioeconomic status
T2DM	Type 2 diabetes mellitus

## INTRODUCTION

Parkinson's disease (PD) has been recognized as the second most common neurodegenerative disease globally, with an estimated >1% of the population aged 65 years and older affected. With an increasingly older population and a concomitant increasing burden of neurodegenerative pathology throughout much of the world, the prevalence of PD has been projected to double from the year 2010 to 2030 (Aarsland 2021). For decades, however, it has been noted that there are distinct differences in the presentation of PD among various racial/ethnic groups, affecting all stages from diagnosis and management to the associated morbidity and mortality sequelae. As early as the 1970s, for example, differences in PD prevalence between white and African-American patients were recognized by Kessler in his series of epidemiologic studies of PD, conducted on the basis of community-wide surveys and medical record examination. The results of the studies seemed to corroborate that the rates of PD among African-American patients were significantly lower in comparison to the rates observed in white patients (Kessler 1972a; Kessler 1972b).

A number of studies have since been conducted to further examine the validity of this finding and more deeply probe the potential underpinnings of the racially/ethnically biased presentation of PD. Prominent among these undertakings has been the community-based study performed in Covich County, Mississippi, in 1985, in which door-to-door surveys were carried out targeting the community's elderly population, which was roughly balanced in the proportion of African-American and white residents. After being identified as high-risk for PD based on the results of the community surveys, respondents

were then examined by a neurologist for confirmation of the diagnosis. On the basis of the study results, the researchers concluded that the rates of PD were similar across both populations. Interestingly, however, it was discovered that the number of African-American participants newly diagnosed with PD as part of the study was twice the number of white participants who were likewise newly diagnosed. This finding, in particular, was judged to be significant as a potential indicator of the impact of health care disparities on the diagnosis of PD (Schoenberg 1985).

As exemplified by the findings in the Copiah County study as compared to the observations previously made by Kessler, research studies that have focused on investigating the racial/ethnic differences in PD diagnosis have been notable for their conflicting results, an issue exacerbated by the ongoing lack of consensus in study design and methodology (Bailey 2020). Despite the variability in methods and in population samples among research studies that have so far been conducted exploring PD diagnosis, the majority of these studies are in agreement that the prevalence of PD is lower among the African-American population compared to that of white Americans (Dahodwala 2009a).

In assessing the likelihood of developing PD, however, the incidence, as opposed to just the prevalence indicator, is a valuable measure that may highlight possible risk factors for PD. Study results have, though, been particularly conflicted in their comparisons of incidence among racial/ethnic groups (Bailey 2020). As a case in point, one of the major incidence studies in PD that has been conducted to date involved a community registry of patients in northern Manhattan, which found that the incidence of

PD among African-American men exceeded that among white men by more than double (Mayeux 1995). An important consideration in evaluating this study's findings, however, is that the researchers' incidence measure utilized data collected from the US Census, which is known to underestimate minority population numbers, thereby potentially leading to an artificial rise in the incidence count for PD among African-Americans. Meanwhile, another major incidence-focused study of PD examining racial/ethnic differences in diagnosis, conducted in a large-group practice in northern California in 2003, produced divergent results, finding the incidence among African-Americans to be lower compared to that in the Hispanic, non-Hispanic white, and Asian groups also included in the study (Van Den Eeden 2003). Once again, though, the generalizability of these results may be constrained, as the participants were, on average, from a wealthier, more educated background compared to that of the general population. The study was additionally characterized by geographic restrictions, and the heterogeneity in participants' health insurance statuses introduced further implications influencing the study.

While the diversity of studies that have been conducted to investigate the prevalence and incidence of PD creates challenges for deriving generalizable conclusions about the impact of race/ethnicity in determining PD risk, it is nevertheless possible to distill some fundamental thematic areas that have been implied to underlie the connection between the frequency of PD diagnosis and race/ethnicity that has been observed throughout numerous studies (Dahodwala 2009a; Bailey 2020; Ben-Joseph 2020). Chapter 1 of this thesis will therefore focus on patients' beliefs which may be associated

with their racial/ethnic background and that may be impacting their perceptions of symptoms associated with PD and, consequently, the timeliness of their diagnosis. Then, in Chapter 2, physicians' attitudes and biases that may be associated with the patient's racial/ethnic identification will be explored as another potential contributor to the race/ethnicity-based disparities seen in PD diagnosis. In Chapter 3, more systemic factors will be reviewed pertaining to patients' socio-economic influences which may map to their racial/ethnic identity, such as income status and educational level, and to race/ethnicity-based disparities in health care. In Chapter 4, some findings concerning genetic predisposition toward PD and the influence of co-morbid conditions that may be racially/ethnically influenced will be briefly summarized and compared against the socially-rooted narrative linking patient race/ethnicity to the likelihood and timeliness of a PD diagnosis. Finally, in Chapter 5, racial/ethnic disparities in PD management as well as morbidity and mortality will be briefly looked at to help elucidate and compare against race/ethnicity-based factors influencing PD diagnosis. A final analysis will then be offered as an overview of the factors that appear to be responsible for the discriminatory nature of PD based on race/ethnicity and to weigh in on potential interventions and further studies that may be most beneficial and imminent to help address those factors that are most relevant to the present racial/ethnic disparities in PD diagnosis and which may be most amenable to change.

## **CHAPTER ONE:**

### **DIFFERENCES IN PATIENTS' KNOWLEDGE AND ATTITUDES**

As is the case for many neurological diseases, the diagnosis of PD is dependent on both the physician's observations and knowledge of disease presentation, as well as the patient's self-reporting of symptoms and their progression. The patient's individual knowledge of and attitude toward their health status and their willingness to seek care therefore are a critical prerequisite to making an appropriate diagnosis of PD. In light of findings such as those in the study in Copiah County, Mississippi, that have revealed that, despite comparable rates of PD diagnosis as determined in this study, there may be a significant racial/ethnic bias in the number of participants with a finding of PD determined as part of this study who had no previous PD diagnosis, it follows that a significant contributor to a delay in PD diagnosis could originate on the part of the patient's beliefs and attitudes that hinder them from recognizing certain PD symptoms and/or seeking medical care to address those symptoms (Schoenberg 1985).

In turn, those beliefs and attitudes concerning health and, subsequently, the decision to pursue medical care may have a variety of origins. These beliefs and attitudes may derive either from personal preference or experience, which may have in and of itself been shaped by multiple factors such as those pertaining to one's social and cultural environments. Given that racial/ethnic disparities have been observed in PD diagnosis, investigations have been conducted in an effort to map some of those beliefs and attitudes that may be prevalent among members of certain racial/ethnic groups and that may therefore to some degree account for the differences in PD diagnosis that have been

found to be dependent on the patient's race/ethnicity (Dahodwala 2009a; Bailey 2020; Ben-Joseph 2020).

In this section, the predominant beliefs and attitudes that have been identified in these studies in relation to patients' likelihood of receiving a PD diagnosis will be explored from the perspective of three major themes: health literacy and self-awareness, beliefs about the aging process, and barriers to accessing health care. Reviews of multi-ethnic community-based surveys have been able to pinpoint key recurrent themes in how individuals from different racial/ethnic groups approach PD with reference to the above three broad categories (Dahodwala 2009a; Bailey 2020; Ben-Joseph 2020).

