Placing a Health Equity Lens on Non-Communicable Diseases: Origin and Destination Considerations

By

Helena Eyram Dagadu

Dissertation
Submitted to the Faculty of the
Graduate School of Vanderbilt University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY
in

Sociology
August, 2015
Nashville, Tennessee

Approved:

C. André Christie-Mizell, Ph.D.

Daniel B. Cornfield, Ph.D.

Derek M. Griffith, Ph.D.

Evelyn J. Patterson, Ph.D.

DEDICATION

This dissertation is dedicated in honor of my grandmother, Emma Tamashie Lorho who passed away shortly after I arrived to the United States from Ghana in 1988. Prior to her death, Mami (as we called her) suffered a series of strokes, the last of which left her paralyzed. Despite her debilitation, she remained sharp of mind and wit. She was the final arbiter on all dishes prepared in the kitchen. My sister and I were tasked with taking her teaspoons of meals to taste and inform the kitchen about any required adjustments in salt or pepper. She tolerated the rambunctious play of my sister and me; often humoring us as we dressed her hair. As a child, I could not fully understand the condition that left her unable to walk; but I fully understood her love and kindness. She was and continues to be a major inspiration in my work on non-communicable diseases. I am blessed to count myself among her legacies. Thank you Mami.

ACKNOWLEDGEMENTS

I thank God for surrounding me with people who enabled me to successfully complete this dissertation. This work would not have been possible without the financial and professional support from the Robert Wood Johnson Foundation Center for Health Policy at Meharry Medical College. I am deeply indebted to my advisor and committee members. To my fearless advisor, Professor C. André Christie-Mizell, I cannot express in sufficient words how grateful I am for your guidance, patience, support, and encouragement. You are more than a mentor to me. You took me as a daughter and challenged me to be a better scholar and person as a result. I also would like to thank Professor Evelyn Patterson, whom I have come to regard as an older sister. Thank you for believing in my ideas and accompanying me on my publication endeavors. Because you believed in me, I came to believe in myself. I am also grateful to Professor Daniel Cornfield for inviting me to participate in the invaluable sociological enterprise that is *Work and Occupations*. Thank you also for supporting my grant activities and for the wisdom that you imparted during my tenure at Vanderbilt. You make me proud to be a sociologist. I am also thankful to Professor Derek Griffith for challenging me to look at my work from a different perspective. Your feedback has greatly expanded the reach of my work.

To my family, I thank you all for sustaining me through this process. Mom, thank you for being my biggest cheerleader, protector, and prayer warrior. Dad, I am so grateful for your unwavering support for me. Linda, Ellie, and Korkor, thank you so much for the smiles and laughter you infused in this process. I am grateful to my brothers Ephraim and Benoit for having my back. Finally, I want to acknowledge Emmanuel Korbla Edudzie. I would not have been in this program had it not been for you. Your faith in me is both awesome and humbling. Thank you for your steadfast support and listening ear. Your presence in my life is truly a blessing.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

Introduction

Sociologists have a long history of documenting and attempting to explain major transitions and upheavals in human history (e.g. Auguste Comte on the Enlightenment; Karl Marx on the Industrial Revolution; W.E.B. Du Bois on Jim Crow era in the U.S.). A major transition occurring today is the marked increase in non-communicable disease deaths worldwide. Chronic non-communicable diseases are characterized as conditions that occur in or affect individuals over an extensive period of time and for which there are no known causative agents that are transmitted from one affected individual to another (Daar et al. 2007). According to the World Health Organization (WHO), 38 million people die each year from non-communicable conditions such as cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers (WHO 2014).

While non-communicable diseases are a familiar feature of morbidity and mortality in high-income countries like the United States (U.S.), they are rapidly becoming a part of the morbidity and mortality profiles of low- and middle-income countries. According to the World Bank's current classification of world's economies, high-income countries are those whose economies have a gross national income (GNI) of $12,746 or more per capita; upper-middle income countries are those with GNI between $4,125 and $12,746 per capita; lower-middle income countries those with GNI between $1,045 and $4,125 per capita; and low-income countries have economies with GNI per capita of $1,045 or less (The World Bank 2014).

Low- and middle income countries (LMICs), specifically those in sub-Saharan Africa, are projected to see the most rapid increase in non-communicable diseases over the next two decades (Abegunde et al. 2007; Dalal et al. 2011; Stuckler 2008; Unwin et al. 2001; WHO 2006). The situation in Sub-Saharan Africa is especially dire because a historic focus on maternal-child health and infectious diseases like malaria, HIV/AIDS, and tuberculosis has meant less research and resources devoted to non-communicable diseases (Dalal et al. 2011; de-Graft Akins 2007). Available data suggest that in 2004, 25% of all deaths in Sub-Saharan Africa were due to non-communicable diseases; but that number is expected to rise to about 46% by 2030 (WHO 2006). Indeed, current WHO estimates indicate that 85% of the over 14 million plus non-communicable disease deaths occurring annually in people aged 30 and 70 years are in developing LMICs like the majority of countries in sub-Saharan Africa (WHO 2014).

One of the more influential frameworks that have been put forth to explain changing morbidity and mortality patterns like the one currently occurring in sub-Saharan African countries is the epidemiologic transition theory (Omran 1971/2005). The hallmark of the epidemiological transition is the displacement of infectious communicable diseases with chronic non-communicable diseases as the primary cause of morbidity and mortality. The theory describes transitions as occurring in three successive stages, with life expectancy increasing with each successive stage: from an age of pestilence and famine; through an age of receding pandemics; and finally to an age of man-made and degenerative diseases. Furthermore, progression through these stages are linked to the level of development within a given country. As such, hypotheses derived from the epidemiologic transition theory would expect communicable diseases as the main cause of death in low-income developing countries and non-communicable diseases as the main cause of high-income developed countries.

There are many critiques of the epidemiologic transition theory, a topic scholars worldwide have dealt with extensively (Agyei-Mensah and de-Graft Aikins 2010; Avilés 2001; Caselli et al. 2002; Dagadu and Patterson 2015; Frenk et al. 1989; Gaylin and Kates 1997). For this dissertation, I focus on three limitations. First, the epidemiologic transition theory essentializes the experiences of high-income countries. Despite historical, structural and contextual differences in the morbidity and mortality transitions of LMICs compared to high income countries, much of the evidence Omran (1971/2005) offered in support of the epidemiologic transition theory relied heavily on perspectives that hold the experiences of high-income countries—particularly those in Europe as well as the U.S.—as normative. The extent to which the framework applies to the experiences of LMICs in Sub-Saharan Africa is an ongoing empirical debate.

A second major limitation of the epidemiologic transition theory is that due to its focus on national trends, it does not explicitly take stratifying factors such as socioeconomic status (SES) and gender into account. Dating back to Karl Marx and Max Weber, social stratification has been a major feature of sociological study that has implications for health and life chances. Socioeconomic status, a major stratifying factor typically assessed by educational attainment, income, and employment status, is important for both high-income and low- and middle-income countries with respect to non-communicable disease outcomes. A well-documented finding in social science research is the SES-health gradient (Adler et al. 1994; Boykin et al. 2011; Braveman et al. 2010; Preston and Taubman 1994; Williams et al. 2010). In high-income countries, researchers have linked low income, low education, and low occupational status to poorer health outcomes across numerous conditions (Braveman et al. 2010). Because SES impacts multiple health outcomes and involves access to resources that can be used to avoid risks

or to minimize the consequences of disease once it occurs, it has been described as a fundamental cause of morbidity and mortality as well health inequities (Link and Phelan 1995; Phelan et al. 2004). While SES has also been found to be a primary contributor to health in LMICs, the association between SES and non-communicable diseases in these countries is somewhat uncertain. There is what has been described as the reversal hypothesis, which states that in LMICs, high SES is associated with *high* morbidity and mortality from NCDs; that is, the opposite of the SES-gradient observed in high-income countries like the U.S. (Addo et al. 2009; Akarolo-Anthony et al. 2014; Pampel et al. 2012; Ploubidis et al. 2013). One explanation provided by the reversal hypothesis is that in LMICs, it is those of high SES who can afford to consume excess calories, remain physically inactive, and who are more likely to be exposed to the stressors of living in an urban environment, all of which are important risk factors for non-communicable diseases (Pampel et al. 2012).

Like SES, gender is an important stratifying factor that is associated with and influences health outcomes. From a social constructionist perspective, gender is a set of socially constructed relationships which are produced and reproduced through people's actions (Acker 2004; Charmaz 1995; Courtenay 2000a; Griffith 2012; Risman 2004). Sociology emphasizes how gender is learned, changes over time as cultural definitions change, and how it varies considerably in different contexts. Sociologists often use the terms masculinity and femininity to signify the expected attitudes and behaviors associated with being a man or woman, respectively. Researchers have argued that health related beliefs and behaviors can be understood as means of constructing or demonstrating gender (Courtenay 2000a; West and Zimmerman 1987). Further, the construction of health and gender does not occur in isolation from other forms of social action. Black feminist perspectives emphasize the structuring role gender plays in the lives of

women and men as well as its intersection with race and class (Brown and Hargrove 2013; Collins 1990/2008; Crenshaw 1991; Springer et al. 2012). SES both constrains and enables certain forms of gendered social action and influences women's and men's health behaviors. Through gender socialization, women are often ascribed certain care roles and responsibilities for their families and communities that impact their health outcomes.

Across countries and ethnic groups, women live and average of five to eight years longer than men, but they also tend to be sicker than men (Waldron, 1998; WHO 2009) due to biological and socio-behavioral factors. Compared to women, men tend to have higher death rates from both intentional and non-intentional injuries from events such as accidents, homicide, and suicide. In addition, gendered social norms and pressures have often been implicated in explanations of men's poor health outcomes due to unhealthy behaviors such as alcohol consumption and smoking that may be used to reestablish that men embody a particular form of masculinity; that is, that men are independent, self-reliant, strong, robust and tough (Charmaz 1995; Courtenay 2000b). Ultimately, men and women, those of low SES, those of high SES, and other sub-groups within a given country effectively live in different epidemiological worlds, and experience different risk factors for non-communicable diseases. As such, the epidemiologic transition theory's focus on national averages/trends can hide some important disparities within countries.

A final limitation of the epidemiologic transition theory is its failure to account for the interconnectedness of countries and how morbidity and mortality patterns within a given country are influenced by larger global forces such as migration. Although this trend of increasing non-communicable disease is occurring in what may seem a world away, these changing morbidity and mortality patterns in LMICs in Sub-Saharan Africa have implications for health patterns in

high-income countries like the U.S. The avenue through which what is happening in Sub-Saharan African countries affects the U.S. is immigration. Between 2001 and 2006, immigration contributed to at least 20% of the growth in the U.S. black population (Kent 2007). Further, foreign-born Africans represent one of the fastest growing immigrant groups in the U.S., increasing by 166% in just a decade between 1990 and 2000 (Capps et al. 2012). Because African immigration into the U.S. is increasingly a major contributor of the ethnic variation in the U.S. black population, the rapid epidemiologic transition occurring in Sub-Saharan Africa will be a major force impacting both the composition and health profile of the U.S. black population. Specifically the growth in African immigrants in the U.S. has important implications for current understandings of racial/ethnic health disparities in the U.S. (Read and Emerson 2005).

Although scholarship exploring ethnic heterogeneity within the U.S. black population and various health outcomes has increased in recent years (e.g. Dagadu and Christie-Mizell 2014; Griffith et al. 2011; Ida and Christie-Mizell 2012; Read and Emerson 2005; Williams et al. 2007), the majority of studies still portray the U.S. black population as homogeneous. While there are important commonalities in the black experience (e.g., shared history of slavery; historic and contemporary experiences of racism and discrimination), there is significant variation within this group that may predict diversity in health status, including risk for non-communicable disease (Williams and Jackson 2000; Williams et al. 2007). For instance, with respect to socioeconomic characteristics, African immigrants tend to have higher educational attainment, higher levels employment, and higher rates of marriage compared to Caribbean Blacks, who in turn, are more likely to have to have higher educational attainment, higher levels employment, and higher rates of marriage compared to their native-born black counterparts

(Griffith et al. 2011; Ida and Christie-Mizell 2012; Kalmijn 1996; Kent 2007; Williams et al. 2007). The selectivity of African immigrants is due in part to the way they enter the U.S. Over 20% of recent African legal immigrants enter the U.S. through the diversity visa program, which is designed to admit immigrants from countries not well represented in the U.S. The program tends to attract well-educated and highly skilled African immigrants. The difficulty, high costs, and lengthy distance Africans face to enter the U.S. favors immigrants with exceptional ability, persistence, and resources (Kent 2007).

Despite representing one of the fastest-growing immigrant groups in the U.S., the health needs and practices of black Africans in the U.S. remain poorly characterized compared to other immigrant groups (Capp et al. 2012; Venters and Gany 2009). As a consequence, compared to their Latino or Asian counterparts, African immigrants are noticeably absent in policy considerations surrounding the immigration and healthcare debates. For now, prevailing understandings of health between immigrant and native-born residents in the U.S. focus on the healthy immigrant effect (Antecol and Bedard 2006; David and Collins 1997; Elo et al. 2008; Hamilton and Hummer 2011; Hummer et al. 1999; Singh and Siahpush 2002). The healthy immigrant effect describes a pattern observed among many researchers where immigrants arrive in the U.S. with a health advantage over their native-born counterparts. The research shows that black immigrants have lower morbidity and mortality rates, and more favorable self-reports of health than native-born blacks. In fact, across some indicators of health, black immigrants look more similar to U.S.-born whites than U.S.-born blacks. However, this health advantage dissipates over time; the longer immigrants are in the U.S. the closer their health profiles converge to that of their racial/ethnic native-born counterparts (Antecol and Bedard 2006; Goel et al. 2004; Venters and Gany 2009; Read et al. 2005). Furthermore, with a few exceptions (Read

and Reynolds 2012), much of the research on immigrant health has not differentiated between the experiences of men and women. Although African women are closing the gap, African migration to the U.S. is still predominantly a male enterprise.

Ultimately, while this line of research on the healthy immigrant indicates that black immigrants come to the U.S. with better health profiles than native-born blacks, this trend may shift as sending African countries like Ghana experience rapid increases in non-communicable conditions over the next decades. As the growing African immigrant population assimilates to U.S. society, the number of men and women within the U.S. black population disproportionately affected by non-communicable diseases will likely also increase unless research is available to inform policies and intervention efforts. This study is an important step in addressing this research challenge.

Research Questions

In this dissertation, I take on the issues arising from the global increase in non-communicable diseases by engaging literature on social stratification to examine the socioeconomic and gender disparities in non-communicable disease trends in two contexts: Ghana, a significant low-middle income country (LMIC) of origin for African immigrants in the U.S. and the U.S. a major high-income destination country for immigrants of Sub-Saharan African countries. I focus on these two geographic locations for three key reasons. First, as an LMIC that is increasingly influenced by globalization, Ghana is currently facing unprecedented increases in non-communicable diseases (Agyei-Mensah and de-Graft Aikins 2010). Second, Ghanaians represent one of the largest and most established African immigrant groups in the U.S. (Capps et al. 2012). According to Census data, for over three decades, Ghana has

consistently been among the top five countries of origin for African immigrants in the U.S. (Gambino et al. 2014). Understanding the context from which Ghanaians come to the U.S. is critical to guiding intervention efforts in both Ghana and the U.S. Third, Ghana shares a long history of close and strong relations (political, economic, developmental, financial aid) with the U.S. (Cook 2009). Understanding the contextual underpinnings of this interrelationship is critical to guiding health policy interventions in the U.S. that are more inclusive of African immigrants as well as guiding national health policies in Ghana that are more inclusive of non-communicable diseases.

Using Ghana and the U.S. as my two cases for this study, I develop two main research questions to better understand gender and socioeconomic determinants of non-communicable disease in these respective origin and destination countries.

1. a. What is the relationship between socioeconomic status (SES) and non-communicable disease outcomes in Ghana?

   b. Does this relationship in 1(a) vary by gender?

2. a. What is the relationship between African immigrant status and non-communicable disease outcomes in the U.S.?

   b. Does this relationship in 2(a) vary by gender?

While question 1(a-b) examines the stratifying role SES and gender play in an origin country like Ghana, question 2(a-b) examines gender differences in the healthy immigrant effect among African immigrants in the U.S. As such, the data I employ to explore these questions are derived from two sources, both of which are survey data. For question 1(a-b), I utilize Ghana specific data from the World Health Organization Study on Global AGEing and Adult Health (SAGE): Wave 1, 2007-2008. For question 2(a-b), I utilize 10 years (2003-2012) of the National Health

Interview Survey (NHIS). Furthermore, in my analyses, I focus on two non-communicable diseases: diabetes and hypertension, which are important causes of morbidity and mortality in both high-income countries and LMICs. Diabetes is characterized by abnormally high levels of blood glucose due to a deficiency in the production of insulin by the pancreas or the ineffectiveness in the use of the insulin produced (CDC 2011). The focus of my studies is on type 2 diabetes, which accounts for well over 90% of all diabetes cases in Sub-Saharan Africa (Hall et al. 2011). Hypertension, also known as high blood pressure, is characterized by high force of blood pushing against the walls of blood vessels over an extended period of time (WHO 2013). Another major reason for my focus on diabetes and hypertension is that while serious on their own, both often lead acute life-threatening conditions like heart attack, stroke, and kidney failure.

My dissertation is comprised of three separate but related articles that examine gender and SES determinants of diabetes and hypertension in Ghana and the U.S. The first paper addresses question one by examining the interaction between SES and gender in predicting diabetes in Ghana. The second paper addresses the same question but for hypertension. The third paper addresses the second question by examining gender differences in both diabetes and hypertension outcomes among African immigrants and native-born blacks in the U.S.

Significance and Contributions of this Dissertation: The Health Equity Lens

A health equity lens provides two critical insights to this dissertation's examination of SES, gender, and non-communicable diseases in an origin LMIC experiencing rapid morbidity and mortality transition like Ghana and a destination high income country experiencing increased numbers of African immigrants like the U.S. First, a health equity lens provides practical

guidance on the operationalization of the concept as well as possible analytic strategies for conducting research given survey data as is the case for this dissertation. Like most abstract constructs, health equity cannot be directly measured; however, scholars such as Braveman and Gruskin (2003) have operationalized health equity based on measurable criteria: equity in health is the absence of systematic differences or disparities in health outcomes and/or key social determinants of health between social groups who have different levels of underlying social advantage/disadvantage; i.e., occupy different positions in a social hierarchy based on power, wealth, and/or prestige. Thus, variations in health inequities when they meet all three of the following criteria: 1) systematic; 2) socially produced; and 3) unfair (Whitehead and Dahlgren 2006). Systematic differences in health means that differences are significant and persistent, not distributed randomly. Socially produced means that there are no genetic or biological bases for differences in health. Rather, such differences are a product of social structures and processes (Braveman and Gruskin 2003).

In addition to operationalizing health equity, scholars have also proposed ways to assess health equity in quantitative research studies similar to the current investigation. There are three main components to the method. The first component to assessing health equity is to have an indicator of health or a modifiable determinant of health. In the current investigation, whether or not one was diagnosed with diabetes and hypertension will be used as the indicators of non-communicable disease health. The second component is to include an indicator of social position, i.e., a measure of social stratification such as SES, gender, race, ethnicity, or geographic location. In this dissertation, I examine both SES and gender. The third component for assessing health equity is to have a method for comparing the health indicator across difference social strata, such as a ratio of rates of the health indicators across the least and most advantage groups.

In this investigation, I compare the odds of diabetes and hypertension between men and women in Ghana and the U.S. In addition to these three elements, it is also important to examine changes over time in rate ratios if feasible and to conduct multivariate analyses in the overall sample as within strata to identify factors warranting attention through further research and action (Braveman 2006). While the data employed in this paper do not currently allow for consideration over time, they do allow for multivariate analyses in the overall sample as well between men and women in order to assess whether the association between SES and diabetes differ by gender.

Finally, and perhaps more importantly, a health equity lens provides guidance on interpretation and contextualizing findings so as not to recreate disparities. A health equity lens is attuned to the fact that different social, economic, political and cultural contexts require different ways of defining and explaining equity (Braveman and Gruskin 2003:256). As noted above, the epidemiologic transition theory focuses on macro level mechanisms and has not often considered the possibility that different groups within the same country go through different transitions. What the above discussion on SES in high-income and LMICs has shown is that different groups within the same country are impacted by transitions in different ways depending on factors like SES and gender. Within the health equity literature, the "highest attainable standard of health" typically means the standard of health enjoyed by the most socially advantaged group within a given society (Braveman 2006; Braveman and Gruskin 2003). As such, equity in health implies (re)distributing resources in ways most likely to move towards equalizing the health outcomes of disadvantaged groups with the outcomes of their more advantaged counterparts (Braveman and Gruskin 2003). In his influential piece, Caldwell (1986) points out that countries such as Sri Lanka, Costa Rica, and the Indian state of Kerala achieved low mortality despite their predominantly poor populations. Caldwell credits improvements in

the position of women and children, education (especially educating girls), a vibrant political sector that values egalitarianism, the building of health care systems and the provision of health services as the routes though which poorer countries can achieve low mortality. His findings, along with the findings of numerous scholars afterwards (Hosseinpoor et al. 2012; Hurt et al. 2004; Kuhn 2010; Marmot 2007), suggest that strategies that equitably distribute health and life affirming resources such as education in a population can lead to low mortality even within poor countries. Ultimately, by taking a health equity orientation, this dissertation (1) highlights the importance of stratifying factors like SES and gender in our understanding disease and mortality patterns in both LMICs and high income countries and (2) pushes the boundaries of current understandings of the health immigrant effect by taking the context of increased non-communicable diseases in LMICs like Ghana into account.

CHAPTER II

Socioeconomic Determinants of Diabetes among Ghanaian Women and Men: Implications for a Country in Transition

Introduction

What is the relationship between socioeconomic status (SES) and diabetes in low-middle-income countries experiencing the epidemiologic transition? Does this relationship vary by gender? Like many African countries in Sub-Saharan Africa (SSA), the current epidemiologic profile of Ghana consists of a double burden of disease where communicable diseases like malaria coexist with non-communicable diseases like diabetes (Agyei-Mensah and de-Graft Aikins 2010). According to the World Health Organization (WHO), non-communicable diseases account for approximately 41 % of all deaths in Ghana, communicable diseases for about 51 %, and injuries account for the remaining 8 % (WHO 2014). In total numbers, non-communicable diseases result in approximately 80,000 deaths in Ghana each year (Bosu 2013).

Among non-communicable diseases, diabetes has emerged as an important cause of morbidity and mortality in Ghana (Danaei et al. 2011; Levitt 2008; Mbanya et al. 2010; Shaw et al. 2010). The focus of this paper is on type 2 diabetes (hereafter "diabetes), which accounts for well over 90% of all diabetes cases in Sub-Saharan Africa (Hall et al. 2011). Diabetes, a chronic condition caused by a deficiency in the production of insulin by the pancreas or the ineffectiveness of the insulin produced, is characterized by abnormally high levels of blood glucose (CDC 2011). Diabetes wreaks havoc on vital organs, nerves, and blood vessels, leading

to extensive complications including heart disease, stroke, kidney failure, respiratory diseases, non-traumatic limb amputations, and blindness (CDC 2011).

In Ghana, what few studies are available indicate that diabetes has steadily increased from an early recorded prevalence of less than 1% during the late 1950s to almost 10% in 2009 (Amoah et al. 2002; de-Graft Aikins 2013; de-Graft Aikins 2007; Dodu and de Heer 1964). Ghana currently lacks sufficient infrastructure to effectively address non-communicable diseases like diabetes. As a result, the economic and interpersonal costs of diabetes and its numerous complications for both patients and family members are massively expensive. For instance, the 2007 monthly cost of treating diabetes ranged from $106 to $638, while the monthly cost of treating diabetes complications such as dialysis for end stage renal failure was $1,383. Meanwhile, the minimum daily wage in Ghana during 2007 was $2 and the average monthly salary for a civil servant was $213 (de-Graft Aikins 2007).

Attempts to explain the growing diabetes burden in countries like Ghana have often looked to the epidemiologic transition theory (Omran 1971/2005). The theory posits that as populations move away from traditional lifestyles and become industrialized, economically developed, and technologically dependent, morbidity and mortality profiles also transition from high infectious/communicable diseases to high chronic/non-communicable diseases. As originally articulated by Omran (1971/2005), "the theory of the epidemiologic transition focuses on the complex change in patterns of health and disease and on the interactions between these patterns and their demographic, economic and sociologic determinants and consequences" (732). Much of the scholarly focus on identifying the determinants of the transition from infectious to chronic diseases have been on macroeconomic factors (e.g., gross domestic product) to the detriment of meso and micro socioeconomic and cultural determinants of morbidity and

mortality transitions. In this paper, I use the case of Ghana, a low-and middle-income country (LMIC) sub-Saharan African country in transition, to explore if and how an individual's socioeconomic status (SES) affects odds of diabetes. Additionally, I explore whether SES's impact on diabetes varies by gender.

This study contributes to the sociological literature on SES and health in three important ways. First, although much work has been conducted on SES and non-communicable health outcomes in high-income countries like the U.S., less is known about how SES operates in LMICs like Ghana that are experiencing major transitions in their morbidity and mortality profiles. Studies in high income countries examining SES and non-communicable disease outcomes like diabetes have consistently found a negative relationship such that those of lower SES are more likely to develop and die from these conditions compared to their more affluent counterparts (Braveman 2006; Phelan et al. 2010; Williams and Collins 1995). While SES has also been found to be a primary contributor to health in LMICs like Ghana, the association has been described through the reversal hypothesis, which states that in LMICs, high SES is associated with high morbidity and mortality from NCDs; that is, the opposite of the SES-gradient observed in high-income countries like the U.S. (Akarolo-Anthony et al. 2014; Addo et al. 2009; Pampel et al. 2012; Ploubidis et al. 2013). A major goal of this paper is to test this hypothesis using Ghana as the LMIC case.

Second, whether the positive association between SES and non-communicable disease outcomes described by the reversal hypothesis varies by gender has not been considered in the extant literature. Across countries, women tend to live long but sicker lives than men (WHO 2009; Waldron 1983a; Waldron 1998, Yin 2007). Factors that researchers have noted influence gender differences in mortality include biological factors such as hormonal influences on

physiology (Rogers et al. 2010; Waldron 1983b), in addition to non-biological factors such as environment; and health behaviors (Courtenay 2000a; Luy 2004; Yin 2007). Like SES, gender is an important stratifying factor that influences health outcomes like diabetes (Acker 2004; Charmaz 1995; Courtenay 2000b; Griffith 2012; Risman 2004; Rogers et al. 2010). As such, a major contribution of this paper is to test the reversal hypothesis by gender.

Furthermore, sociologists point to the social construction of health and gender as occurring in concert with other forms of stratification (Brown 1995; Nettleton 1995; Waldron et al. 1998). Most notably, black feminist perspectives emphasize the structuring role gender plays in the lives of women and men as well as its intersection with race and class (Collins 1990/2008; Crenshaw 1991; Brown and Hargrove 2013). SES both constrains and enables certain forms of gendered social action and influences women's and men's health behaviors. Through gender socialization, women and men are often ascribed certain roles and responsibilities within their families and communities that impact their health outcomes. Although politically a constitutional democracy, Ghana's socio-cultural context remains predominantly patriarchal (Sossou 2011). Consequently, Ghanaian men and women occupy social statuses, roles, and engage in behaviors that differentially impact their risk for non-communicable conditions like diabetes. For instance, Ghanaian norms are more tolerant of smoking and drinking—both significant risk factors for diabetes (Baliunas et al. 2009; Zhang et al. 2011)—among Ghanaian men than among Ghanaian women. As such, this study seeks to further clarify how gender interacts with SES to predict history of diabetes in Ghana.

Finally, although the epidemiologic transition theory provides an important framework to understand the pattern of increasing diabetes in Ghana, its tendency to focus on macro/country level determinants often ignores the role more micro/individual level (e.g., gender) meso level

factors (e.g., community involvement) play in morbidity and mortality transitions. By examining the socioeconomic determinants of diabetes among men and women in Ghana, I provide new insights into how socially stratified groups within a country may be experience the epidemiologic transition differently.

Figure 1. Map of Ghana in Africa

Background

The LMIC Case of Ghana

Ghana. I selected Ghana (Figure 1) as an important case to examine the association between SES, gender and diabetes for four key reasons. First, Ghana is rapidly transitioning from

a traditional agricultural society to an industrialized urbanized society with concomitant changes in the non-communicable disease morbidity and mortality profile of its population (Agyei-Mensah and de-Graft Aikins 2010; Minicuci et al. 2014). This transition is challenging previous conceptions of class and gender. While there is some scholarship examining how this transition is affecting diabetes outcomes by gender (Amoah 2003) or SES (de-Graft Aikins 2013), few have examined them together. Second, Ghana's location as an LMIC in sub-Saharan Africa makes it a compelling case because LMICs in that region are projected to see the most rapid increase in non-communicable diseases like diabetes over the next two decades (Abegunde et al. 2007; Dalal et al. 2011; Stuckler 2008; Unwin et al. 2001; WHO 2006). In 2004, 25% of all deaths in sub-Saharan Africa were due to non-communicable diseases; this percentage is expected to rise to about 46% by 2030 (WHO 2006). Third, the aging sub-Saharan African population is a major factor in the increased prevalence of diabetes in the region (Mbanya et al. 2010). The current population of adults in sub-Saharan Africa aged 60 years and above is 4.9% and expected to increase to 7.6% by 2050. Ghana's population is older than this regional average with 6.5% adults 60 years and older currently, increasing to 8.9% by 2050 (Minicuci et al. 2014). Despite its growing number of older adults, Ghana has paid little attention to health and health care needs of this population (Minicuci et al. 2014; Parmar et al. 2014). Unless the country can adequately respond to changing demographic and epidemiologic realties, Ghana's higher than average aging population means diabetes will pose significant challenges for its health system and other social institutions strained by diabetes care (e.g., the family) in the coming decades.

Finally, Ghana has historically served as a pioneering example for other sub-Saharan African countries. In 1957, Ghana (formerly the Gold Coast) became the first African country to declare independence from its European colonizer, Great Britain. Due to its pioneering

achievement, Ghana became a symbol of black achievement, influencing other African independence movements. How Ghana decides to address its increasing burden of non-communicable diseases will have implications for similarly situated African countries.

Guiding Frameworks: The Epidemiologic Transition & the Reversal Hypothesis

The epidemiologic transition theory (Omran 1971/2005) and its critiques (Agyei-Mensah and de-Graft Aikins 2010; Frenk et al. 1989) provide an important orienting framework for this study. The epidemiologic transition theory offers important but limited insight into understanding morbidity and mortality transitions that LMICs like Ghana are currently facing. As articulated by Omran (1971/2005), the hallmark of the epidemiological transition is the displacement of infectious or communicable diseases with chronic non-communicable diseases as the primary causes of morbidity and mortality. The theory posits communicable diseases as the main cause of death in low-income developing countries and non-communicable diseases as the main cause of high-income developed countries. Relying primarily on data from industrialized/high-income countries, Omran (1971/2005) presented three successive stages of transition: 1) the age of pestilence and famine when mortality is high and fluctuating with average life expectancy hovering between 20 and 40 years; (2) the age of receding pandemics when mortality declines progressively and life expectancy increases from about 30 to 50 years; (3) the age of degenerative and man-made diseases when mortality continues to decline and eventually approaches stability at a relatively low level and life expectancy exceeds 50 years.