### **Health Literacy and Self-Awareness**

Broadly defined, "health literacy" is the combination of the skills and tools needed to acquire and understand health-related information and to thereby make informed decisions about one's health care. While factors such as educational level directly impact a patient's level of health literacy, it has been determined that, even after controlling for such direct indicators of one's ability and willingness to seek out and utilize complex health information, there may be differences in how receptive individuals belonging to differing racial/ethnic groups are to health information and in how they interpret this knowledge in relation to themselves and to others (Pan 2014; Dahodwala 2011). In the case of PD, the patient's level of health knowledge and their ability and willingness to navigate the healthcare system become especially important as the presentation, progression, and management of PD are known to be complex and highly

individualized, requiring the specialized care of a movement disorder neurologist for the most successful results.

In a community-based survey of a diverse sample of older adults, which was able to identify a low general knowledge of PD symptoms among the community, it also became apparent that participants' awareness of their susceptibility to PD and their interpretation of the severity of the symptoms and their impact on quality of life displayed key differences that aligned with their racial/ethnic identities (Pan 2014). For example, it was found that Chinese-American participants, as compared with their African-American and white counterparts, had a higher chance of agreeing that diet and exercise would prevent PD, which may be interpreted to be in alignment with a perception among that sampling of participants of a lower susceptibility to PD. However, it is interesting to note that, in this study, Chinese-Americans were more likely to perceive the symptoms of PD as being more severe, as evidenced by their lower level of agreement relative to the other groups queried with the claim that those with PD "live active lives" (Pan 2014).

In the above study, the participants' differing perceptions of the severity of PD, in particular, were tellingly revealed after they were asked to identify the cause of symptoms of individuals shown to them in two video clips, in the first of which mild visual hallmark symptoms of PD were depicted (such as relatively mild tremor, slowed movement, and changes to posture and gait) and in the second of which a more advanced stage of the disease was shown. The video illustrating the more advanced stage of the disease presented a significantly greater challenge for participants to be able to identify,

with a variety of possible explanations offered such as stroke, arthritis, osteoporosis, and old age (Pan 2014). In general, along with the racially/ethnically-aligned differences in knowledge and perceptions of PD that were observed, there also seemed to be considerable confusion and uncertainty among the participants regarding the causes, symptoms, and management of PD.

Compounding the uncertainty that the general population has concerning PD symptoms and progression is the challenge arising from differences that have been noted in the specific presentation of PD among individuals belonging to different racial/ethnic identities (Ben-Joseph 2020). In broad terms, the symptomatology of PD can be categorized into motor and non-motor presentations of the disease. While there have been inconsistencies in the studies attributing various motor and non-motor PD symptoms across different racial/ethnic groups and geographic locations, there is a preponderant body of evidence suggesting that the cognitive symptoms of PD, namely, dementia and other signs of cognitive dysfunction that frequently characterize the disease, tend to be most prevalent among African-American patients (Ben-Joseph 2020). A similar finding was first made in 2000 in studies of London's Black-identifying population, and this observation has continued to hold in a number of subsequent larger-scale studies that have since been conducted (Chaudhuri 2000; Ben-Joseph 2020). In particular, through a large-scale retrospective cohort study using Medicare data in which patients were followed over a 6-year period since their PD diagnosis, it was found that, although 70% of the patients received a dementia diagnosis by the end of the study period, the percentage by race/ethnicity was highest among the African-American group of patients.

At the same time, patients who identified as Asian were determined to have the lowest risk of developing PD-associated dementia during the duration of the study period (Willis 2012).

Contrary to such findings of race/ethnicity-based differences in the clinical presentation and progression of PD, it has also been determined that patients' subjective experiences do not necessarily align with the clinical findings. Despite the previously referenced study by Willis et al. indicating a lower risk of PD progression to dementia in Asian-identifying patients, it has been found that these patients tend to self-report higher levels of cognitive concerns compared to white patients (Willis 2012; Yu 2017). This indication of a discrepancy between clinical findings and patients' subjective experiences and level of self-awareness of their health status confirms the difficulty of obtaining a proper diagnosis of PD, in light of, first of all, the differences in symptoms of this disease that have been observed among various racial/ethnic groups and, secondly, in light of the different interpretations and knowledge levels that exist among members of these groups concerning this condition and its causes and effects that may prompt a PD diagnosis.

Similarly, patients' degree of awareness of their health status has been implicated in delayed diagnosis of PD. In a study based on the medical records of African-American and Caucasian veterans who have been newly diagnosed with PD, it was determined that the observed effect of the patient's race/ethnicity on the stage of PD at which they were diagnosed could be mostly accounted for by the under-reporting of motor impairment that was observed to be particularly prevalent among the African-American patients in this study (Dahodwala 2011). While there are a number of possible explanations for the

observed disproportionate under-reporting of PD-associated motor symptoms, with some possibilities being proposed in the study including differences in attitudes toward aging and disease and also the possibility of cognitive impairment related to PD and thereby limited self-awareness, it is important to note that under-reporting of symptoms is often indicative of poor physician-patient communication. This phenomenon is by itself worthy of further investigation, as poor communication could be suggestive of a mistrust of the healthcare system, or, specifically, of medical professionals. Furthermore, the perpetuation of this phenomenon could indicate a lack of social support resources that could be introduced to potentially remedy the disconnect that those from minority backgrounds may encounter to hinder them from open disclosure of symptoms they may be experiencing. Those facets of decreased health literacy and patient self-awareness among racial/ethnic minority populations that pertain to socioeconomic and other systemic factors will be explored further in Chapter 3.

### **Beliefs and Preconceptions Pertaining to Aging and Disease**

Another important factor to consider that may be responsible for delayed PD diagnosis involves patients' attitudes and expectations regarding the natural process of aging, as opposed to a state of disease. It has been found in the community-based study conducted by Pan et al. that Chinese-Americans and African-Americans are more likely to view the symptoms of PD as a natural part of the aging process (Pan 2014). This perception of the symptoms patients may be experiencing may therefore lead to a reduced sense of agency in seeking health care, thereby resulting in a delayed diagnosis and increased severity of PD at the time of diagnosis.

Similar themes have additionally emerged from studies of other conditions where older age is a risk factor, such as, perhaps most prominently, Alzheimer's disease (AD), which precedes PD as the most common neurodegenerative disorder (Pan 2014). It has been found, for example, in a cross-sectional study conducted by Connell et al. in 2009, that African-Americans were significantly more likely than the white participants to view AD and, in particular, significant memory loss as a typical and therefore expected component of the natural aging process (Connell 2009). Similarly, in a nationwide survey in 2003, it was determined that African-Americans had a higher likelihood compared to whites of agreeing that AD is in fact the term used to refer to "normal memory loss associated with aging" (Connell 2007). These results are consistent with a wide range of research studies that have since formed the basis for outreach efforts to educate the public on the differences between dementia and what is clinically regarded as "normal aging" (Roberts 2003; Ayalon 2004; Mahoney 2005; Connell 2007).

Overall, despite associating AD with normal aging, African-Americans also reported more optimism concerning the risk of developing AD and available treatment options. These reports included the belief that diet and lifestyle changes could reduce the risk of developing AD, that AD can be diagnosed via a blood test, and that a gene responsible for most types of AD has already been determined (Connell 2009). According to the nationwide survey conducted in 2003 by Connell et al., it was likewise found that African-Americans were more likely than whites to express optimism regarding treatment advances, agreeing with such claims as that a cure for AD will become available during their lifetime and that scientists are on the verge of making a

discovery that would advance the current state of knowledge regarding AD (Connell 2007).

To be able to have a fuller conceptualization of the significance of this difference in beliefs that seems to be racially/ethnically biased, it is necessary to more carefully evaluate the possible roots of African-American participants' more prevalent views on the natural origins of dementia symptoms and those views espousing a higher degree of optimism concerning diagnosis and treatment options and future prospects. The underlying motivations for these views and their dependence on racial/ethnic background are expected to have overlaps with views pertaining to PD symptoms, in which case similar racial/ethnic differences in perceptions and expectations have been noted (Pan 2014; Ben-Joseph 2020). It has been observed, for example, that, instead of reflecting a lack of awareness or inadequate health literacy, views emphasizing the natural onset and progression of clinically significant cognitive symptoms, as well as, simultaneously, the promising nature of advances in diagnosis and treatment, may fit into a broader spiritual framework that may have features characteristic of certain racial/ethnic contexts, thus contributing to the consistency in the difference in African-American and white participants' responses. Indeed, this interpretation is in alignment with the finding that African-American respondents were much more likely than white participants to cite "God's will" as an important contributing factor in the development of AD (Connell 2009). Further pursuit of the extent to which a spiritual framework can account for different views among members belonging to different races/ethnicities regarding aging and health would consequently require a deeper investigation into the communal support

networks most commonly utilized by those from particular racial/ethnic backgrounds and the extent to which spirituality may play a role in those support networks and as a means of overcoming challenges and/or accepting certain adverse events such as neurodegenerative disease.

### **Barriers to Health Care Access and Utilization**

A third important theme characterizing beliefs and preconceptions relating to PD diagnosis and knowledge focuses on perceived barriers to health care access. In the community-based study conducted by Pan et al. in 2014, comparing groups of older adults identifying as Chinese-American, African-American, or white, it was found that the major barriers to receiving health care that were identified exhibited distinct differences by racial/ethnic group. In particular, the main themes in the context of health care barriers that were concluded from the responses obtained in the study centered on mistrust among the African-American community and difficulties with language barriers and navigating the healthcare system in the case of the Chinese-American participants (Pan 2014).

Patients' beliefs that may influence their decision to pursue medical care and thereby receive a diagnosis of PD, specifically in the context of barriers that they may perceive within the healthcare system, are especially telling for their capacity to inform potential future efforts to bridge the divide that members of various racial/ethnic backgrounds may encounter in seeking an appropriate diagnosis and timely care. Issues of barriers to accessing health care appear to be particularly amenable to intervention, along with outreach efforts that may potentially raise self-awareness, as well as

communal awareness, among community members which may prompt them to seek out the appropriate health care resources in the first place.

In the case of the African-American community, mistrust of the medical establishment may be more prevalent in light of the complex social and political context that has historically defined African-Americans' experiences with the healthcare system (Pan 2014). Continued endeavors to educate physicians on biases that may be informing their practice, as well as to reach out to community members and promote inclusivity in the delivery of health care, constitute a direct practice that may in due course lead to more open communication and greater comfort among different racial/ethnic communities in drawing on common health care resources and participating within the healthcare system. A similar approach to improve transparency and accessibility within the healthcare system should be able to engage a greater sector of the American population, especially in light of the barriers that were highlighted by the Chinese-American participants in the study by Pan et al. that reflect such challenges commonly encountered by immigrant populations as language obstacles and the ability to navigate a system that may be unfamiliar to them and foreign to their prior experiences (Pan 2014).

## **CHAPTER TWO:**

### **MEDICAL PROFESSIONALS' ATTITUDES AND BIASES**

Along with factors on the level of the individual patient that may impede PD diagnosis, it follows that medical professionals' attitudes and biases which enter the medical encounter have a comparable degree of influence on a successful diagnosis of PD. Factors that inform physician-patient communication from both sides of this exchange are particularly relevant for diagnosis of neurological conditions, and especially of PD, which could vary to a significant extent in its manner of presentation, particularly among different racial/ethnic groups, as described in Chapter 1 (Ben-Joseph 2020). In examining the role of physicians' perceptions and beliefs in PD diagnosis, and the potential for racial/ethnic discrimination that may thus be introduced into the diagnostic process, the following sections will focus on, first, physician bias in communication behaviors and patient health status perception and, consequently, will transition to a discussion of diagnostic criteria for PD, which are predominantly based on investigations of white patients, and the variation in clinical phenotypes based on racial/ethnic background that have been thereby marginalized by the standard criteria currently used for PD diagnosis (Hardy 2003; Dahodwala 2009a).

#### **Bias in Patient Communication and Perception**

While there have been varied findings investigating the impact of physician bias on the diagnosis of and subsequent care for conditions across different racial/ethnic populations, it is nonetheless largely accepted that differences exist in physician-patient communication based on the race/ethnicity of the patient and of the physician.

Additionally, race/ethnicity has been determined to influence the physician's perception of the patient and their health status (Jones 2003; Ghods 2008). Particular areas in which physician bias appears to play a critical role include assessment of patient cognitive function and depression symptoms, both of which are associated with PD, as well as clinical research, which, historically, has been recognized to under-represent individuals from racial/ethnic minority backgrounds (Jones 2003; Ghods 2008; Tilley 2012).

A significant factor in the latter case is the perception that those from racial/ethnic minority backgrounds may not have an interest in research participation, an assumption that has been reported, for example, in a survey of physicians participating in PD clinical trials (Mainous 2008). It is of interest, however, that, even with the implementation of a large-scale intervention trial aiming to educate the medical community on recruitment bias in an attempt to ameliorate persisting biases, the involvement of minority-identifying patients in subsequent PD trials showed no significant improvement (Tilley 2012). This finding may indicate that effective physician-patient communication takes a significant investment and time to be able to yield results. This conclusion especially holds up in light of existing barriers to care that those from minority racial/ethnic backgrounds often face and the overarching challenge of building trust with patients historically marginalized by the healthcare system and the medical community. In conducting interviews after the aforementioned educational intervention trial, it was determined that physician participants who recruited a high proportion of diverse research subjects were more likely to report having adopted the following key initiatives: extensive utilization of prior physician relationships with patients, inclusive community outreach untargeted to a

particular group or sector, and exceptional attention to efforts to ameliorate participants' specific barriers, such as help with transportation. In comparison, those who ranked lower in terms of diverse patient recruitment tended to assign greater responsibility to the prospective research participants, citing such factors as individual patient barriers to participation, excessive inconvenience to the research personnel in terms of the time and effort needed to help address patient barriers, and patients' perceived disinterest in being "treated as guinea pigs" during their involvement in the clinical trials (Tilley 2012).

While the responses of the low-ranking research enrollers, in particular, appear to exhibit some of the biases and assumptions that the original educational intervention trial in this study had aimed to address, the key emergent theme points to a deeper interpretation for some of these entrenched biases within the medical community and for patients' apparent conformity with such biases. As pointedly observed by one of the high enrollers in this study, "I think that the basic issue in my neighborhood is with minorities it takes time, time, time, patience, patience, and care and care. Those are the magic things" (Tilley 2012). In line with this sentiment, those physicians who were most successful in recruiting minority-identifying patients tended to be more assertive in utilizing community networks. For example, they reached out to referring community neurologists consistently and over a prolonged period of time, whereas those physicians with a poorer record of recruiting minority patients tended to instead rely on brochures and other informational material, without necessarily investing the time and effort to engage in more prolonged community outreach (Tilley 2012).