As alluded above, the epidemiologic transition theory is not without limitations (Agyei-Mensah and de-Graft Aikins 2010; Dagadu and Patterson 2015; Frenk et al. 1989). For purposes of this study, I focus on two. First, the epidemiologic transition theory essentializes the

experiences of high-income industrialized countries. Despite structural and contextual differences in the morbidity and mortality transitions of LMICs compared to high income countries, much of the evidence Omran offered in support of the epidemiologic transition theory relied heavily on perspectives that hold the experiences of western industrialized countries as normative (Agyei-Mensah and de-Graft Aikins 2010; Avilés 2001; Caselli et al. 2002; Frenk et al. 1989; Gaylin and Kates 1997). The extent to a framework scholars have described as Eurocentric (e.g., Avilés 2001; Caselli et al. 2002; Gaylin and Kates 1997) applies to the experiences of LMIC like Ghana is still up for debate. Ultimately, "the expectation that various developing countries including African countries go through stages and transitions in population structure and health shaped by changes in fertility and mortality by cause of death as they progress toward fuller industrialization as it was documented in now-developed countries of Europe and North America, has not been materialized in many African countries and regions over the last 60 years" (Defo 2014:10).

The second limitation of the theory is that it does not consider if and how stratifying factors such as socioeconomic status and gender may impact certain groups within countries experience the epidemiologic transition. Instead, the theory emphasizes structural or macro-level factors such as industrialization as the primary drivers of morbidity and mortality transitions (Omran 1971/2005). These macro-level factors, which speak to the structural changes that occur as societies moved from agrarian to more industrial societies, are important and necessary to understanding morbidity and mortality transitions. At the same time, a singular focus on industrialization ignores stratification by gender and SES. For example, scholars examining the epidemiologic transition in Ghana have implicated many communities' preference for western foods, cultural products, and technology (Agyei-Mensah and de-Graft Aikins 2010; Prentice

2006) in the country's growing non-communicable disease trend. Scholars have linked such preferences changing behavioral practices that increase the risk of diabetes; namely, diets high in saturated fat, salt, sugar, and physical inactivity (Abubakari et al. 2009; Agyei-Mensah and de-Graft Aikins 2010; Amoah 2003; de-Graft Aikins 2007; Prentice 2006). Access to western foods and lifestyles varies by ones social position and gender with those of high SES and women most at risk (de-Graft Aikins 2013; Prentice 2006). Ultimately, there are accompanying changes that industrialization introduces to groups stratified by SES and gender that have important implications for non-communicable disease outcomes like diabetes.

The Reversal Hypothesis: Considering SES and Gender

Socioeconomic Status. Given the epidemiologic transition theory's limitations, I engage literature on social stratification with a focus on socioeconomic status and gender to guide my study on diabetes in Ghana. Socioeconomic status (SES) is a key independent variable in most sociological research owing to the influence of early sociological theorists such as Karl Marx and Max Weber. Marx attempted a comprehensive theory of social stratification, emphasizing ownership of property as the primary basis for class distinction (Marx 1848). Heavily influenced by his predecessor, Weber expanded on Marx's view of social stratification beyond economic ownership with his three component theory of social stratification. Weber's multidimensional view of social stratification focused on class, status, and party/power (Gerth and Mills 1946) and the extent to which these factors influence individuals' life chances, i.e., their access to important societal resources such as food, shelter, and clothing as well as more intangible resources such as education and health.

Weber's articulation of social stratification remains influential among contemporary sociologists (Williams and Collins 1995). Today, sociologists often use "socioeconomic status" to capture Weber's three-pronged articulation of social stratification. Although there are variations in indicators used to measure SES, the most commonly included are educational attainment, income, and occupational prestige (Williams and Collins 1995; Preston and Taubman 1994). While closely related, education, income, and occupation tap into different dimensions of SES that are important for health. Specifically, education taps into availability of information/knowledge and with cognitive skills. Income signals the amount of resources available to purchase health-related goods and services. Finally, occupation indicates a variety of physical and psychosocial features of the workplace/employment (Preston and Taubman 1994).

Today, much of the theorizing and research examining the association between SES and non-communicable disease outcomes have focused on the experiences of high-income countries like the U.S., which, because of their earlier transition to high morbidity and mortality from non-communicable diseases, have a longer history documenting experiences with these conditions (Link and Phelan 1995; Phelan et al. 2010; Preston and Taubman 1994; Williams and Collins 1995). In high-income countries, a well-documented finding in social science research is the SES-health gradient whereby low income, low education, and low occupational status are associated poorer health outcomes across various conditions (Adler et al. 1994; Boykin et al. 2011; Braveman et al. 2010; Williams et al. 2010). Because SES impacts multiple health outcomes and involves access to resources that can be used to avoid risks or to minimize the consequences of disease once it occurs, it has been described as a fundamental cause of morbidity and mortality as well health inequities (Link and Phelan 1995; Lutfey and Freese 2005; Phelan et al. 2004). According to Link and Phelan's fundamental cause theory (1995) SES

is a fundamental cause because it encapsulates resources like knowledge, money, power, prestige, and social connectedness that are transportable from one situation to another; as health-related situations change, those who command the most resources are best able to avoid risks, diseases, and the consequences of disease. As populations transition from one dominant cause of morbidity and mortality to another, people of higher SES are more favorably positioned to know about new health risks and have the resources to avoid these risks or to minimize the consequences of disease once it occurs (Link and Phelan 1995; Phelan et al. 2004).

The Reversal Hypothesis. While SES has also been found to be a primary contributor to health in LMICs, the association between SES and non-communicable conditions like diabetes and key risk factors like obesity have not been as consistent in LMICs as documented for high-income countries (Addo et al. 2009; Akarolo-Anthonly et al. 2014; Pampel et al. 2012; Ploubidis et al. 2013; Sodjinou et al. 2008). There is what has been called the reversal hypothesis (Pampel et al. 2012), which states that in LMICs, high SES is associated with high morbidity and mortality from non-communicable diseases; that is, the opposite of the SES-gradient observed in high-income countries like the U.S. More specifically, the reversal hypothesis, states that the association between SES and non-communicable conditions like diabetes is initially positive and then over the course of the epidemiologic transition reverses to being negative (Pampel et al. 2012; Subramanian et al. 2013). Explanations for the reversal hypothesis includes the social environment of risk factors and cultural values. With respect to the social environment, the reversal hypothesis suggests that in low-income countries, risk factors such as obesity and physical inactivity are relatively uncommon due to food shortages and the need to engage in physical labor to eat and live. Because food insecurity in LMICs means lack of any food and economies are not fully industrialized, it is only high SES groups that can afford excess calories

to consume and/or remain physical inactive. Conversely, in high-income countries, food insecurity often means lack of access to nutritiously healthy food. Because the social environment in high-income countries is such that the economy is based primarily on service and technological industries, access to high calorie foods and minimum physical labor are more readily accessible to low SES groups (Pampel et al. 2012).

The second explanation for the reversal hypothesis focuses on cultural values within a given society. Cultural values explanation highlights how factors such as excess symbolize higher status in LMICs. For instance, in Nigeria—an LMIC located near Ghana—some ethnic groups encourage fattening of women in preparation for marriage and childbearing, believing that such fattening encourages fertility (Akarolo-Anthony et al. 2014). Research in Ghana has linked obesity in women to factors such as multiple child births due in part to cultural pressures to eat fatty foods and avoid strenuous activity during breastfeeding (de-Graft Akins et al. 2010). Further, excess weight in LMICs like Ghana where weight loss is often associated infectious diseases like HIV/AIDS, malaria, and tuberculosis, is largely seen as a sign of health as well as beauty (de-Graft Aikins 2013; Prentice 2006). Ultimately, the reversal hypothesis asserts that in LMICs, sections of the population that undergo rapid social development (i.e., experience transitions) may also be at increased risk for non-communicable diseases like diabetes compared to people of lower SES (Addo et al. 2009; Pampel et al. 2012).

Gender. While the reversal hypothesis provides insight to assessing the relationship between SES and diabetes in Ghana, there has been a dearth of attention in the literature about the role of gender on non-communicable disease outcomes in LMICs in transition. Like SES, gender is a major component of social interactions and a determinant of access to resources. Compared to women, Ghanaian men occupy a dominant status in most social spheres (Adinkrah

2012). Because Ghana is predominantly patriarchal, power relations between men and women are asymmetrical, creating unequal access to and utilization of resources within and outside the household (Dixon et al. 2014). For instance, women in Ghana have limited access to critical resources such as land, labor, and credit (African Development Fund [ADF] 2008).

Despite legal frameworks derived from the Ghanaian Constitution's prohibition of discrimination based on gender (ADF 2008), cultural norms around gender create expectations of women acquiescing to men (Akinkrah 2012). The fulfillment of the domestic role—household work, cooking, and childcare, are regarded as the primary obligations of women regardless of whether they work outside the home and earn higher incomes than men (Adinkrah 2012). The economic and social standing of Ghanaian women is still often tied to their husbands', fathers', and/or other male relatives' social standing. For instance, in the context of subsistence farming, men often have access to and take custody of their wives earned proceeds and financial income because they are regarded at household decision makers (Buor 2004; Dixon et al. 2014).

At the same time, the incremental strides that women are making in Ghana are changing gender dynamics and disturbing traditional male roles and patriarchal identity as household breadwinners (Dixon 2014; Adomako Ampofo and Boateng 2007). For Ghanaian men, successful masculinity is often measured by the ability to meet the material needs of wives, children and other family members. "Men generally lose face and become socially stigmatized within the family and community whenever there is a significant role reversal, with the woman as the economic provider" (Adinkrah 2012: 475). Although seeking financial assistance is acceptable as a last resort, Ghanaian men's ability to find solutions to economic difficulties is often seen as a sign of independence and personal strength. Ultimately, as a society, Ghana

places high expectations and pressure on men to succeed economically as an important way of confirming their masculinity.

Ghana's gendered constructions of what it means to be a man or woman have important implications for health outcomes. Unfortunately, there is a dearth of research that specifically examine diabetes by gender in Ghana. The studies that have examined diabetes have generally found higher rates among Ghanaian men (Amoah et al. 2002, Addo et al. 2009, Hall et al. 2011). Similar to economic hardship, diabetes can cause serious disruptions in the social identities and roles of Ghanaian men and women. Scholars have found that Ghanaian men experiencing sexual dysfunction or other complications such as loss of limbs, eyesight, and disabilities struggle to manage their lost or diminished masculine identities (Owiredu et al. 2012; de-Graft Aikins et al. 2013). These diabetes complication also cause disruptions in men's ability to work and fulfill their provider role.

Ghanaian women are six times more likely than Ghanaian men to be obese, a significant risk factor diabetes (Prentice 2006). Moreover, when family members do become chronically ill, it is the primary responsibility of women to provide care (Addai and Adjei 2014). Existing literature has found that attending to the needs of chronically ill family members in non-institutionalized settings precipitates declines in in the caregivers' own health and well-being (Addai and Adjei 2014; de-Graft Aikins 2006; Read et al. 2009). This burden of care for non-communicable diseases disproportionately effects Ghanaian women (Addai and Adjei 2014). Not surprisingly, scholars have found that Ghanaian women perceive their health status more negatively than men (Addai and Adjei 2014).

Summary and Hypotheses

While the literature on the epidemiologic transition, SES, and gender in high income countries is robust, there is less scholarship connecting these areas to examine how SES affects men and women in LMICs experiencing morbidity and mortality transitions. In this paper, I bridge these areas by investigating the relationship between SES and diabetes among Ghanaian men and women. Current understandings of SES and non-communicable diseases in LMICs favor the reversal hypothesis, which posits a positive relationship between SES and health such that those of high SES experience higher rates of non-communicable diseases like diabetes because of their ability to afford foods and lifestyles that put them at higher risk for these conditions as well as socio-cultural norms that view excess weight as a symbol of status. Using Ghana as its LMIC case, this paper tests the reversal hypothesis to see whether there is a positive association between SES and diabetes. As such, I hypothesize that:

Hypothesis 1 (a-c): High SES—(a) education; (b) occupational status; and (c) income—will increase the odds of diabetes.

Further, given the patriarchal structure and gender norms in Ghana, I explore whether hypotheses 1 (a-c) to varies by gender. In the models I develop below, I control for factors that vary among men and women living in Ghana that prior studies have sown are associated with diabetes; including age, marital status, weight, alcohol use, smoking status, physical activity, community resources such as social cohesion, and health system measures such as health insurance status and health care responsiveness.

Data and Measures

Data

The analyses for this study are based on data from Wave 1 of the World Health Organization Study on Global Ageing and Adult Health (SAGE). SAGE is a series of longitudinal studies following a cohort of adults that WHO conducts in six countries of which Ghana is one. The succinct goal of SAGE is to strengthen, gather, process and manage data on older persons to respond to identified needs via policy, planning, and research. The sampling design aimed to obtain a nationally representative cohort of adults aged 50+ years, with a smaller cohort aged 18-49 for comparison. Built on the experience and standardized instruments of the WHO's 2000/2001 Multi-country Survey Study and the 2002/2004 World Health Surveys, SAGE aims to address data gaps on aging, adult health and well-being in lower and middle income countries (LMICs) so as to achieve nationally representative surveys that are comparable to those in higher income countries; e.g., the Health and Retirement Survey in the U.S. (Biritwum et al. 2013; Chatterji et al.2013).

The topics covered by SAGE Wave 1 are especially suited for the current investigation examining diabetes, SES, and gender in Ghana. Respondents answered questions about their household and related characteristics, individual socio-demographics, income and work history, perceived health status (i.e., self-rated health, risk factors and preventative health behaviors, chronic conditions (including diabetes, hypertension, stroke, and heart disease), health services coverage, health care utilization, subjective well-being and quality of life, and social networks (Biritwum et al. 2013). A total household population of 27,988 was drawn from 5,266 households. Those aged 50 years and older comprised 21% of the household population.

Households were spread evenly between rural and urban localities. For this dissertation analysis, there was a total sample size of 4,219 respondents with 2,002 women and 2,217 men.

Measures

Diabetes. The dependent variable of this study is diabetes. I used a single item where respondents were asked whether they had had ever been diagnosed with diabetes or high blood sugar (not including diabetes associated with pregnancy). I coded "Yes" responses as 1 to indicate presence diabetes and coded "No" responses as 0 to indicate absence of diabetes.

Socioeconomic Status & Gender. Socioeconomic status (SES) is my key independent variable. I used education, employment status, and income as my three measures of SES. Education was measured as years of school attended. I coded employment status as 1 for respondents who responded "Yes" to currently working and 0 for those who responded "No" (working part-time, unemployed or not in the labor force). SAGE measured income categorically as quintiles. I combined the quintiles to obtain a scale measure of income that ranged from 1: low income to 5: high income. Finally, with respect to gender, I coded females as 1 and compare them to males.

Sociodemographic Characteristics. Other socio-demographic variables I included in my analyses are age, marital status, urbanicity, region, and ethnicity. As mentioned above, Ghana's aging population is a major force in the prevalence of diabetes in the country, with diabetes prevalence increasing with increased life expectancy (Ayernor 2012; Mbanya et al. 2010; Minicuci et al. 2014). Age is measured in years, including adult respondents aged 18 years and above. With marital status, I compared those who are married or cohabitating (1= Yes) to those who are single, divorced, separated, or widowed.