This end result of efforts to educate physicians on biases potentially affecting minority patient recruitment in PD clinical trials is especially informative in that it may be better appreciated that biases, both on the level of the provider and of the patient, take significant investment to overcome and are often indicative of deeper underlying factors, such as the ease with which a physician may find themselves drawing on a bias that minority patients may be disinterested in research participation, while at the same time failing to commit the time and effort to better understand and possibly help address patient barriers to participation as well as to build greater trust in relationships with patients, an endeavor likewise requiring much time, patience, and care.

While this study of physician bias in patient recruitment focused heavily on larger-scale factors on the level of the broader community that may be at play behind biases and their perpetuation in the medical community, another aspect to physician bias in the care of minority-identifying patients that must be considered is on the level of physician communication with the individual patient. In particular, racially/ethnically-motivated biases have been found in physicians' communication with and perceptions of patients when making assessments of patients' cognitive functioning and symptoms associated with depression (Jones 2003; Ghods 2008). A compendium of research has demonstrated that primary care physicians' visits with African-American patients tend to be more one-sided and verbally dominated by the physician, with less focus on rapport-building and more oriented around discussions of clinical details. Overall, the physician-patient communication in these visits is characterized by less positive affect, both on the part of the patient and the physician (Roter 1997; Johnson 2004). Moreover, a number of

studies have confirmed that depression is less likely to be brought up in visits with patients identifying as racial/ethnic minorities (Sleath 2002; Gallo 2005; Tai-Seale 2005; Kales 2006; Ghods 2008). In their cross-sectional study of primary care visits by a group of urban-based African-American and Caucasian patients experiencing depression symptoms, Ghods et al. interestingly found that, even when discussion of depression occurred in the context of the visit, physicians tended to rate a lower percentage of African-American than white patients as experiencing significant emotional distress (Ghods 2008). This finding is particularly interesting in light of the observation that engaging in a discussion of depression with the patient led to a marked increase in the percentage of white patients whose symptoms were believed by the physician to be indicative of emotional distress. However, physicians' assessments of the level of emotional distress experienced by African-American patients did not generally increase to a significant extent following communication concerning depression as part of the visit.

The implications of this finding appear to be especially relevant since physician-patient communication typically involves a combination of conscious and unconscious choices that may impact the emotional delivery of the conversation and the informational content delivered by the physician. Since communication is an exchange between the physician and patient, it also inevitably incorporates the patient's attitudes and beliefs in their interactions with the physician. The researchers in this study therefore took this into account in suggesting that African-Americans may share fewer emotional cues with their providers. This hypothesis was supported by the researchers determining that post-visit

positive and negative affect were both lower for patients belonging to racial/ethnic minority groups, thereby potentially suggesting a basis for physicians' decreased willingness to engage in communication about depression with minority patients and their decreased recognition of signs of emotional distress in those patients who did discuss depression (Ghods 2008). The authors of this study also reported that the severity of the depression symptoms at the time of the visit did not objectively exhibit any significant racial/ethnic bias in the sample of patients studied. They additionally made reference to previous studies where it has been found that communication about depression is initiated by the patient in about 50% of cases, with no evidence of notable racial/ethnic differences in terms of which party initiates conversation about this topic.

Along with the patient's influence in the physician-patient communication that transpires, the physician's biases nonetheless continue to have a major contribution, especially in terms of rapport-building with the patient, which was found to be less prevalent in depression communication with African-American patients, and the ability to empathize and be attentive to both verbal and non-verbal cues that may be exhibited by the patient, especially in discussions of such a sensitive and personal topic as depression symptoms experienced (Ghods 2008). Aspects of communication such as rapport-building and empathy may potentially be improved upon through increased education for the medical community focusing on affective behaviors in communication. Rapport-building is inherently impacted by the physician's subconscious biases and perceptions if they are not explicitly addressed, as shown by the continued observation of racial/ethnic differences in physician-patient communication.

### **Bias in Diagnostic Criteria**

As a neurodegenerative condition seen across all sectors of the human population, the recognition and diagnosis of PD presents a particularly interesting case in light of the heterogeneity in the disease's presentation and symptomatology and in its impact during its progression on multiple facets of patients' daily living. It has been recognized that, although the burden of PD may be similar among differing racial/ethnic groups, the clinical phenotypes of PD show some variation depending on race/ethnicity, which presents a unique challenge for diagnosis given that consensus diagnostic criteria have been designed based on the examination and reports of Caucasian patients (Hardy 2003; Dahodwala 2009a). In addition to genetic differences which may align with differences in race/ethnicity and that may explain respective variations in clinical phenotype, it can also be expected that members of differing races/ethnicities may have various distinct environmental risks and susceptibilities and other predisposing factors, potentially linked to genetic differences as well as cultural influences, that may affect the true incidence of PD among these populations and its presentation and progression following disease onset.

Ethnic variation has been reported in both the motor and non-motor symptoms of PD (Ben-Joseph 2020). Even in the Western population, however, where most studies of PD have been conducted, predominantly with white patients, PD displays a significant degree of heterogeneity, which has led to efforts to subtype PD patients based on such criteria as the type of motor symptoms, type of non-motor symptoms, age of symptom onset, progression rate, specific known genetic causes, and other clinically distinguishing factors (Burn 2006; Thenganatt 2014; Pagano 2016; Sauerbier 2016; Mu 2017; Lawton

2018; De Pablo-Fernández 2019; Zhang 2019). Racial/ethnic differences have been detected even among motor subtypes of PD. However, findings have been contradictory as the criteria for determining the specific motor subtype have been fluid, without a rigorous standardized methodology in place to date and lacking concretely specified inclusion/exclusion criteria in the studies so far (Ben-Joseph 2020). Some general patterns, however, that have been noted in several studies include the observation that the rigid-akinetic dominant phenotype of PD appears to be predominant in Black and South Asian patients (Chaudhuri 2000; Ben-Joseph 2020).

Non-motor symptoms of PD continue to be under increasing investigation, though the range of non-motor manifestations associated with PD has still not been as thoroughly delineated compared to motor symptoms. Since 2006, though, the Non-Motor Symptom Questionnaire has been utilized to allow for comparison among populations based on specific non-motor symptoms associated with PD, ranging from concentration problems to hyperhidrosis (Chaudhuri 2006; Romenets 2012; Li 2015). Regardless of race/ethnicity, all patients diagnosed with PD are expected to experience a significant degree of non-motor symptoms over the course of their illness. However, the prevalence of certain non-motor symptoms among PD patients, as well as individuals' awareness and recognition of particular symptoms as being associated with PD, has been shown to exhibit differences based on race/ethnicity (Ben-Joseph 2020). Non-motor symptoms affecting the gastrointestinal system, for example, are thought to have a higher prevalence among PD patients of East Asian ethnicity (Cheon 2008; Li 2015). Similarly, differences in the specific non-motor symptom of depression have been shown to vary by

race/ethnicity. These differences are evident from comparing Chinese, Korean, Mexican, and Peruvian studies, each of which reports a prevalence of depression among PD patients exceeding 60%, and those conducted in the United States and the United Kingdom, where the prevalence is reported as less than 40% (Ben-Joseph 2020). While the influence of geography may also be considered in the above comparison, the racially/ethnically biased nature of depression symptoms observed in PD is in line with the racial/ethnic variation in cognition in PD that has been more broadly observed. African-American patients, in particular, have been reported in numerous studies to be at a higher risk of developing dementia and cognitive deterioration due to PD progression compared to white patients at a similar stage of PD (Chaudhuri 2000; Willis 2012; Ben-Joseph 2020).

Given the heterogeneity in PD presentation among various racial/ethnic groups, the consensus diagnostic criteria in use by physicians introduce a bias that may affect the diagnosis of PD and would therefore be reflected in the racial/ethnic differences seen in PD diagnosis. The bias associated with the prevailing diagnostic criteria has also been seen reflected in the general public's knowledge of PD and awareness of its various symptoms. For example, through a large-scale investigation of knowledge of PD across Asian countries, it was discovered that distinct differences, in the level and type of knowledge relevant to PD, existed among the diverse ethnicities surveyed. These differences are manifest in such findings as that those of Chinese ethnicity had a greater awareness of the non-motor symptoms associated with PD in comparison with respondents of Malay ethnicity, and that Chinese respondents had a higher likelihood

than Indian respondents of recognizing that not all PD patients have a tremor (Tan 2015). The ethnic variation in knowledge of different aspects of PD suggests that there may be predominant conceptions of PD that exist in different societies and groups, and this predominant narrative of PD may function to marginalize alternative presentations of PD even in individuals belonging to the same racial/ethnic group. This community-level marginalization may manifest in both patients' under-awareness of PD symptoms, if they may not fit into the predominant narrative of PD they may have been educated about prior and/or discussed with their physician, and in physician bias in judging patients' reports based on the predominant narrative of PD diagnostic symptoms. This marginalization is perhaps most strikingly seen in the assessment of cognitive changes in the context of PD, with a major obstacle being the lack of a culturally inclusive definition for dementia and for neuropsychiatric symptomatology more generally (Jones 2003; Parker 2004; Ben-Joseph 2020).

**CHAPTER THREE:**  
**ROLE OF SYSTEMIC FACTORS AFFECTING HEALTH CARE**  
**ACCESSIBILITY AND UTILIZATION**

Along with patients' and physicians' attitudes that may affect PD diagnosis, it must be recognized that PD diagnosis inevitably occurs against the broader background of systemic factors affecting access to and utilization of health care. Under the current framework, those systemic factors all too often serve to marginalize racial/ethnic minorities. Systemic factors influencing health care accessibility and utilization include socioeconomic factors, such as income and education level, which exhibit a racial/ethnic bias, and more fundamental barriers to health care, such as the mistrust of the healthcare system, deeply rooted in the checkered history of the US healthcare system's treatment of African-Americans. Mistrust of the healthcare system was cited as a major barrier by African-American participants in the community-based survey of older adults conducted by Pan et al. in 2014, focused on gauging knowledge and attitudes toward PD in racially/ethnically diverse communities (Pan 2014). Numerous studies investigating PD diagnosis rates have concluded, however, that racial/ethnic differences persist in diagnosis, even when accounting for such factors as age, gender, income, education level, health insurance, and health care utilization (Dahodwala 2009a). It may be reasoned that consideration of these factors, including such common socioeconomic status (SES) indicators as income and education level, cannot preclude the validity of influences such as patients' and physicians' attitudes and knowledge, which have been explored in depth

in Chapters 2 and 3, respectively, and that appear to directly impact the racially/ethnically biased nature of PD diagnosis.

Systemic factors, however, invariably play a role in formulating attitudes and beliefs held by patients and physicians alike, whether on a conscious, more deliberate level or on an unconscious level. The role of systemic factors was, for example, vividly seen in the outcome of the multi-center intervention trial to educate physicians on recruitment of racially/ethnically diverse patients in clinical research trials pertaining to PD (Tilley 2012). Although no significant improvement was observed post-intervention in recruitment of diverse populations to PD clinical trials, key findings emerged from the study that highlighted the differences in attitudes and approaches between physicians known as “high enrollers,” who enrolled a relatively high proportion of patients identifying as racial/ethnic minorities in their clinical research trials, and the “low enrollers.” In comparing those physicians’ responses, it can be seen that the main themes that arise pertain to barriers experienced by patients in accessing health resources, as well as to the lack of systems in place to address those barriers to patient participation (Tilley 2012).

Similar to previous studies investigating patient recruitment for clinical trials, it was found that low enrollers tended to place much of the responsibility on the patients themselves, citing patients’ lack of interest in research, poor comprehension, and barriers to accessing the clinical site that would require excessive time and effort to overcome (Kornblith 2002; Tilley 2012). While these respondents’ statements appear to reveal persisting biases in their attitudes toward minority-identifying patients, a closer

inspection suggests that those biases were convenient for those physicians to hold on to and perpetuate given the systemic factors at play that have long marginalized the patient groups being targeted from being active participants in the healthcare system, whether in clinical research, or in seeking care for their direct health needs. Those physicians who were most successful in recruiting diverse patients, on the other hand, were able to leverage existing networks with community-based neurologists and other representatives within the communities being targeted, and they were willing to commit the time and effort to overcome specific systemic barriers identified by patients who expressed interest in participation (Tilley 2012). By addressing the direct factors preventing patient participation, rather than assigning responsibility to the patients themselves, those physicians were able to effectively build a connection with patients and did not express the biases that were often cited by the low enrollers surveyed in this study, who were oftentimes unable or unwilling to make the commitment to build a similar type of relationship with patients (Tilley 2012).

A particular difficulty highlighted by the challenge of recruiting diverse patients for PD clinical trials was the need to develop relationships with community physicians, along with the obstacles associated with referring patients from those communities to the specialty clinics where the research was being conducted. In general, there is a significant racial/ethnic bias in patients' ability to access specialized neurological services, which are believed to provide the best standard of care, especially for a complex neurodegenerative disease such as PD (Ben-Joseph 2020). This gap in specialized care is a significant factor in delaying appropriate PD diagnosis and care, especially for patients identifying as

racial/ethnic minorities. To be able to bridge this gap requires an intensive commitment to reducing barriers to health care access and utilization, such as transportation challenges and additional SES barriers. In the long term, an even more intensive commitment would be required to continue building trust with community-based physicians and patients and to help dismantle biases on both the part of the physicians and the patients, which appear to be so inextricably linked with systemic factors that have so far been shaping patients' and physicians' views and beliefs about each other and the healthcare system more generally.

## **CHAPTER FOUR:**

### **BIOLOGICAL DIFFERENCES IN PD**

Given the heterogeneity observed in clinical phenotypes associated with PD, and the mapping of this heterogeneity onto the racial/ethnic background of patients, there have been investigations into the genetic diversity that may be largely responsible for the observed variety in the clinical manifestations of PD (Ben-Joseph 2020). At the same time, there has been a recent rise in interest in investigating the impact of co-morbidities on the risk of developing PD and on its symptoms and progression (De Pablo-Fernández 2018). Since, for the most part, the prevalence of each of the relevant co-morbidities that have been investigated to date exhibits distinct racial/ethnic differences as well, the contributions of co-morbidities may be quite significant in determining differences in PD manifestation in various racial/ethnic groups, thereby potentially impacting PD diagnosis rates (Ben-Joseph 2020).