Urbanicity and Region. Factors at the macro level that may impinge on the odds of diabetes include urbanicity and region of residence. Ghana is currently undergoing rapid urbanization, with an overall urban growth rate of about 4.6% (compared to a sub-Saharan average urban growth rate of 3%) (Owusu and Agyei-Mensah 2011; Mbanya et al. 2010). Studies indicate that urban dwellers are more susceptible to diabetes risk factors such as overweight, obesity and physical inactivity than their rural counterparts (Agyei-Mensah and de-Graft Aikins 2010; Danquah et al. 2012). At the same time, hospitals, clinics, and pharmacies are disproportionately concentrated in urban areas, with rural residents travelling great distances for health care and/or relying on traditional medicine and remedies (Dixon et al. 2011; Jehu-Appiah et al. 2011). While close to 79% of the urban population in Ghana have access to a health facility with a 30 minute distance, only 42% of the rural population has access (ADF 2008). In this study, I coded urban 1 and compare to respondents living in rural areas.

In addition to urbanicity, I also accounted for regional variations in diabetes. Ghana's 10 regions have different histories and resources that matter for diabetes outcomes. For instance, urbanicity and educational attainment varies widely across regions. Over 90% of residents in the Greater Accra region, 61% in the Ashanti region, 47% in the Central region, 45% in the Brong Ahafo region, 43 % in the Eastern region, 42% in the Western region, 34% in the Volta region, and 23% in the Northern/Upper regions live in urban areas (Ghana Statistical Service 2012). Further, while only 12% of residents aged 15 years and above in the Greater Accra region have never attended school, 20% in the Ashanti region, 21% in the Eastern region, 25% in the Central region, 26% in the Western region, 29% in the Volta region, 34% in the Brong Ahafo region, and 62% in the Northern/Upper regions 15 and older have never attended school (Ghana Statistical Service 2012. Furthermore, across all regions, a greater proportion of women have never

attended school compared to men (Ghana Statistical Service 2012). The Greater Accra region, where Ghana's capital is located, is not only the most urbanized and educated, it also attracts a disproportionate share of investments in health facilities and infrastructure to address conditions like diabetes (Agyei-Mensah and de-Graft-Aikins 2010; Owusu and Agyei-Mensah 2011). As such, I compare the Greater Accra region to the other regions: Ashanti, Brong Ahafo, Central, Eastern, Northern/Upper Regions, Volta, and Western in my analysis. Given their relatively low number of respondents and because the three northern regions in Ghana (Northern, Upper East, and Upper West) are the least urbanized and least developed by all socioeconomic indices (Owusu and Agyei-Mensah 2011; Aryeetey et al. 2013), I combined these three regions: Northern, Upper East, and Upper West.

Finally, I include ethnicity as a sociodemographic variable. Due to the newness of diabetes in Ghana's health profile, there are currently no studies that examine diabetes among Ghanaians by ethnicity. However, like gender and SES, ethnicity structures the lives of Ghanaians and influences living arrangements, kinship, and descent patterns—i.e., patrilineal or matrilineal (Tuller 2013) which may in turn influence diabetes outcomes. According to Ghana's 2010 Census, Akans, the only matrilineal group in Ghana, are also the largest ethnic group (48%), followed by the Mole Dagbon (17%), the Ewe (14%), Ga-Abangbe (7%), and other ethnic groups comprising the remaining 14% (Ghana Statistical Service 2012). The Akans, Ga-Abangbes, and Ewes reside mainly in the urban and southern regions of Ghana, while the Mole-Dagbon reside in the more rural and less developed northern regions (Awuah and Afrifa-Anane 2013; Dake et al. 2010). The other ethnic grouping consists of small minority groups that are spread across Ghana's regions. While there is a dearth of research on diabetes and ethnicity in Ghana, there have been studies examining ethnic differences in obesity—a significant risk factor

for diabetes. These studies have found higher obesity among Akan and Ga ethnicities (Amoah 2003; Dake et al. 2010). Given that few studies have taken ethnicity into consideration when examining diabetes among Ghanaians, this dissertation takes a small step in filling this gap. I included the four major ethnic groups in Ghana in my analysis: Akan, Ewe, Ga-Abangbe, Mole-Dagbon, as well as respondents selecting "Other" ethnicity. I compare the four major ethnicity to other ethnicities.

Risk and Protective Factors. SAGE, Wave 1 includes measures of risk and protective factors that research has shown matters for diabetes; specifically, weight, alcohol consumption, smoking/tobacco use, and physical activity. I used body mass index (BMI) as a measure of weight. SAGE includes both self-reported and measured height (in centimeters) and weight (in kilograms). Given the large number of unknown or unavailable self-reported height and weight, I used the more accurate measured height and weight values to first convert centimeters into meters and calculated respondents' body mass index using the formula (CDC 2015):

$$BMI = \frac{Weight(kg)}{Height(meters)^2}$$

I kept BMI as continuous rather than dividing it into dummy variables using the conventional cutoffs used in countries like the U.S. because research suggests that those cutoffs may be less meaningfully for LMICs like Ghana that have a shorter history with overweight and obesity compared to high-income countries (Sodjinou et al. 2008). Tobacco use measured respondents' current use of tobacco with the question: "Do you currently use (smoke, sniff or chew) any tobacco products such as cigarettes, cigars, pipes, chewing tobacco or snuff?" I coded "Yes" responses as 1 and compared to 0 or "No" responses. Similarly, alcohol consumption was assessed by asking respondents whether they had ever consumed a drink that contains alcohol (such as beer, wine, or spirits). Similar to tobacco use, I coded "Yes" responses to alcohol

consumption as 1 and compared to 0 or "No" responses. Physical activity was assessed by asking respondents: "In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities that causes a small increase in breathing or heart rate [*such as brisk walking, cycling or swimming*]?" I coded the variable to represent the number of days per week respondents engage in moderate physical activity.

Community Social Cohesion and Health Care Measures. Dating back to Durkheim, the relationship between social cohesion and specific health outcomes has been a major line of inquire in sociology (Bruhn 2009; Durkheim 1897/1979). Durkheim attributed differences in suicide rates to differences in social integration such that people with strong social ties had low suicide rates while those who were alienated had higher social rates (Durkheim 1897/1979). Today, scholars continue to find a protective effect of social cohesion across a number of non-communicable diseases including diabetes (Shaya et al. 2013) as well as conditions for which diabetes itself is a major risk factor such as heart disease (Kim et al. 2014) and stroke (Kim et al. 2013). For example, a study by Shaya and colleagues (2013) found that diabetic patients who participated in a social network intervention that included recruitment of peers, monthly educational sessions, and peer support experienced lower blood glucose, increased diabetes knowledge as well as more favorable weight and quality of life outcomes than the control group. The concept of social cohesion itself has been variously defined and has included other names such as social integration, social solidarity, and social networks (Bruhn 2009). In the SAGE, Wave 1 dataset social cohesion is best described as community or neighborhood social cohesion, which measures the level of trust or engagement an individual has for and with his/her community. Specifically, SAGE asked respondents about their social and political involvement in their respective communities. The nine item community involvement measure asked: "How

often in the last 12 months have you: attended any public meeting in which there was discussion of local or school affairs; met personally with someone you consider to be a community leader; attended any group, club, society, union or organizational meeting; worked with other people in your neighborhood to fix or improve something; had friends over to your home; been in the home of someone who lives in a different neighborhood than you do or had them in your home; socialized with coworkers outside of work; attended religious services (not including wedding and funerals); gotten out of the house/your dwelling to attend social meetings, activities, programs or event to visit friends or relatives?" I reverse coded, summed the items, and divided by 9 so that level of community involvement ranges from 1(low community involvement) to 5 (high community involvement). The Cronbach's alpha estimate is .78 for women and .80 for men.

Given the focus of this dissertation on a health care intensive condition like diabetes, I also included two measures that speak to access to health insurance as well as health system responsiveness. With respect to health insurance, SAGE asked respondents whether they had health insurance. I coded all "Yes" responses as 1 and compare to those respondents with no health insurance. Health system responsiveness measures include indicators of the interaction between individuals and their health system. SAGE collected information on respondents' impressions of their most recent inpatient and/or outpatient visit along seven dimensions, including waiting time, privacy/being treated respectfully, clear explanations/time for questions from providers, being involved in making treatment decisions, confidentiality or records, choice/happiness with providers, and cleanliness of the health facility. For each of these seven items, respondents were asked to rate health care responsiveness from 1(very good) to 5(very bad). I reverse coded, summed the items and divided by seven so that the items range from

1(very bad health system response) to 5(very good health system response). The Cronbach's alpha estimate is .63 for women and .65 for men.

Analytic Strategy

The main goals of this study were 1) to test the reversal hypothesis by investigating the relationship between three measures of SES (education, employment status, and income) and diabetes in Ghana and 2) to explore whether this relationship varies by gender. To accomplish these goals, I employed three analytic steps. First, I generated descriptive statistics for all study variables by comparing means and percentages for the whole sample and by gender (Table 1). Second, I conducted multivariate analyses using logistic regression to assess the relationship between diabetes and the variables of interest in seven models (Table 2). The first model was a baseline establishing the direct effects of sociodemographic variables (gender, age, ethnicity, and marital status) on diabetes. Next, I added risk and protective factors associated with diabetes; namely body mass index (BMI), alcohol use, tobacco use, and moderate exercise. Following this step, I added community, health system resources, and regional variables to the model, including social cohesion, health insurance, health system responsiveness, region of residence, and urbanicity. The fourth through seventh models included all variables from the previous models and added the three SES measures separately and then together. Thus, the fourth model includes only education; the fifth includes only employment status; the sixth includes only income; and the seventh model (full model) includes education, employment status, and income. These seven models together help establish the separate main effects of the variables of interest as well as how they operate together to impact the odds of diabetes. Finally, using statistical interactions, I tested whether the impact of the three measures of SES varied for women compared to men

(Table 3). My analyses were weighted to ensure representativeness and to account for the SAGE complex sampling design.

Results

Descriptive Findings

Table 1 presents means and percentages for all the variables used in this study. There is no significant difference between the 4.10% women and 3.11% of men who report diabetes. However, with respect to SES, there are significant gender differences among all three measures. Compared to Ghanaian men, Ghanaian women attain fewer years of education (3.94 years vs. 3.99 years), are less likely to be employed (67.98 % vs. 77.00 %), and have lower income status (2.98 vs. 3.13).

Table 1: Descriptive Characteristics (Means and Percentages) for Diabetes, Adults Aged 18+, WHO SAGE Ghana, Wave 1 (N=4,219).

	Females		Males		
Variables	**Mean /Per.**	**SD**	**Mean /Per.**	**SD**	**Sig.**
Non-Communicable Disease					
Diabetes	4.10	--	3.11	--	
Socioeconmic Status					
Education (years)	8.33	3.94	9.70	3.99	***
Employment Status					
Employed	67.98	--	77.00	--	***
Unemployed	30.67	--	20.97	--	***
Income (1:low to 5:high)	2.98	1.41	3.13	1.41	***
Sociodemographic Characteristics					
Age (years)	60.86	14.17	59.38	13.67	***
Ethnicity					
Akan	57.34	--	44.25	--	***
Ewe	6.59	--	5.86	--	
Ga Adangbe	10.34	--	9.34	--	
Mole Dagbon	7.59	--	9.65	--	*
Other Ethnicity	16.73	--	28.91	--	***
Marital Status					
Married	32.12	--	84.26	--	***
Single	2.70	--	2.80	--	
Divorced	20.23	--	7.13	--	***
Widowed	44.96	--	5.82	--	***
Risk & Protective Factors					
Body Mass Index (BMI)	24.28	6.97	22.86	5.76	***
Alcohol Use					
Alcohol	47.40	--	68.11	--	***
No Alcohol	52.55	--	31.75	--	***
Tobacco Use					
Tobacco	7.34	--	37.80	--	***
No Tobacco	92.61	--	62.07	--	***
Physical Activity					
Moderate Exercise	12.64	--	18.49	--	***
No Moderate Exercise	87.31	--	81.37	--	***
Social Cohesion & Health Care Measures					
Social Cohesion (1:low to 5:high)	3.39	.73	3.16	.75	***
Health Insurance Status					
Health Insurance	37.11	--	36.13	--	
No Health Insurance	62.89	--	63.87	--	
Health System Responsiveness (1:low to 5:high)	2.66	.55	2.74	.57	***
Region					
Ashanti	15.53	--	14.30	--	
Brong Ahafo	10.39	--	10.15	--	
Central	13.54	--	9.97	--	***
Eastern	13.19	--	11.10	--	*
Greater Accra	13.44	--	11.32	--	*
Northern/Upper Regions	10.39	--	22.33	--	***
Volta	9.59	--	8.16	--	
Western	13.94	--	12.67	--	
Type of Geographic Location					
Urban	46.00	--	37.35	--	***
Rural	54.00	--	62.65	--	***
Sample Size (N)	2,002		2,217		

*** p <.001 ** p <.01 * p <.05.

With respect to other sociodemographic variables, women are slightly older than men (60.86 years vs. 59.38 years). There is variability with respect to ethnicity such that there are significantly more Akan women than Akan men (57.34 % vs. 44.25 %); but more men are of Mole Dagbon (9.65 % vs. 7.59 %) and Other Ethnicity (28.91 % vs. 16.73 %) compared to women. There are no significant difference between men and women with respect to Ewe and Ga Adangbe ethnicities. Furthermore, men are more likely than women to be married (87.56 % vs. 57.34 %), while women are more likely to be divorced (20.23 % vs. 7.13 %) or widowed (44.96 % vs. 5.82 %). There is no significant difference in being single between men and women.

As for risk and protective factors for diabetes, Ghana women have significantly higher BMI (24.28 vs. 22.86) compared to men, but are less likely to use alcohol (47.40 % vs. 68.11 %) and tobacco (7.34 % vs. 37.80 %) compared to men. Ghanaian men are significantly more likely to engage in moderate physical activity compared to Ghanaian women (18.49 % vs. 12.64 %). In terms of community social cohesion and health care measures, Ghanaian women report significantly higher levels of social cohesion (3.39 vs. 3.16) compared to men. While there are no differences between men and women with respect to health insurance status, Ghanaian women report significantly lower levels of health system responsiveness compared to Ghanaian men (2.66 vs. 2.74). Finally, with respect to regional differences, significantly more Ghanaian women reside in the Central (13.54 %), Eastern (13.19 % vs. 11.10 %), and Greater Accra (13.44 % vs. 11.32 %) regions compared to men; while more Ghanaian men reside in the Northern/Upper regions (22.33 % vs. 10.39 %). Given these gender differences by region, it is not surprising that a significantly more women reside in urban areas compared to men (46.00 % vs. 37.35 %).

Table 2. Logistic Regression Models Predicting Diabetes, WHO SAGE Ghana, Wave 1 (N=4,219).

	DIABETES													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR
Sociodemographic Characteristics														
Female	.49	1.64	.50	1.65	.66	1.93	.83	2.29	.69	1.99	.68	1.98	.86	2.36
Age (years)	.01	1.01	.01	1.01	.02	1.02	.05 ***	1.06	.01	1.01	.02 *	1.02	.05 **	1.05
Ethnicity														
Akan	.16	1.18	.24	1.27	-.73	.48	-.99	.37	-.81	.45	-.96	.38	-1.20	.30
Ewe	1.24	3.44	1.31	3.69	.64	1.89	.66	1.93	.38	1.46	.46	1.59	.49	1.64
Ga Adangbe	.82	2.27	.91	2.49	.19	1.21	-.33	.72	-.09	.91	-.05	.96	-.55	.57
Mole Dagbon	1.42 *	4.12	1.45 *	4.26	.53	1.70	-.99	.37	.23	1.26	.39	1.48	-1.15	.32
Married	-0.91	.40	-.91	.40	-.82	.44	-.51	.60	-.67	.51	-.98	.38	-.60	.55
Risk & Protective Factors														
Body Mass Index (BMI)			.02	1.02	.00	1.00	-.01	.99	.01	1.01	-.01	.99	-.01	.99
Alcohol Use			-.24	.78	-.23	.79	-.44	.65	-.23	.79	-.28	.76	-.50	.61
Tobacco Use			.40	1.49	.53	1.71	.54	1.72	.48	1.62	.63	1.88	.67	1.96
Moderate Exercise			-.14	.87	-.20	.82	-.17	.84	-.18	.84	-.30	.74	-.19	.83
Social Cohesion & Health Care Measures														
Social Cohesion (1:low to 5:high)					-.46 *	.63	-.22	.80	-.67 **	.51	-.48 *	.62	-.38	.68
Health Insurance					.90 *	2.47	1.09 *	2.98	.99 **	2.70	.72	2.06	1.04	2.82
Health System Responsiveness (1:low to 5:high)					-.35	.71	.06	1.06	-.34	.71	-.40	.67	-.03	.98
Region														
Ashanti					-.11	.90	-.69	.50	-.11	.89	-.09	.92	-.58	.56
Brong Ahafo					-.57	.57	-2.27 **	.10	-.46	.63	-.50	.61	-2.12 **	.12
Central					-1.36 *	.26	-2.38 ***	.09	-1.41 *	.24	-1.10	.33	-2.21 **	.11
Eastern					-1.59 **	.20	-2.56 ***	.08	-1.72 **	.18	-1.37 *	.26	-2.36 **	.09
Northern/Upper Regions					-2.83 ***	.06	-4.06 **	.02	-2.87 ***	.06	-2.66 ***	.07	-4.00 **	.02
Volta					-.30	.74	-1.09	.34	-.18	.84	-.07	.93	-.97	.38
Western					.58	1.79	-.89	.41	.38	1.47	.67	1.95	-.85	.43
Urban					.70	2.01	.04	1.04	.68	1.97	.43	1.54	-.21	.81
Socioeconomic Status														
Education (years)							.15 **	1.17					.13 *	1.14
Employed									-1.33 ***	.26			-.78	.46
Income (1:low to 5:high)											.46 **	1.58	.32	1.37
Constant	-4.51 ***		-4.92 ***		-2.06		-5.69 *		-.29		-3.12 *		-4.63	

*** p <.001 ** p <.01 * p <.05.

Model 1: Individual characteristics including gender, age, ethnicity, and marital status.

Model 2: Adds risk factors including body mass index (BMI), alcohol consumption, tobacco use, and moderate exercise to Model 1.

Model 3: Adds community, health system, and regional factors including social cohesion, health insurance status, health system responsiveness, region, and ubanicity to Model 2.

Model 4: Effect of education on Model 2.

Model 5: Effect of employment status on Model 2.

Model 6: Effect of income on Model 2.

Model 7: Full model including all measures of SES.

Multivariate Findings

This section introduces the findings from logistic regression models with respect to hypothesis 1(a-c) presented above. The results are presented in Table 2. Recalling that the first step in my model building was to establish the direct effects of sociodemographic variables including gender, age, ethnicity, and marital status, Model 1 of Table 2 shows that only Mole Dagbon ethnicity is associated with increased odds of diabetes (logit=1.42, OR=4.12). Compared to Other ethnicities, Mole Dagbon ethnicity increases the odds of diabetes by over four times. In Model 2, which adds risk and protective factors including BMI, alcohol use, tobacco use, and exercise, Mole Dagbon ethnicity is again associated with a four-fold increase in diabetes (logit=1.45, OR=4.26).

The third model in Table 2 adds community, health care, and regional variables. Model 3 shows that high community cohesion decreases the odds of diabetes. An increase in social cohesions is associated with a 37 % decrease in the odds of diabetes (logit=-.46, OR=.63). However, having health insurance is associated with a 47 % increase of diabetes (logit=.90, OR=2.47). This result regarding health insurance may be expected given that SAGE measured diabetes by asking respondents whether they had been told by a health professional that they had diabetes. Further, Model 3 shows some regional variations. Compared to living in the Greater Accra region, residing in the Central, Eastern, and the Northern most regions are associated with significantly decreased odds of diabetes. Living in the Central region is associated with a 74 % decrease in the odds of diabetes (logit=-1.36, OR=.26); living in the Eastern region with an 80 % decrease (logit=-1.59, OR=.20); and living in the Northern regions with a 94 % (logit=-2.83, OR=.06) decrease in the odds of diabetes. Furthermore, in the presence of these community and

regional variables, the association between Mole Dagbon ethnicity and increased odds of diabetes observed in the previous two models is no longer significant.

Model 4 include all previous variables and adds one dimension of SES: education. The model shows that education is significantly associated with odds of diabetes. A one year increase in education is associated with a 17 % increase in diabetes (logit=.15, OR=1.17). Even more interesting, in the presence of education, age and living in the Brong Ahafo region become significantly associated with diabetes in Model 4. A year increase in age is associated with a 6 % increase in the odds of diabetes (logit=.05, OR=1.06). Compared to living in the Greater Accra region, living in Brong Ahafo is associated with a 90 % decrease of diabetes ((logit=-2.27, OR=.10). All other regional variables that were significant in Model 3 remain significant in Model 4. Finally, in the presence of education, social cohesion is no longer significantly associated with odds of diabetes.

Model 5 includes all previous variables, but includes only employment status as a measure of SES. Being employed is significantly associated with a 74 % decrease in the odds of diabetes (logit=-1.33, OR=.26). Similar to Model 3, Model 5 shows that social cohesion is associated with decreased odds of diabetes; health insurance with increased odds; and the Central, Eastern, and the Northern most regions with decreased odds of diabetes. Unlike Model 4, age is not significantly associated with odds of diabetes in the presence of employment status.

Model 6 considers the effect of the third dimension of SES: income. The model shows that an increase in income is associated with a 58 % increase in diabetes (logit=.46, OR=1.58). As with Model 4 with only education, Model 6 shows a small but significant association between age and diabetes. An increase in age is associated with a 2 % increase in the odds of diabetes (logit=1.01, OR=1.02). Further, like Model 5, Model 6 shows that social cohesion is significantly

associated with decreased odds of diabetes (logit=-.48, OR=.62). However, unlike all previous models, only the Eastern and Northern most regions are significantly associated with decreased odds of diabetes compared to the Greater Accra region.

Model 7 of Table 2 includes all study variables. Only one dimension of SES—education—remains significantly associated with diabetes in this full model. Increased education is associated with a 14 % increase in odds of diabetes (logit=.13, OR=1.14). Consistent with Models 4 and 6, age is significantly associated with diabetes. An increase in age is associated with a 5 % increase in odds of diabetes (logit=.05, OR=1.05). Finally, similar to Model 4, living in the Brong Ahafo (logit=-2.12, OR=.12), Central (logit=-2.21, OR=.11), Eastern (logit=-2.36, OR=.09), and Northern most regions (logit=4.00, OR=.02) are associated with significantly decreased odds of diabetes compared to living in the Greater Accra region.

Table 3. Logistic Regression Models of the Moderating Effect of Gender on Relationship between SES and Diabetes WHO SAGE Ghana, Wave 1 (N=4,219).

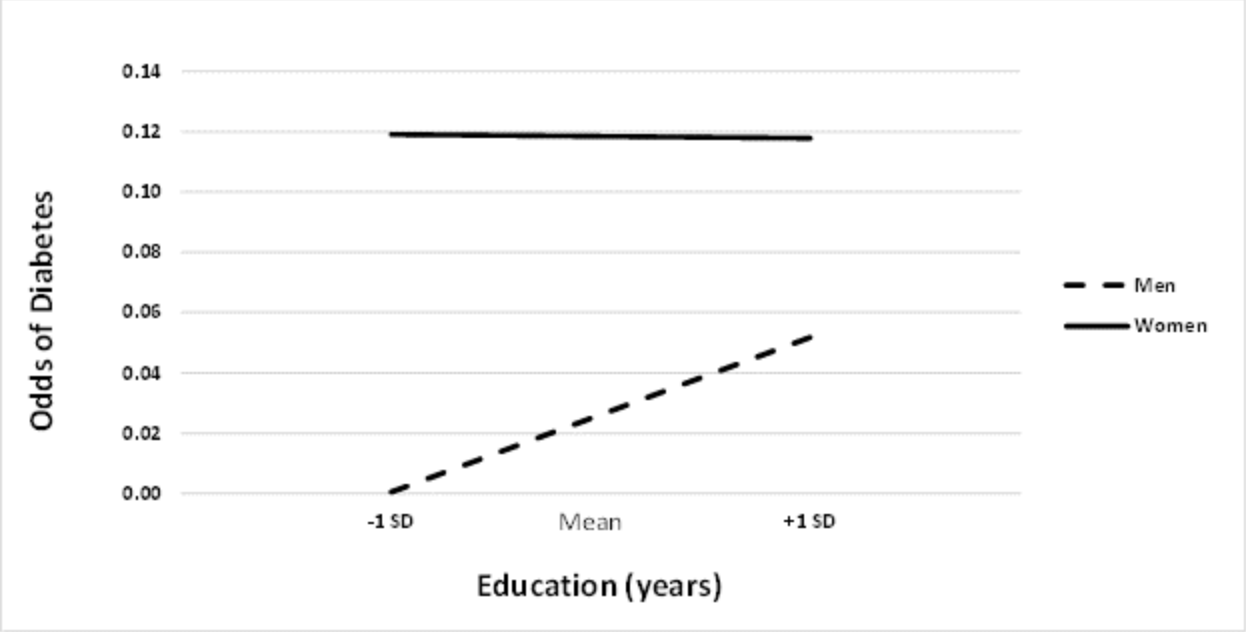
	Model 1		Model 2		Model 3	
	Logit	OR	Logit	OR	Logit	OR
Sociodemographic Characteristics						
Female	4.31 ***	74.45	.40	1.50	3.09 *	21.96
Age (years)	.04 *	1.04	.05 **	1.05	.04 **	1.05
Ethnicity						
Akan	-1.24	.29	-1.21	.30	-1.17	.31
Ewe	.56	1.75	.45	1.58	.45	1.57
Ga Adangbe	-.66	.52	-.62	.54	-.53	.59
Mole Dagbon	-1.36	.26	-1.16	.32	-1.10	.33
Married	-.61	.54	-.57	.57	-.60	.55
Risk & ProtectiveFactors						
Body Mass Index (BMI)	-.02	.98	-.01	.99	-.01	.99
Alcohol Use	-.49	.61	-.47	.62	-.48	.62
Tobacco Use	.87	2.38	.68	1.98	.72	2.04
Moderate Exercise	-.12	.89	-.17	.84	-.16	.85
Social Cohesion & Health Care Measures						
Social Cohesion (1:low to 5:high)	-.33	.72	-.43	.65	-.39	.68
Health Insurance	1.08	2.95	1.02	2.76	1.05 *	2.85
Health System Responsiveness (1:low to 5:high)	-.14	.87	-.04	.96	-.11	.90
Region						
Ashanti	-.51	.60	-.59	.56	-.57	.57
Brong Ahafo	-2.25 **	.11	-2.10 **	.12	-2.15 **	.12
Central	-2.27 **	.10	-2.20 **	.11	-2.25 **	.11
Eastern	-2.37 **	.09	-2.35 **	.10	-2.39 **	.09
Northern/Upper Regions	-3.86 ***	.02	-4.04 **	.02	-3.92 **	.02
Volta	-1.05	.35	-.98	.37	-.93	.39
Western	-.98	.38	-.81	.45	-.86	.42
Urban	-.24	.79	-.21	.81	-.23	.79
Socioeconomic Status						
Education (years)	.29 ***	1.34	.13 *	1.14	.13 ***	1.14
Employed	-.79	.45	-1.23	.29	-.77	.46
Income (1:low to 5:high)	.36	1.44	.32	1.37	.67 *	1.95
Interaction Effects						
Education X Female	-.29 **	.75				
Employed X Female			.77	2.16		
Income X Female					-.52	.60
Constant	-6.30 *		-4.25		-5.85	

*** p <.001 ** p <.01 * p <.05.

Table 3 displays the results of the interactions between education, employment status, income and gender in predicting diabetes. While Model 1 shows that gender moderates the effect of education on diabetes, models 2 and 3 show that the interactions between employment status

and gender and income and gender, respectively, are not significant. Figure 2 graphically displays the significant interaction between education and gender. The figure shows that at low levels of education Ghanaian men have little to no odds of diabetes compared to Ghanaian women. However, as one approaches average levels of education, there is an upward trajectory for men such that at high levels of education, the odds of diabetes for Ghanaian men increase significantly. For Ghanaian women, education really does not seem to have an effect as shown by the flat line. Regardless of years of educational attainment, Ghanaian women have higher odds of diabetes compared to Ghanaian men.

Figure 2. Interaction between Education and Gender in Predicting Diabetes



Discussion

In this paper, I examined whether SES—measured by educational attainment, employment status, and income—was positively associated with diabetes among older adults in Ghana in accordance with the reversal hypothesis. I further explored gender differences by

examining whether the relationship between SES and diabetes differed for Ghanaian women and men. In examining the SES measures separately, I found support for education increasing the odds of diabetes (hypothesis 1a), but did not find the same for being employed (hypothesis 1b). Rather, being employed was significantly associated with decreased odds of diabetes. Finally, like education, income was significantly associated with higher odds of diabetes (hypothesis 1c). However, when all three measures of SES were entered into the full model, only education remained significantly associated with increased odds of diabetes. These findings suggest that different aspects of SES work differently when examined singly or collectively in predicting diabetes. Specifically, they suggest that there may be features of attaining education that impact Ghanaians risk for diabetes.

The gender interactions helped to further clarify the role educational attainment plays in predicting diabetes among Ghanaians and revealed two patterns. First, women had higher odds of diabetes compared to men across education levels. Gendered norms in Ghana requires that women be responsible for the gathering and preparation of food. Like many other African societies, norms surrounding health and beauty in Ghana favor fatness among women (de-Graft Aikins 2013; Prentice 2006). Recall that in Ghana, women are six times more likely to be obese than men (Prentice 2006). Perhaps there is something about fulfilling those traditional gender roles as well as assuming new ones as gender norms shift that are particularly detrimental to the non-communicable disease outcomes for women.

Second, the interaction effect showed that increased education represents a liability only to Ghanaian men; i.e., increased years of schooling increased the odds of diabetes for men. What could explain this pattern for Ghanaian men? The mechanisms by which education increases risk for diabetes among Ghanaian men still needs further exploration. However, as mentioned above,

Ghana is largely patriarchal. Men in Ghana are expected to be head of households and providers and face stressors associated with fulfilling those roles. And while women in Ghana face many more barriers to access resources and power, those barriers are gradually being removed. It is important to note that the same macro forces that are facilitating the epidemiologic transition in Ghana—urbanization and westernization—are also facilitating transitions in the traditional social and cultural order in Ghana. Men in Ghana are expected to head of households (even among matrilineal ethnicities), breadwinners, and providers. As more Ghanaian women enter assume career and social roles once held exclusively by high SES men, Ghanaian men may engage in traditionally masculine behaviors (e.g. drinking or tobacco use) that, while signaling their status also negatively affects their health and increase their risk for conditions like diabetes.