#### **Genetic Variation in PD**

Especially over the course of the last two decades, a number of genetic mutations have been identified that are associated with autosomal dominant or recessive forms of what is known, specifically, as monogenic PD. It is notable, however, that monogenic PD solely is responsible for less than 5% of PD cases, with the overwhelming proportion of cases considered to be sporadic in nature (Reed 2019). In the case of monogenic PD, though, multiple genes have been determined to be potential targets for disease-causing mutations, with the most common genes involved being *LRRK2*, *PARK2*, *SNCA*, and *DJ-1* (Reed 2019). These genes and their corresponding alterations have been found to each

contribute to distinct phenotypes and to vary considerably in their prevalence in members of differing racial/ethnic groups (Trinh 2018; Shu 2019). A particularly prominent example is that of the *LRRK2* G2019S mutation, believed to be the most common genetic cause of PD worldwide (Healy 2008). When considering the distribution of this alteration based on ethnicity, however, it is observed that there are stark differences, with the prevalence of the alteration amounting to 30-39% among the North African Berber population and to 26% among those of Ashkenazi Jewish ancestry (Orr-Urtreger 2007; Benamer 2010). On the opposing side of the spectrum, though, the prevalence has been reported to be less than 0.1% in Asia, and this mutation has apparently not yet been noted in Nigerian PD patients (Ben El Haj 2017; Okubadejo 2018).

That being said, it must be considered that research in PD in many parts of the world has been substantially limited, with, to put these barriers into perspective, only approximately 3 neurologists present for every 10 million people living in sub-Saharan Africa (Bailey 2020). These considerations must therefore be taken into account in comparing the prevalence of PD more generally, as, for instance, the prevalence of PD in one door-to-door study conducted in Igbo-Ora, Nigeria, was reported to be five times lower than that determined in the Copiah County, Mississippi, community-based study for its African-American population (Schoenberg 1985; Bailey 2020). A similar study conducted in Tanzania in 2008 likewise found a comparable low prevalence of PD but is of further interest for its additional finding that 78% of those identified as positive for PD as part of the study had not been diagnosed with PD prior to the study (Dotchin 2008). An additional critical consideration in comparing populations is that, even with age-

adjustment of PD prevalence estimates in different populations, the discrepancy in the age distribution in differing populations is quite significant nonetheless, with, for example, only 3% of Tanzania's population older than 65, thereby significantly skewing prevalence estimates of PD compared with, on average, much older populations such as in the United States (Bailey 2020). Due to these population-specific differences, there are distinct challenges in the ability to make valid comparisons among populations in different parts of the world. However, the available evidence does suggest that populations do in fact vary in their genetic causes for PD, and these variations are reflected both in comparing different racial/ethnic groups as well as different geographical locations (Bailey 2020).

It is also known that certain genetic variations confer different levels of risk for the development of PD and its course of progression in individuals of differing race/ethnicity. In particular, certain variants of the *GBA* gene are known to raise the risk of developing PD at an earlier age of onset compared to the typical PD patient. It has also been determined that the prevalence of *GBA* gene variants, and, perhaps more interestingly, their penetrance, is dependent on race/ethnicity (Sidransky 2009; Gan-Or 2015). As a case in point, the *GBA* variants 84insGG and R496H are known to confer an elevated risk of developing PD, but, based on the studies conducted so far, only in individuals identifying as Ashkenazi Jewish (Zhang 2018). Further analyses of the interaction of predisposing genetic factors with various environmental and social influences and susceptibilities are needed, however, to be able to more specifically pinpoint

and better appreciate the role of race/ethnicity in the risk of the development of PD and its associated complications.

### **Role of Co-Morbidities**

Another interesting more recent area of research that has emerged in investigating racial/ethnic differences in PD has focused on the role of co-morbidities in determining the risk of PD and its associated complications. Since a variety of chronic conditions that have been implicated to be linked with PD display racial/ethnic differences, this has been a very promising and extensive endeavor that has been able to shed new light on the complexity of PD and its racial/ethnic underpinnings. Some of the preliminary investigations into this area have, for example, highlighted the role of co-morbid type 2 diabetes mellitus (T2DM), as it has been found that T2DM is associated with a significantly higher rate of subsequent development of PD. The precise nature of this association, however, which the authors speculate could be due to a common genetic predisposition and/or disruption of shared pathological pathways, still remains under investigation (De Pablo-Fernández 2018). Since it is furthermore known that T2DM exhibits racial/ethnic differences in its prevalence, with, for instance, a particularly high frequency among those of South Asian ethnicity, it has been a topic of continued study as to what extent T2DM, which has both genetic underpinnings as well as strong associations with diet and lifestyle, may affect the racial/ethnic variation seen in PD (Ben-Joseph 2020).

Of particular interest in the investigation of co-morbid pathology has been the identification of factors contributing to cognitive decline that may be associated with

development of certain PD subtypes and disease progression. Co-morbid conditions affecting cognition have generally been subdivided into cardiovascular causes and dementia-associated pathology. It is generally recognized, on the basis of evidence presented in multiple studies, that African-Americans tend to have a higher burden of cerebral vascular disease compared to white Americans (Gottesman 2015; Waldstein 2017). Interestingly, there has been found a strong association between a number of the clinical phenotypes seen in both cerebral small-vessel disease (CSVD) and in PD, among them being distinctive postural and gait changes and cognitive dysfunction. This has been taken as evidence of the contribution of vascular pathology in PD, since deep white matter hyperintensities of the frontal lobe, indicative of a subtype of CSVD, have been determined to be an independent risk factor for the postural instability and gait disturbance phenotype observed in PD (Wan 2019). In a separate analysis of predictors for progression in early PD, it was concluded that cardiovascular risk factors, in addition to poorly controlled blood glucose levels, inflammation, and uric acid metabolic derangements, were definitive risk markers for accelerated progression of PD symptoms (Mollenhauer 2019). Further exploration into the linkages between cardiovascular risk factors and PD should shed more light on the racial/ethnic differences seen in PD, as, based on the studies conducted so far, cardiovascular disease, already known to exhibit distinct racial/ethnic differences, presents as a significant co-morbidity, and even a likely initiator, in the pathology of PD (Mollenhauer 2019; Wan 2019).