Furthermore, the literature from SES and gender health offer additional explanations for the findings supporting the reversal hypothesis uncovered in this study. One comes from the fundamental cause theory. While maintaining that the connection between SES and health is quite powerful, Phelan and colleagues (2010) conceded the possibility of other equally potent goals and motivations that could compete with this relationship. Specifically, scholars have noted the possibility of countervailing mechanisms to SES as a fundament cause. Countervailing mechanisms are powerful motivations aside from SES that are more readily attained by those of high SES but work to the detriment of health. For example, in their study of SES and health in the routine clinic visit for diabetes, Lutfey and Freese (2005) observed a patient with high occupational status (i.e., a biochemist) would undermine his adherence by spending the majority time in his laboratory. In Sub-Saharan African countries like Ghana, weight loss is often associated with infectious diseases like HIV/AIDS, malaria, and tuberculosis. Although a risk factor for diabetes, excess weight is associated with health and status. Moreover, in Ghana risk

factors such as obesity and physical inactivity are relatively uncommon due to food shortages and the need to engage in physical labor to eat and live, it is only high SES groups that can afford excess calories to consume and/or remain physical inactive.

Like all studies, my study is not without some limitations. First, the data employed for this study are cross-sectional. Although, the WHO SAGE data is longitudinal study, only Wave 1 is currently available. As such, it is difficult for this study to establish temporal ordering and causality. Specifically, using cross-sectional data to examine SES dimensions like income and employment status, which are dynamic and change over time, presents a limited picture. As additional waves of SAGE Ghana become available, researchers can better assess changes in SES and diabetes over time Second, although I used three different measures of SES to examine diabetes, perhaps other measures of SES based on living conditions, wealth, or religious affiliation are more salient for an LMIC in transition like Ghana. Relatedly, I was not able to examine differences by occupational prestige/status. Like other countries, there is a hierarchy in Ghanaian occupations with professionals and business men and women at top and unskilled laborers at the bottom. Future studies should make it a priority to examine other dimensions of SES that allow more specificity in locating the social position of respondents. Despite these limitations, this study has the advantage of using a fairly new nationally representative dataset with large enough samples to examine how SES and gender interact to predict diabetes among older Ghanaians.

Conclusion

The main finding of this study: that education increases odds of diabetes in support of the reversal hypothesis, particularly among Ghanaian men needs to be placed in proper context.

While most studies in LMICs support the reversal hypothesis, compelling alternative arguments have also been offered. One argument suggests that the global production and consumption of food has reached a point where low SES groups in LMICs now also have access to cheap, calorie-dense, processed food (Agyei-Mensah and de-Graft Aikins 2010). Further with increasing exposure and consumption of western media, high SES groups in LMICs may be adopting western ideals of thinness. According to this argument, these trends of global food production and consumption, globalization of fast-food industry, and media exposure may weaken the positive relationship between SES and non-communicable conditions in LMICs as predicted by the reversal hypothesis (Pampel et al. 2012).

Scholars examining non-communicable diseases in LMICs like Ghana provide additional insight consistent with the alternative arguments to the reversal hypothesis (e.g. Agyei-Mensah and de-Graft Aikins 2010). While acknowledging that wealthy communities experience higher risk of chronic disease, these researchers have argued that those of low SES are burden with both infectious diseases and non-communicable diseases (de-Graft Aikins 2013). The role of comorbidities is a key factor underscoring this argument. According to the argument, major infectious diseases most prevalent in low SES populations in LMICs also increase the risk for non-communicable diseases. For example, tuberculosis has been linked to diabetes, and antiretroviral treatment for HIV/AIDS has been linked to metabolic complications leading to diabetes and cardiovascular diseases. (Agyei-Mensah and de-Graft Aikins 2010; Nimako et al. 2013; Unwin and Alberti 2006; Young et al. 2009). The conclusion drawn from this line of argument is that because both high SES and low SES groups are at risk for non-communicable conditions like diabetes in LMICs like Ghana, there is a need to promote prevention of these conditions across SES strata.

Ultimately, my findings should not be taken to mean that those of low SES are not at risk for non-communicable conditions like diabetes. Rather, the findings suggest that in LMICs like Ghana, effectively addressing non-communicable diseases requires a comprehensive approach that is inclusive of all segments of the population. As some scholars have noted, while those of high SES in LMICs are at higher risk for developing chronic conditions (Agyei-Mensah and de-Graft Aikins 2010; Pampel et al. 2012), that burden is likely to shift to low SES individuals if countries are not proactive in their efforts. Aside from research to untangle additional mechanisms at work in the relationship between SES and non-communicable conditions, policies that countries like Ghana could take to address this growing burden should focus not so much on treating each non-communicable condition that emerges, but rather on social structures that place individuals at increased risk for developing preventable conditions like diabetes.

CHAPTER III

Socioeconomic and Gender Determinants of Hypertension in Ghana

Introduction

Hypertension is a significant health challenge for populations worldwide, affecting close to a billion people and responsible for nine million deaths each year (World Health Organization [WHO] 2013). Also known as high blood pressure, hypertension is a serious condition characterized by high force of blood pushing against the walls of blood vessels. Fluctuations in blood pressure are a normal feature of the day. However, if pressure rises and stays high over an extended period time, it can damage the heart and lead to life-threatening conditions including heart attack, stroke, aneurysm, heart failure, and kidney failure (WHO 2013). Although long recognized as a major health issue in high income countries like the U.S., hypertension is increasingly a problem for low-and-middle income countries (LMICs), particularly those in Africa (Addo et al. 2013). Indeed, according to current WHO (2013) estimates, the prevalence of hypertension is highest in the African region, with 46% of adults aged 25 and above affected.

Among African LMICs significantly impacted by hypertension is Ghana. Hypertension is the second leading cause of outpatient morbidity in adults aged 45 years and older in Ghana (Addo et al. 2013). Because hypertension is often asymptomatic, nearly half of Ghanaians diagnosed with hypertension have end stage organ damage, indicating lack of screening leading to long-standing disease without control or treatment (Bosu 2013; Ghana Ministry of Health [MOH] 2012). Consequently, Ghana is seeing a growing number of its population die from heart

attacks and strokes as a result of undiagnosed, uncontrolled, and untreated hypertension (Addo et al. 2013; WHO 2013)

These increases hypertension—along with other non-communicable diseases like diabetes in Ghana—are part of an epidemiologic transition. First articulated by Omran (1971/2005), the epidemiologic transition theory posits that as populations move away from traditional lifestyles and become industrialized, economically developed, and technologically dependent, morbidity and mortality profiles also transition from high infectious/communicable diseases to high chronic/non-communicable diseases. Ghana is rapidly transitioning from a traditional agricultural society to an industrialized urbanized society with concomitant changes in the non-communicable disease morbidity and mortality profile of its population (Agyei-Mensah and de-Graft Aikins 2010; Minicuci et al. 2014). Specifically, Ghana has seen unprecedented growth in its economy, service, and industrial sectors over the last two decades. Indeed, due to steady growth, reductions in poverty levels, and emphasis on a competitive business environment, the World Bank reclassified Ghana from low-income to low middle-income country in late 2010 (World Bank 2014). During the same time, non-communicable disease cases also increased. According to outpatient cases in public and mission facilities in Ghana, hypertension increased from 60,000 cases in 1990 to approximately 700,000 cases in 2010 (MOH 2012).

In this paper, I use the case of Ghana, a low-and middle-income country (LMIC) sub-Saharan African country in transition, to explore if and how an individual's socioeconomic status (SES) affects hypertension. Additionally, I examine whether SES impacts hypertension differently for Ghanaian women compared to Ghanaian men. As such, the two main questions

guiding this investigation are: What is the relationship between socioeconomic status and hypertension in a Ghana? Does this relationship vary by gender?

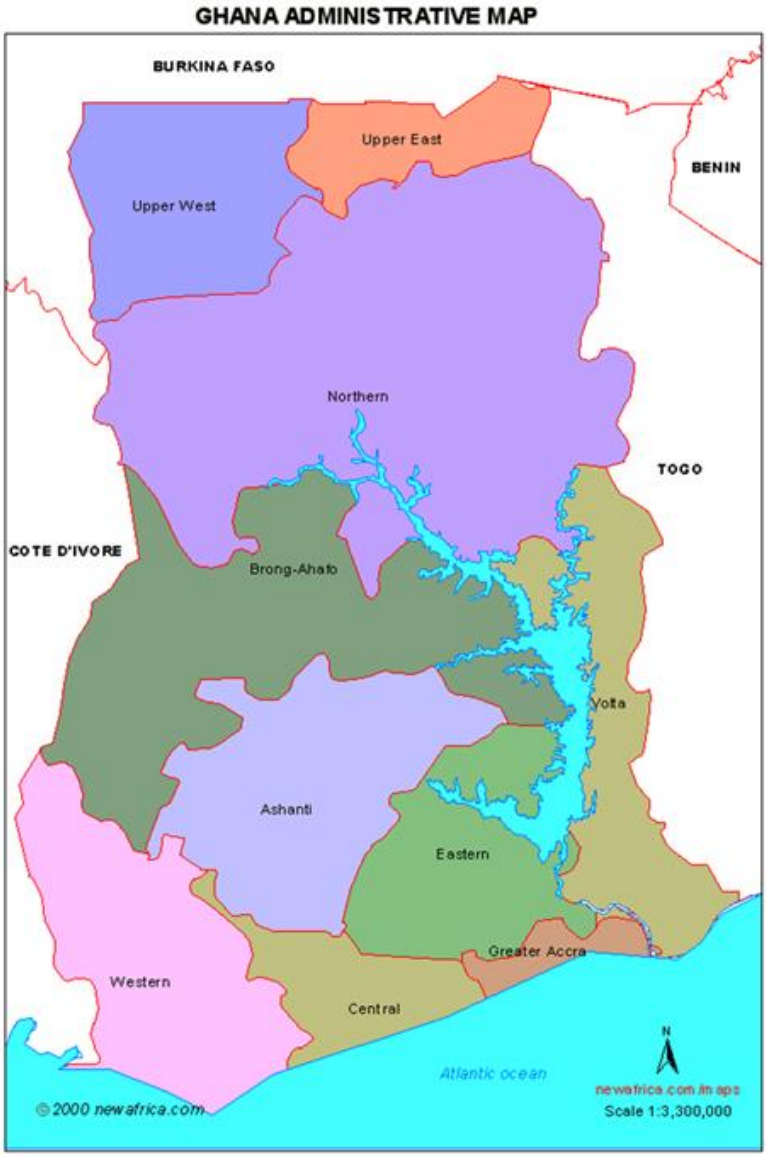
There are four important contributions this study makes to the sociological literature on SES and health. First, given the relative recent nature of increases in non-communicable diseases in LMICs, very little is known about how SES operates in countries like Ghana that are experiencing major transitions in their morbidity and mortality profiles. While SES is a major contributor to health in LMICs like Ghana, the association has been described through the reversal hypothesis, which states that in LMICs, high SES is associated with *high* morbidity and mortality from NCDs (Akarolo-Anthony et al. 2014; Addo et al. 2009; Pampel et al. 2012; Ploubidis et al. 2013); that is, the opposite of the SES-gradient observed in high-income countries like the U.S. (Adler et al. 1994; Braveman 2006; Phelan et al. 2010; Williams and Collins 1995) A major goal of this paper is to test this hypothesis using Ghana as the LMIC case and hypertension as the non-communicable disease case.

Second, whether the positive association between SES and non-communicable disease outcomes described by the reversal hypothesis varies by gender has not been fully considered. Studies across countries show that women live long but sicker lives than men (WHO 2009). Biological factors such as hormonal influences on physiology as well as social structures, environment, and health behaviors are all factors that researchers have noted influence gender differences in morbidity and mortality. Gender, similar to SES, is an important stratifying factor that influences health outcomes like hypertension (Acker 2004; Charmaz 1995; Courtenay 2000a; Griffith 2012; Risman 2004). The current morbidity and mortality transition occurring in Ghana is challenging previous conceptions of class and gender. While there is some scholarship examining how this transition is affecting hypertension outcomes by gender (Amoah 2003) or

SES (de-Graft Aikins 2013), few have examined them together. As such, a major contribution of this paper is the examination of the relationship between SES and hypertension by gender.

Third, although the epidemiologic transition theory provides an important framework to understand the pattern of increasing hypertension in Ghana, its tendency to focus on macro level determinants (e.g. country income status) often ignores the role more micro/individual level (e.g., gender) meso level factors (e.g., community involvement) play in morbidity and mortality transitions. By examining the socioeconomic determinants of hypertension among men and women in Ghana, I provide new insights into how socially stratified groups within a country may experience the epidemiologic transition differently. Finally, while scholars have grouped diabetes and hypertension under an umbrella of cardiometabolic disorders—a constellation of diseases that share similar characteristics and have related risk factors and fatal outcomes (Kirk and Klein 2009; Mezuk 2010)—these conditions are distinct and have different screening, diagnostic, treatment, and management prescriptions. Ultimately, together with examination of other diseases such as diabetes, this study's focus on hypertension helps in building knowledge of how distinct but related non-communicable diseases are affecting the health profiles of LMICs like Ghana.

Figure 3. Regional Map of Ghana



Background

The Setting

Ghana (Figure 3) as an important case to examine the association between SES, gender and hypertension for three reasons. First, Ghana's location as an LMIC in sub-Saharan Africa makes it a compelling case because LMICs that region are projected to see the most rapid increase in non-communicable diseases like hypertension over the next two decades (Abegunde

et al. 2007; Dalal et al. 2011; Stuckler 2008; Unwin et al. 2001; WHO 2006). Second, Ghana has historically served as a pioneering example for other sub-Saharan African countries. Due to its achievement as the first African country to declare independence from its European colonizer, Ghana became a symbol of black achievement, influencing other African independence movements. How Ghana decides to address its increasing burden of non-communicable diseases will have implications for similarly situated African countries. Finally, aging is a major factor in the increased prevalence of non-communicable disease like hypertension in LMICs like Ghana (Agyei-Mensah and de-Graft Aikins 20110). The current population of adults in sub-Saharan Africa aged 60 years and above is 4.9% and expected to increase to 7.6% by 2050. Ghana's population is older than this regional average with 6.5% adults 60 years and older currently, increasing to 8.9% by 2050 (Minicuci et al. 2014). Despite its growing number of older adults, Ghana has paid little attention to health and health care needs of this population (Minicuci et al. 2014; Parmar et al. 2014). As such, Ghana presents a compelling case to examine how an LMIC facing growth in its older population can effectively respond to changing demographic and epidemiologic realties.

Guiding Frameworks: The Epidemiologic Transition & the Reversal Hypothesis

The epidemiologic transition theory (Omran 1971/2005) provides an important framework for this study. The theory describes a pattern whereby infectious or communicable diseases are displaced with chronic non-communicable diseases as the primary cause of morbidity and mortality as countries become more industrialized and "developed". As such, hypotheses derived from the epidemiologic transition theory would expect communicable

diseases to be the main cause of death in low-income developing countries and non-communicable diseases to be the main cause of high-income developed countries.

Scholars have noted limitations to the epidemiologic transition theory that help inform this current study (Agyei-Mensah and de-Graft Aikins 2010; Dagadu and Patterson 2015; Frenk et al. 1989). First, the epidemiologic transition theory essentializes the experiences of high-income industrialized countries. Despite structural and contextual differences in the morbidity and mortality transitions of LMICs compared to high income countries, much of the evidence Omran offered in support of the epidemiologic transition theory relied heavily on perspectives that hold the experiences of western industrialized countries as normative (Agyei-Mensah and de-Graft Aikins 2010; Avilés 2001; Caselli et al. 2002; Frenk et al. 1989; Gaylin and Kates 1997). The extent to a framework scholars have described as Eurocentric (e.g., Avilés 2001; Caselli et al. 2002; Gaylin and Kates 1997) applies to the experiences of LMIC like Ghana is still up for debate.

Second, the epidemiologic transition theory's focus on macro factors such as level of industrialization or a country's level of development as the main drivers of morbidity and mortality transitions ignores how stratifying factors such as socioeconomic status and gender impact certain groups within countries experiencing the epidemiologic transition. Indeed, the theory's "expectation that various developing countries including African countries go through stages and transitions in population structure and health shaped by changes in fertility and mortality by cause of death as they progress toward fuller industrialization as it was documented in now-developed countries of Europe and North America, has not been materialized in many African countries and regions over the last 60 years" (Defo 2014:10). Scholars who have documented instance of low-income countries achieving low morbidity and mortality have

pointed not so much to macro level factors, but to meso and micro level factors such as improvements in the position of women and children, education (especially education of girls), vibrant political sectors that value egalitarianism, and investments in local health services as important drivers (see influential piece, Caldwell 1986).

At the same time, these macro-level factors, which speak to the structural changes that occur as societies moved from agrarian to more industrial societies, are important and necessary to understanding morbidity and mortality transitions. However, a singular focus on industrialization ignores stratification by gender and SES. Ultimately, there are accompanying changes that industrialization introduces to groups stratified by SES and gender that have important implications for non-communicable disease outcomes like hypertension.

The Reversal Hypothesis: Considering SES and Gender

Socioeconomic Status. Given the aforementioned limitations of the epidemiologic transition theory, I engage literature on social stratification with a focus on socioeconomic status and gender to guide my study on hypertension in Ghana. Socioeconomic status (SES) is a key independent variable in most sociological research and major concern for early sociological theorists such as Karl Marx and Max Weber. Marx attempted a comprehensive theory of social stratification, emphasizing ownership of property as the primary basis for class distinction (Marx 1848/1983:203). Heavily influenced by his predecessor, Weber expanded on Marx's view of social stratification beyond economic ownership with his three component theory of social stratification. Weber's multidimensional view of social stratification focused on class, status, and party/power (Gerth and Mills 1946) and the extent to which these factors influence individuals' life chances.

Weber's articulation of social stratification remains influential among contemporary sociologists (Williams and Collins 1995). Today, sociologists often use "socioeconomic status" to capture Weber's three-pronged articulation of social stratification. Although there are variations in indicators used to measure SES, the most commonly included are educational attainment, income, and occupational prestige (Williams and Collins 1995; Preston and Taubman 1994). While closely related, education, income, and occupation tap into different dimensions of SES that are important for health. Specifically, education taps into availability of information/knowledge and with cognitive skills. Income signals the amount of resources available to purchase health-related goods and services. Finally, occupation indicates a variety of physical and psychosocial features of the workplace/employment (Preston and Taubman 1994).

Much of the theorizing and research examining the association between SES and non-communicable disease outcomes have focused on the experiences of high-income countries like the U.S. (Link and Phelan 1995; Phelan et al. 2010; Preston and Taubman 1994; Williams and Collins 1995). A well-documented finding in social science research in high-income countries is the SES-health gradient whereby low income, low education, and low occupational status are associated poorer health outcomes across various conditions (Adler et al. 1994; Boykin et al. 2011; Braveman et al. 2010; Williams et al. 2010). Because SES impacts multiple health outcomes and involves access to resources that can be used to avoid risks or to minimize the consequences of disease once it occurs, it has been described as a fundamental cause of morbidity and mortality as well health inequities (Link and Phelan 1995; Lutfey and Freese 2005; Phelan et al. 2004). According to Link and Phelan's fundamental cause theory (1995) SES as a fundamental cause because it encapsulates resources like knowledge, money, power, prestige, and social connectedness that are transportable from one situation to another, and as

health-related situations change, those who command the most resources are best able to avoid risks, diseases, and the consequences of disease. As populations transition from one dominant cause of morbidity and mortality to another, people of higher SES are more favorably positioned to know about new health risks and have the resources to avoid these risks or to minimize the consequences of disease once it occurs (Link and Phelan 1995; Phelan et al. 2004).

The Reversal Hypothesis. Unlike the SES-health gradient observed in high-income countries, scholars have observed an inverse association between SES and non-communicable diseases in LMICs like Ghana (Addo et al. 2009; Akarolo-Anthonly et al. 2014; Pampel et al. 2012; Ploubidis et al. 2013; Sodjinou et al. 2008). Specifically, scholars examining non-communicable conditions in LMICs describe a pattern whereby high SES is associated with high morbidity and mortality from non-communicable diseases, a phenomenon described as the reversal hypothesis (Pampel et al. 2012). The reversal hypothesis states that the association between SES and non-communicable conditions is initially positive and then over the course of the epidemiologic transition reverses to being negative (Pampel et al. 2012; Subramanian et al. 2013). Explanations for the reversal hypothesis includes the social environment of risk factors and cultural values. In terms of the social environment, the reversal hypothesis suggests that in low-income countries, risk factors such as obesity and physical inactivity are relatively uncommon due to food shortages and the need to engage in physical labor to eat and live. Because food insecurity in LMICs means lack of *any* food and economies are not fully industrialized, it is only high SES groups that can afford excess calories to consume and/or remain physical inactive (Pampel et al. 2012).

Cultural value explanation from the reversal hypothesis highlight how factors such as excess can symbolize higher status in LMICs. For instance, in LMICs like Ghana where weight

loss is often associated infectious diseases like HIV/AIDS, malaria, and tuberculosis, excess weight is largely valued as a sign of health as well as beauty (de-Graft Aikins 2013; Prentice 2006). Ultimately, the reversal hypothesis asserts that in LMICs, sections of the population that undergo rapid social development (i.e., experience transitions) may also be at increased risk for non-communicable diseases like hypertension compared to people of lower SES (Addo et al. 2009; Pampel et al. 2012).

Gender. While the reversal hypothesis provides insight to assessing the relationship between SES and hypertension in Ghana, there has been a dearth of attention in the literature about the role of gender on non-communicable disease outcomes in LMICs in transition. Like SES, gender is a major component of social interactions and a determinant of access to resources. Sociologists point to the social construction of health and gender as occurring in concert with other forms of stratification (Brown 1995; Nettleton 1995). Most notably, black feminist perspectives emphasize the structuring role gender plays in the lives of women and men as well as its intersection with race and class (Collins 1990/2008; Crenshaw 1991; Brown and Hargrove 2013). SES both constrains and enables certain forms of gendered social action and influences women's and men's health behaviors.

Although politically a constitutional democracy, Ghana's socio-cultural context remains predominantly patriarchal (Sossou 2006). Through gender socialization, Ghanaian men and women occupy social statuses, roles, and engage in behaviors that differentially impact their risk for non-communicable conditions like hypertension. For instance, studies that have examined hypertension have generally found higher rates among Ghanaian men (Amoah et al. 2002, Addo et al. 2009, Hall et al. 2011), despite Ghanaian women's six times higher rates obesity compared to men (Prentice 2006). One possible explanation for this is that Ghanaian men are much more

likely drink and smoke—behaviors that Ghanaian women are culturally proscribed from engaging (de-Graft Aikins 2013).

The fulfillment of the domestic role—household work, cooking, and childcare, are regarded as the primary obligations of women regardless of whether they work outside the home and earn higher incomes than men (Adinkrah 2012). The challenges Ghanaian women in fulfilling such cultural norms and expectations takes a toll on their health. When family members do become chronically ill, it is the primary responsibility of Ghanaian women to provide care (Addai and Adjei 2014). Existing literature has found that attending to the needs of chronically ill family members in non-institutionalized settings precipitates declines in in the caregivers' own health and well-being (Addai and Adjei 2014; de-Graft Aikins 2006; Read et al. 2009). This burden of care for non-communicable diseases disproportionately effects Ghanaian women (Addai and Adjei 2014). Not surprisingly, scholars have found that Ghanaian women perceive their health status more negatively than men (Addai and Adjei 2014).

Compared to women, Ghanaian men occupy a dominant status in most social spheres (Adinkrah 2012). For Ghanaian men, successful masculinity is often measured by the ability to meet the material needs of wives, children and other family members. "Men generally lose face and become socially stigmatized within the family and community whenever there is a significant role reversal, with the woman as the economic provider" (Adinkrah 2012: 475). Although seeking financial assistance is acceptable as a last resort, Ghanaian men ability to find solutions to economic difficulties is often seen as a sign of independence and personal strength. As such, economic hardships can cause serious disruptions in gender roles and identities among Ghanaian men, which also impact their risk for hypertension. For instance, a study examining the impact of socioeconomic hardships on traditional male responsibility in one of Ghana regions

linked economic hardship to men's increased abuse of a locally brewed gin known as *akpeteshie* (Luginaah 2008). This alcohol consumption, in turn lead to increased violence and negligent behaviors that burdened women family members' responsibilities (Dixon et al. 2014; Luginaah 2008). Ultimately, as a society, Ghana places high expectations and pressure on men to succeed economically as an important way of confirming their masculinity.

Summary and Hypotheses

Little scholarship currently exists that examines how SES affects men and women in LMICs experiencing morbidity and mortality transitions. This paper is an attempt to build knowledge in this area by investigating the relationship between SES and hypertension among men and women the LMIC of Ghana. Understandings of SES and non-communicable diseases in LMICs rely on the reversal hypothesis, which states that those of high SES experience higher rates of non-communicable diseases like hypertension because of their ability to afford foods and lifestyles that put them at higher risk for these conditions as well as socio-cultural values that view excess weight as a symbol of status. This paper tests the reversal hypothesis to see whether there is a positive association between SES and hypertension. Specifically, I hypothesize that: *Hypothesis 1 (a-c)*: High SES—(a) education; (b) employment status; and (c) income—will increase the odds of hypertension.

Further, given the patriarchal structure of Ghana, I explore whether hypotheses 1 (a-c) to varies by gender. In the models I develop below, I control for factors that vary among men and women living in Ghana that prior studies have sown are associated with hypertension; including age, marital status, weight, alcohol use, smoking status, physical activity, community resources

such as social cohesion, and health system measures such as health insurance status and health care responsiveness.

Data and Measures

WHO SAGE Data

The analyses for this study are based on data from Wave 1 of the World Health Organization Study on Global Ageing and Adult Health (SAGE). SAGE is a series of longitudinal studies following a cohort of adults that WHO conducts in six countries of which Ghana is one. The succinct goal of SAGE is strengthen, gather, process and manage data on older persons to respond to identified needs via policy, planning, and research. The sampling design aimed to obtain a nationally representative cohort of adults aged 50+ years, with a smaller cohort aged 18-49 for comparison. SAGE aims to address data gaps on aging, adult health and well-being in lower and middle income countries (LMICs) so as to achieve nationally representative surveys that are comparable to those in higher income countries; e.g., the Health and Retirement Survey in the U.S. (Biritwum et al. 2013; Chatterji et al.2013).

The topics covered by SAGE Wave 1 are especially suited for the current investigation examining hypertension, SES, and gender in Ghana. Respondents answered questions about their household and related characteristics, individual socio-demographics, income and work history, perceived health status (i.e., self-rated health, risk factors and preventative health behaviors, chronic conditions (including hypertension, diabetes, stroke, and heart disease), health services coverage, health care utilization, subjective well-being and quality of life, and social networks (Biritwum et al. 2013). SAGE, Wave 1 includes both household and individual characteristics.

Households were spread evenly between rural and urban localities. For this dissertation analysis, there was a total sample size of 4,219 respondents with 2,002 women and 2,217 men.

Measures

Hypertension. For my dependent variable, I used a single item where respondents were asked whether they had had ever been diagnosed with hypertension or high blood pressure. I coded "Yes" responses as 1 to indicate presence hypertension and coded "No" responses as 0 to indicate absence of hypertension. Although this measure of hypertension relies on self-reports, prior studies indicate high recall accuracy for non-communicable conditions like hypertension health history (Chae et al. 2010; Colditz et al. 1986; Harlow and Linet 1989).

Socioeconomic Status & Gender. My key independent variable is SES. I used education, employment status, and income as my three measures of SES. Education was measured as years of school attended. I coded employment status as 1 for respondents who responded "Yes" to currently working and 0 for those who responded "No" (unemployed or not in the labor force). SAGE measured income categorically as quintiles. I combined the quintiles to obtain a scale measure of income that ranged from 1: low income to 5: high income. Finally, with respect to gender, I coded females as 1 and compare them to males.

Sociodemographic Characteristics. I include age, marital status, urbanicity, region, and ethnicity as other socio-demographic variables. As mentioned above, Ghana's aging population is a major force in the prevalence of non-communicable diseases like hypertension (Ayernor 2012; Mbanya et al. 2010; Minicuci et al. 2014). Age is measured in years for adult respondents aged 18 years and above. With marital status, I compared those who are married or cohabitating (1= Yes) to those who are single, divorced, separated, or widowed.

Urbanicity and Region. Factors at the macro level that may impinge on the odds of hypertension include urbanicity and region of residence. Ghana is currently undergoing rapid urbanization, with an overall urban growth rate of about 4.6% (compared to a sub-Saharan average urban growth rate of 3%) (Owusu and Agyei-Mensah 2011; Mbanya et al. 2010). Studies indicate that urban dwellers are more susceptible to hypertension risk factors such as overweight, obesity and physical inactivity than their rural counterparts (Agyei-Mensah and de-Graft Aikins 2010; Danquah et al. 2012). At the same time, hospitals, clinics, and pharmacies are disproportionately concentrated in urban areas, with rural residents travelling great distances for health care and/or relying on traditional medicine and remedies (Dixon et al. 2011; Jehu-Appiah et al. 2011). While close to 79% of the urban population in Ghana have access to a health facility with a 30 minute distance, only 42% of the rural population has access (ADF 2008). In this study, I coded urban 1 and compare to respondents living in rural areas.

In addition to urbanicity, I also accounted for regional variations in hypertension. Ghana's 10 regions (see Figure 3) have different histories and resources that matter for hypertension outcomes. For instance, educational attainment varies widely across regions. While only 12% of residents aged 15 years and above in the Greater Accra region have never attended school, 20% in the Ashanti region, 21% in the Eastern region, 25% in the Central region, 26% in the Western region, 29% in the Volta region, 34% in the Brong Ahafo region, and 62% in the Northern/Upper regions 15 and older have never attended school (Ghana Statistical Service 2012). Furthermore, across all regions, a greater proportion of women have never attended school compared to men (Ghana Statistical Service 2012). The Greater Accra region, where Ghana's capital is located, is not only the most urbanized and educated, it also attracts a disproportionate share of investments in health facilities and infrastructure to address conditions

like hypertension (Agyei-Mensah and de-Graft-Aikins 2010; Owusu and Agyei-Mensah 2011). As such, I compare the Greater Accra region to the other regions: Ashanti, Brong Ahafo, Central, Eastern, Northern/Upper Regions, Volta, and Western in my analysis. Given their relatively low number of respondents and because the three northern regions in Ghana (Northern, Upper East, and Upper West) are the least urbanized and least developed by all socioeconomic indices (Aryeetey et al. 2013; Owusu and Agyei-Mensah 2011), I combined these three regions: Northern, Upper East, and Upper West.