Similar investigations have also focused on the role of dementia-associated pathology that could contribute to and/or exacerbate PD-associated cognitive changes. A

major motivation in investigating the interplay of dementia-associated pathology with PD has been the observation that African-American and Hispanic patients with PD exhibit higher rates of progression to cognitive decline and dementia compared to Caucasian patients (Chaudhuri 2000; Willis 2012; Ben-Joseph 2020). Similar racially/ethnically-driven patterns have been observed in studies of AD (Mehta 2017; Bailey 2020). To date, research in AD has been more extensive compared to studies focusing on PD, with results from a number of longitudinal, community-based studies utilizing large and diverse sample populations that have yielded evidence-backed and more broadly applicable conclusions (Bailey 2020). Through racially/ethnically diverse patient studies conducted for AD, it has been found that an important contributing factor to its increased prevalence among African-American populations seems to be African-Americans' higher likelihood of carrying the APOE  $\epsilon$ 4 gene (Logue 2011). Meanwhile, it has additionally been determined that PD patients carrying the APOE  $\epsilon$ 4 gene exhibit accelerated cognitive decline, which has fostered speculation that racial/ethnic differences in the cognitive deterioration observed in PD patients may be at least in part attributable to a combination of AD and PD pathology responsible for this symptomatology (Morley 2012). In confirmation of an increased mixed neuropathology burden among African-Americans, a post-mortem study conducted in 2015 has been able to show that African-Americans with AD pathology tended to have a significantly higher likelihood than Caucasians with the pathology of exhibiting a mixed pathology, featuring the additional burden of either Lewy bodies (LBs), a well-recognized histological hallmark of PD, or LBs accompanied by infarcts (Wakabayashi 2007; Barnes 2015). These findings suggest that the differences

in PD identification and prognosis that appear to be divided along racial/ethnic lines may be indicative of variations in co-morbid conditions, which have been shown to exhibit racial/ethnic divides and, as in the case of AD, have often been more extensively studied on a community-based, multi-ethnic level compared to ongoing PD research that is still developing in this direction (Mehta 2017; Bailey 2020). This speculation is particularly relevant given the higher likelihood of a delayed diagnosis of PD in African-American populations, as one diagnostic criterion commonly applied for PD dementia ascertainment is the progression to cognitive dysfunction after one year since the onset of primarily motor symptoms (Dahodwala 2011; Fang 2020). Therefore, it is more likely that, in this patient population, co-morbidities, which are particularly relevant in the context of cognitive changes associated with PD progression, would play a more significant role in contributing to the symptomatology at the time of diagnosis when patients would seek medical care.

## **CHAPTER FIVE:**

### **DIFFERENCES IN PD MANAGEMENT AND DISEASE PROGRESSION**

Racial/ethnic disparities that have been identified in PD diagnosis, and which have been discussed in length in the preceding chapters, have been found to extend beyond the time of diagnosis to affect management of PD patients' care and the course of patients' disease progression. The disparities in PD progression have already been highlighted in the preceding in the context of cognitive dysfunction, which is a marker for progression of PD symptomatology and is most prevalent among certain racial/ethnic groups, especially among African-American patients, who also have a higher likelihood of receiving a delayed diagnosis, which would therefore coincide with a later stage of PD development in these patients (Dahodwala 2011; Fang 2020).

PD progression, however, continues to display a racially/ethnically discriminatory course even after diagnosis has been made, which may be interpreted as an indication of race/ethnicity-based biases in physician management of PD patients. A deeper analysis, though, reveals that a variety of factors is most likely at play, similar to the case with disparities in PD diagnosis, with patient-dependent influences coming in as well as, potentially, biological factors that may have a racially/ethnically-dependent nature. Inequitable care has been shown in studies reporting African-Americans' lower likelihood of receiving dopaminergic medications compared to whites (Hemming 2011). Additionally, based on nationwide studies of PD patients, African-Americans have a decreased chance of being prescribed advanced care treatments such as deep brain stimulation (DBS), despite being as eligible in terms of their symptomatology and stage

of PD as their Caucasian counterparts (Chan 2014; Willis 2014). Other indications of disparities in the medical care of PD patients include the finding that African-American patients have a decreased likelihood compared to Caucasians of being referred for specialized care from a neurologist. Furthermore, regardless of referral status, African-American patients are less likely to receive treatment for depression symptoms associated with PD, while at the same time, they are at a greater risk of prescribing error when treatment is offered (Cheng 2008; Willis 2011; Saadi 2017; Mantri 2019). A study conducted by Dahodwala et al. in 2009 using Medicaid claims in the state of Pennsylvania came to the conclusion that overall, African-Americans are as much as four times less likely than whites to be the recipients of any type of treatment for PD (Dahodwala 2009b). These disturbing trends are in close alignment with the general pattern of health inequities that has been observed in the diagnosis of PD among racial/ethnic minorities and, once diagnosed, in the care and treatment regimens offered to members of those minority groups.

Similar to the underlying issues that have been explored in connection with PD diagnosis among differing racial/ethnic groups, a plethora of issues must be considered in beginning to address the inequities found in the management of PD once a diagnosis has been made. These issues include socioeconomic factors, which, for example, may account to some extent for African-Americans' lack of utilization of advanced care options such as DBS, given African-American patients' increased dependence on Medicaid for access to health care services, as well as patient beliefs and attitudes that may inhibit open physician-patient communication that would be required for

identification and appropriate treatment of symptoms such as depression (Chan 2014). Lack of patient knowledge regarding available treatment options and their expected efficacy, as well as preconceptions about the benefits or risks associated with the decision to pursue treatment, constitute additional barriers to not only seeking medical care for appropriate diagnosis in the first place but also to deciding to pursue further care for management of their condition (Pan 2014). The close association between the decision-making involved in diagnosis and that in further disease management is particularly important since a patient's judgement of the value of the diagnosis may be inextricably linked to their views on treatment options and their willingness to pursue different avenues of treatment that they believe may be offered to them upon diagnosis. Therefore, differences in treatment access and utilization, as well as in eventual disease outcome, whether attributable to systemic social disparities, the healthcare system, the individual provider, or the patient themselves, or to a combination of these factors, involve many of the same considerations as those that underlie the event of diagnosis.

Just as in the case of variations in PD diagnosis, there are additional findings that have supported some role for biological differences among members of various racial/ethnic groups in explaining variations in the management of patients diagnosed with PD. For example, there may be distinct racial/ethnic variance in the degree of benefit and complication associated with various PD treatments, especially in the case of motor symptoms that may result from reliance on certain medications used for the management of PD (Woitalla 2007; Nicoletti 2016). In Asian patients, for instance, a decreased dosage of dopaminergic medication is commonly utilized due to increased

susceptibility to dyskinesia in these patients (Woitalla 2007). Differential treatment of patients based on their racial/ethnic identification, therefore, can be necessary, especially with the wide variety of PD management options currently available (Ben-Joseph 2020). However, the decision-making ultimately involved on both the part of the physician and the patient invariably makes room for the introduction of various biases and preconceptions, with, for the achievement of the most thorough clinical judgment possible, a careful consideration of the patient's racial/ethnic identification being inevitably made.

## CONCLUSION

In this exploration of the racial/ethnic differences in PD diagnosis, a number of underlying considerations were analyzed, starting with patient-based factors, focused on in Chapter 1, such as their internal attitudes, beliefs, social and cultural influences, and level of knowledge, among patients from different racial/ethnic backgrounds. Chapter 2 then discussed provider-based influences such as their biases and preconceptions that enter the physician-patient exchange at the time of diagnosis. The role of broader influences such as socioeconomic factors was consequently explored in Chapter 3, especially in the context of oftentimes helping to create and perpetuate the biases and attitudes previously addressed in Chapters 1 and 2.

In Chapter 4, an overview of more recent research investigating biological differences that may be at least in part responsible for the racial/ethnic variation observed in PD diagnosis was provided, thereby offering an alternative perspective on the observed differences. Ultimately, however, this summary raised further questions as to the impact of co-morbidities related to PD that, like PD, are themselves divided along racial/ethnic lines (De Pablo-Fernández 2018; Ben-Joseph 2020). Subsequently, in Chapter 5, a closer look was given to summarize certain racial/ethnic differences that have been observed in the management of PD patients once they have been diagnosed. The trends that have been observed in some of the underlying motivations, such as provider- and patient-based attitudes and beliefs, as well as in the overarching influence of systemic factors, such as inequities in health care access and utilization and broader socioeconomic inequities, are reminiscent of the factors explored in the context of PD diagnosis in the preceding

chapters. It is also of note that, in the case of patients who are diagnosed at a later stage of PD, a risk that the African-American population is particularly susceptible to, inequities that would appear in the course of PD progression would already be evident at the time of diagnosis, as patients with a delayed diagnosis tend to present with more severe symptoms before they seek or have access to medical care. This often results in a poorer overall prognosis, even compared to their counterparts who may be at a similar stage in their PD progression (Dahodwala 2011).

In analyzing the sum of the various factors at play in the racial/ethnic disparities evident in PD diagnosis, it appears that a common underlying theme is concerned with barriers to health care access and utilization, deriving fundamentally from socioeconomic inequities and social influences that continue to frame individuals' attitudes toward the healthcare system. The role of social influences is especially well exemplified by the persistent mistrust of the medical establishment which remains prevalent among the African-American population and that may inhibit a willingness to seek out medical care in that population upon the onset of worrisome symptoms (Pan 2014). While in Chapter 1 it was discussed that individual patients' beliefs, such as those concerning their expectations for aging, may prevent them from seeking timely medical care, it seems that a major obstacle to receiving medical care is a lack of trust and ease of accessibility when it comes to reporting to a physician's office (Connell 2009; Pan 2014). When patients are able to establish a longitudinal relationship with their physician, or, at the minimum, when they have access to and are comfortable reaching out for care, beliefs and preconceptions that may be influencing patients' attitudes toward their health may be

better addressed. Ideally, such interactions would lead to patients being provided with the appropriate information to be able to make an informed decision in accordance with the set of beliefs and values which the patient chooses to retain after their exchange with the physician.

This malleability of patients' beliefs when provided with the appropriate clinical knowledge and level of trust and ease of access when it comes to receiving medical care is evidenced from the community-based study conducted by Pan et al. in 2014, in which it was shown that Chinese-American and African-American participants had a higher likelihood than their white counterparts of perceiving PD as a natural consequence of aging (Pan 2014). However, even while the Chinese-American participants retained this view of PD, they nonetheless rated highly in their perception of the symptoms of PD as being very severe and incompatible with the ability to lead an active lifestyle. Meanwhile, when queried about barriers to diagnosis and treatment, Chinese-American respondents tended to cite language difficulties and lack of familiarity with the healthcare system (Pan 2014). These findings relating to patients' perceptions suggest that, while certain beliefs and preconceptions, such as, in this case, about what constitutes normal aging, may prevent patients from making a fully knowledgeable and impartial evaluation of their specific health care needs, these beliefs and attitudes are not necessarily incompatible with patients' ability to pinpoint potential areas of concern, such as the interference of what may be perceived as normal aging with an active lifestyle, and their willingness to bring them up in a visit with the physician. To make this possible,

however, more concrete barriers such as language or a hard-to-navigate healthcare system must be adequately addressed.

In addition to patient-based factors, however, the provider's beliefs and biases inevitably impact and may ultimately determine the course and outcome of the physician-patient exchange that is required for the proper assignment of a diagnosis. This is particularly important in the case of PD, which, as a neurological condition, requires the subjective impressions of both the patient and the physician for diagnosis, in addition to observations collected from a clinical examination. Physician biases, either conscious or unconscious, may result in the differential treatment of patients belonging to differing racial/ethnic groups. However, as is perhaps most tellingly seen through the results, as reported by Tilley et al. in 2012, which had been obtained after the initiation of a multi-center intervention trial intended to educate physicians on biases related to diverse recruitment for PD clinical trials, physician biases may, like patients' preconceptions and beliefs, derive from broader perceptions of barriers commonly faced by patients from certain racial/ethnic backgrounds. As seen through the results of the study by Tilley et al., these physician biases may even represent a means by which to evade taking on responsibility for helping to dismantle some of those barriers (Tilley 2012). From this perspective, biases may therefore serve as a type of learned response, where physicians may potentially be unaware of patient barriers and thus be tempted to engage in making assumptions that lead to and perpetuate biases. Alternatively, physicians may assume that certain barriers that their patients may experience are outside the scope of their influence

or may otherwise require work to dismantle that they do not have the bandwidth to address.

In the comparison of those physicians involved in the trial who were regarded as successful recruiters of diverse participants with those physicians who scored poorly in markers of diverse recruitment, it came to light that the so-called high enrollers were investing significantly more time and effort in connecting with local community networks, encouraging community physicians to refer patients to specialized neurological centers for participation in the PD trials, and drawing on support networks to best account for patients' foreseeable barriers to participation such as transportation needs and other costs, overall building trust with all parties ranging from the patients to community liaisons. Conversely, the low enrollers were often unwilling to look into such support networks and instead over-relied on assumptions that placed the responsibility on the patient, such as that patients "did not want to be treated as guinea pigs," or that they were uninterested due to the length of the commitment and/or economic restraints (Tilley 2012). The low enrollers often failed to further investigate the validity of these claims for refusal, by, for example, expressing unawareness about transportation resources, which were, in fact, actually easily made available for participants thanks to the support of the National Institute of Neurologic Disorders and Stroke responsible for the study. It may therefore be concluded that those physicians were drawing on their biases and preconceptions about their patients and their circumstances and finding convenient support for these biases, instead of being willing to investigate on a patient-by-patient basis the particular reasons for their refusal and how they may be addressed (Mainous

2008; Tilley 2012). It may then be surmised that similar assumptions and biases on the part of the physician may impede the referral of patients for specialized neurologic care, given the commitment on the part of the patient that may be required and the assumed restrictions that those from certain racial/ethnic backgrounds may more commonly experience, whether due to socioeconomic factors, cultural beliefs, or other potential barriers that may not be adequately explored as part of the initial physician visit.

An additional aspect that had been explored in the preceding chapters is the so-called biological explanation for differences in PD diagnosis. Though the genetic predispositions and risks among members of various racial/ethnic groups are under continued investigation, the influence of biological differences appears so far to be inadequate in explaining the differences in PD prevalence seen among differing racial/ethnic groups, especially in comparisons of African-American and Caucasian populations (Ben-Joseph 2020). The role of co-morbidities, however, is an emergent area of research that appears to link other chronic conditions which exhibit racial/ethnic divides to PD and therefore promises to add yet another layer of complexity to studies of PD and the racial/ethnic variations in its prevalence, clinical phenotype, and course of progression and outcomes.

Possible areas of intervention that may be addressed in attempting to ameliorate the racial/ethnic disparities observed in PD include continued education and outreach efforts to help increase both physician and patient awareness. To be able to directly reach a diverse populace, such outreach efforts would require a significant investment of time and effort and the utilization of widespread community-based networks that are expected

to carry a greater weight in building relationships with patients founded on mutual trust and accessibility. Barriers such as socioeconomic restrictions and other ongoing inequities that certain populations may have traditionally been disproportionately subjected to would need to be addressed to more deeply tackle the inequities seen in PD. Such initiatives should be undertaken on both the level of the individual patient, if additional and broader support networks may be made available to them through their health care resource, as well as, over time and through concerted efforts, on a community-based and population-based level.

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**CURRICULUM VITAE**

