Finally, I include ethnicity. Due to the newness of hypertension in Ghana's health profile, there are few studies that examine hypertension among Ghanaians by ethnicity. However, like gender and SES, ethnicity structures the lives of Ghanaians and influences living arrangements, kinship, and descent patterns—i.e., patrilineal or matrilineal (Tuller 2013) which may in turn influence hypertension outcomes. According to Ghana's 2010 Census, Akans, the only matrilineal group in Ghana, are also the largest ethnic group (48%), followed by the Mole Dagbon (17%), the Ewe (14%), Ga-Abangbe (7%), and other ethnic groups comprising the remaining 14% (Ghana Statistical Service 2012). The Akans, Ga-Abangbes, and Ewes reside mainly in the urban and southern regions of Ghana, while the Mole-Dagbon reside in the more rural and less developed northern regions (Awuah and Afrifa-Anane 2013; Dake et al. 2010). The other ethnic grouping consists of small minority groups that are spread across Ghana's regions. While there is a dearth of research on hypertension and ethnicity in Ghana, there have been studies examining ethnic differences in obesity—a significant risk factor for hypertension. These studies have found higher obesity among Akan and Ga ethnicities (Amoah 2003; Dake et al. 2010). I included the four major ethnic groups in Ghana in my analysis: Akan, Ewe, Ga-

Abangbe, Mole-Dagbon, as well as respondents selecting "Other" ethnicity. I compare the four major ethnicity to Other ethnicities.

Risk and Protective Factors. Risk and protective factors that research has shown matters for hypertension include weight, alcohol consumption, smoking/tobacco use, and physical activity. I used body mass index (BMI) as a measure of weight. SAGE includes both self-reported and measured height (in centimeters) and weight (in kilograms). Given the large number of unknown or unavailable self-reported height and weight, I used the more accurate measured height and weight values to first convert centimeters into meters and calculated respondents' body mass index using the formula (CDC 2015):

$$BMI = \frac{Weight(kg)}{Height(meters)^2}$$

I kept BMI as continuous rather than dividing it into dummy variables using the conventional cutoffs used in countries like the U.S. because research suggests that those cutoffs may be less meaningfully for LMICs like Ghana that have a shorter history with overweight and obesity compared to high-income countries (Sodjinou et al. 2008). Tobacco use measured respondents' current use of tobacco with the question: "Do you currently use (smoke, sniff or chew) any tobacco products such as cigarettes, cigars, pipes, chewing tobacco or snuff?" I coded "Yes" responses as 1 and compared to 0 or "No" responses. Similarly, alcohol consumption was assessed by asking respondents whether they had ever consumed a drink that contains alcohol (such as beer, wine, or spirits). Similar to tobacco use, I coded "Yes" responses to alcohol consumption as 1 and compared to 0 or "No" responses. Physical activity was assessed by asking respondents: "In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities that causes a small increase in breathing or heart rate [*such as*

brisk walking, cycling or swimming]?" I coded the variable to represent the number of days per week respondents engage in moderate physical activity.

Community Social Cohesion and Health Care Measures. The relationship between social cohesion and specific health outcomes has been a major line of inquire in sociology dating back to Durkheim (Bruhn 2009; Durkheim 1897/1979). Durkheim attributed differences in suicide rates to differences in social integration such that people with strong social ties had low suicide rates while those who were alienated had higher social rates (Durkheim 1897/1979). Contemporary scholars continue to find a protective effect of social cohesion across a number of non-communicable diseases including hypertension (Schmitz et al. 2012) as well as conditions for which hypertension is a major risk factor such as heart disease (Kim et al. 2014) and stroke (Kim et al. 2013). For example, Schmitz and colleagues (2012) found high perceived neighborhood cohesion to be associated with increased use of hypertension management strategies. In addition, a study by Kim and colleagues (2014) that followed older American adults over four years found that higher perceived neighborhood social cohesion was associated with 22% reduced odds of heart attack.

The concept of social cohesion itself has been variously defined and has included other names such as social integration, social solidarity, and social networks (Bruhn 2009). In the SAGE, Wave 1 dataset social cohesion is best described as community or neighborhood social cohesion, which measures the level of trust or engagement an individual has for and with his/her community. The nine item community involvement measure asked: "How often in the last 12 months have you: attended any public meeting in which there was discussion of local or school affairs; met personally with someone you consider to be a community leader; attended any group, club, society, union or organizational meeting; worked with other people in your

neighborhood to fix or improve something; had friends over to your home; been in the home of someone who lives in a different neighborhood than you do or had them in your home; socialized with coworkers outside of work; attended religious services (not including wedding and funerals); gotten out of the house/your dwelling to attend social meetings, activities, programs or event to visit friends or relatives?" I reverse coded, summed the items, and divided by 9 so that level of community involvement ranges from 1(low community involvement) to 5 (high community involvement). The Cronbach's alpha estimate was .78 for women and .80 for men.

Finally, I included two measures that speak to access to health insurance as well as health system responsiveness. With respect to health insurance, SAGE asked respondents whether they had health insurance. I coded all "Yes" responses as 1 and compare to those respondents with no health insurance. Health system responsiveness measures include indicators of the interaction between individuals and their health system. SAGE collected information on respondents' impressions of their most recent inpatient and/or outpatient visit along seven dimensions, including waiting time, privacy/being treated respectfully, clear explanations/time for questions from providers, being involved in making treatment decisions, confidentiality or records, choice/happiness with providers, and cleanliness of the health facility. For each of these seven items, respondents were asked to rate health care responsiveness from 1(very good) to 5(very bad). I reverse coded, summed the items and divided by seven so that the items range from 1(very bad health system response) to 5(very good health system response). The Cronbach's alpha estimate was .63 for women and .65 for men.

Analytic Strategy

The main goals of this study were 1) to test the reversal hypothesis by investigating the relationship between three measures of SES (education, employment status, and income) and hypertension in Ghana and 2) to explore whether this relationship varies by gender. These goals were accomplished in three analytic steps. First, I generated descriptive statistics for all study variables by comparing means and percentages for the whole sample and by gender (Table 4). Second, I conducted multivariate analyses using logistic regression to assess the relationship between hypertension and the variables of interest in seven models (Table 5). The first model established the direct effects of sociodemographic variables (gender, age, ethnicity, and marital status) on hypertension. In the next model, I added risk and protective factors associated with hypertension; namely body mass index (BMI), alcohol use, tobacco use, and moderate exercise. In the third model, I added community, health system resources, and regional variables to the model, including social cohesion, health insurance, health system responsiveness, region of residence, and urbanicity. The fourth through seventh models included all variables from the previous models and add the three SES measures separately and then together. Specifically, the fourth model included only education; the fifth only employment status; the sixth only income; and the seventh model (full model) included education, employment status, and income. These seven models together help establish the separate main effects of the variables of interest as well as how they operate together to impact the odds of hypertension. Finally, using statistical interactions, I tested whether the impact of the three measures of SES varied for women compared to men (Table 6). My analyses were weighted to ensure representativeness and to account for the SAGE complex sampling design.

Table 4. Descriptive Characteristics (Means and Percentages) for Hypertension, Adults Aged 18+ WHO SAGE, Ghana (N=4,219).

	Females		Males		
Variables	**Mean /Per.**	**SD**	**Mean /Per.**	**SD**	**Sig.**
Non-Communicable Disease					
Hypertension	15.63	--	8.71	--	***
Socioeconmic Status					
Education (years)	8.33	3.94	9.70	3.99	***
Employment Status					
Employed	67.98	--	77.00	--	***
Unemployed	30.67	--	20.97	--	***
Income (1:low to 5:high)	2.98	1.41	3.13	1.41	***
Sociodemographic Characteristics					
Age (years)	60.86	14.17	59.38	13.67	***
Ethnicity					
Akan	57.34	--	44.25	--	***
Ewe	6.59	--	5.86	--	
Ga Adangbe	10.34	--	9.34	--	
Mole Dagbon	7.59	--	9.65	--	*
Other Ethnicity	16.73	--	28.91	--	***
Marital Status					
Married	32.12	--	84.26	--	***
Single	2.70	--	2.80	--	
Divorced	20.23	--	7.13	--	***
Widowed	44.96	--	5.82	--	***
Risk & Protective Factors					
Body Mass Index (BMI)	24.28	6.97	22.86	5.76	***
Alcohol Use					
Alcohol	47.40	--	68.11	--	***
No Alcohol	52.55	--	31.75	--	***
Tobacco Use					
Tobacco	7.34	--	37.80	--	***
No Tobacco	92.61	--	62.07	--	***
Physical Activity					
Moderate Exercise	12.64	--	18.49	--	***
No Moderate Exercise	87.31	--	81.37	--	***
Social Cohesion & Health Care Measures					
Social Cohesion (1:low to 5:high)	3.39	.73	3.16	.75	***
Health Insurance Status					
Health Insurance	37.11	--	36.13	--	
No Health Insurance	62.89	--	63.87	--	
Health System Responsiveness (1:low to 5:high)	2.66	.55	2.74	.57	***
Region					
Ashanti	15.53	--	14.30	--	
Brong Ahafo	10.39	--	10.15	--	
Central	13.54	--	9.97	--	***
Eastern	13.19	--	11.10	--	*
Greater Accra	13.44	--	11.32	--	*
Northern/Upper Regions	10.39	--	22.33	--	***
Volta	9.59	--	8.16	--	
Western	13.94	--	12.67	--	
Type of Geographic Location					
Urban	46.00	--	37.35	--	***
Rural	54.00	--	62.65	--	***
Sample Size (N)	2,002		2,217		

*** p <.001 ** p <.01 * p <.05.

Results

Descriptive Findings

Means and percentages for all the variables I used in this study are displayed in Table 4. In terms of the main dependent variable, Ghanaian women ((15.63 %) have significantly higher rates of hypertension compared to Ghanaian men (8.71 %), contrary to the literature. There are also significant gender differences among all three SES measures. Compared to Ghanaian men, Ghanaian women have attained fewer years of education (3.94 years vs. 3.99 years), are less likely to employed (67.98 % vs. 77.00 %), and have lower income status (2.98 vs. 3.13). Look at other sociodemographic variables, women are slightly older than men (60.86 years vs. 59.38 years). There is also variability with respect to ethnicity such that there are significantly more Akan women than Akan men (57.34 % vs. 44.25 %); but more men that are Mole Dagbon (9.65 % vs. 7.59 %) and Other Ethnicity (28.91 % vs. 16.73 %) compared to women. There are no significant differences between men and women with respect to Ewe and Ga Adangbe ethnicities. Furthermore, men are much more likely than women to be married (87.56 % vs. 57.34 %), while women are more lily to be divorced (20.23 % vs. 7.13 %) or widowed (44.96 % vs. 5.82 %). There is no significant difference in being single between men and women.

As for risk and protective factors for hypertension, consistent with the literature, Ghana women have significantly higher BMI (24.28 vs. 22.86) compared to men, but are less likely to use alcohol (47.40 % vs. 68.11 %) and tobacco (7.34 % vs. 37.80 %) compared to men. Ghanaian men are significantly more likely to engage in moderate physical activity compared to Ghanaian women (18.49 % vs. 12.64 %). In terms of community social cohesion and health care measures, Ghanaian women report significantly higher levels of social cohesion (3.39 vs. 3.16) compared to men. While there are no differences between men and women with respect to health

insurance status, Ghanaian women report significantly lower levels of health system responsiveness compared to Ghanaian men (2.66 vs. 2.74). Finally, with respect to regional differences, significantly more Ghanaian women reside in the Central (13.54 %), Eastern (13.19 % vs. 11.10 %), and Greater Accra (13.44 % vs. 11.32 %) regions compared to men; while more Ghanaian men reside in the Northern/Upper regions (22.33 % vs. 10.39 %). Given these gender differences by region, it is not surprising that a significantly more women reside in urban areas compared to men (46.00 % vs. 37.35 %).

Table 5. Logistic Regression Models Predicting Hypertension WHO SAGE, Ghana (N=4,219).

	SELF-REPORTED HYPERTENSION													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR
Sociodemographic Characteristics														
Female	.11	1.11	.05	1.05	.11	1.12	.55	1.74	.16	1.17	.13	1.14	.57	1.76
Age (years)	.04 ***	1.04	.04 ***	1.04	.05 ***	1.05	.06 ***	1.06	.04 ***	1.04	.05 ***	1.05	.05 ***	1.05
Ethnicity														
Akan	1.43 ***	4.18	1.64 ***	5.15	1.08 ***	2.94	1.32 **	3.74	1.05 ***	2.85	.94 **	2.57	1.16 *	3.20
Ewe	1.62 **	5.04	1.73 **	5.66	1.17 *	3.24	1.52 *	4.59	1.03 *	2.81	1.12 *	3.06	1.26 *	3.52
Ga Adangbe	1.90 ***	6.67	1.95 ***	7.02	1.06 *	2.87	1.04	2.83	.90	2.46	.98 *	2.66	.86	2.37
Mole Dagbon	1.54 ***	4.66	1.68 ***	5.37	.64	1.90	.87	2.39	.53	1.69	.63	1.88	.81	2.24
Married	-0.44	.65	-.41	.66	-.25	.78	-.12	.89	-.19	.83	-.39	.68	-.21	.81
Risk & Protective Factors														
Body Mass Index (BMI)			.07 ***	1.07	.06 **	1.06	.06 *	1.06	.06 ***	1.06	.05 **	1.05	.05 **	1.06
Alcohol Use			.33	1.40	.19	1.21	-.02	.98	.18	1.20	.16	1.18	-.07	.93
Tobacco Use			.09	1.09	.13	1.14	.59	1.81	.12	1.13	.18	1.20	.63	1.87
Moderate Exercise			.10	1.10	-.07	.93	-.40	.67	-.10	.90	-.14	.87	-.42	.66
Social Cohesion & Health Care Measures														
Social Cohesion (1:low to 5:high)					-.09	.91	-.21	.81	-.26	.77	-.07	.94	-.38	.69
Health Insurance					.48 *	1.62	.46	1.58	.49	1.64	.33	1.40	.38	1.46
Health System Responsiveness (1:low to 5:high)					.20	1.22	.38	1.47	.17	1.18	.18	1.20	.31	1.36
Region														
Ashanti					-.83 *	.44	-1.17 *	.31	-.81	.45	-.72	.49	-1.04	.36
Brong Ahafo					-1.52 ***	.22	-1.85 **	.16	-1.42 **	.24	-1.40 **	.25	-1.65 *	.19
Central					-2.26 ***	.11	-2.63 ***	.07	-2.26 ***	.10	-2.02 ***	.13	-2.43 ***	.09
Eastern					-.93	.40	-1.23	.29	-.94	.39	-.73	.48	-1.06	.35
Northern/Upper Regions					-2.21 ***	.11	-1.90	.15	-2.22 ***	.11	-1.86 ***	.16	-1.47	.23
Volta					-1.53 ***	.22	-1.83 ***	.16	-1.48 ***	.23	-1.35 ***	.26	-1.61 ***	.20
Western					-1.07 *	.34	-1.18	.31	-1.11 *	.33	-.92	.40	-1.05	.35
Urban					.50	1.65	.29	1.33	.43	1.54	.27	1.31	.09	1.09
Socioeconomic Status														
Education (years)							.05	1.05					.03	1.03
Employed									-.94 ***	.39			-.97 **	.38
Income (1:low to 5:high)											.31 **	1.36	.23	1.26
Constant	-5.36 ***		-7.76 ***		-6.78 ***		-7.80 ***		-5.21 ***		-7.67 ***		-6.56 ***	

*** p <.001 ** p <.01 * p <.05.

Model 1: Individual characteristics including gender, age, ethnicity, and marital status.

Model 2: Adds risk factors including body mass index (BMI), alcohol consumption, tobacco use, and moderate exercise to Model 1.

Model 3: Adds community, health system, and regional factors including social cohesion, health insurance status, health system responsiveness, region, and ubanicity to Model 2.

Model 4: Effect of education on Model 2.

Model 5: Effect of employment status on Model 2.

Model 6: Effect of income on Model 2.

Model 7: Full model including all measures of SES.

Multivariate Findings

Starting with Table 5, I present findings from logistic regression models with respect to hypotheses 1(a-c) presented above. Recalling that the first step in my model building was to establish the direct effects of sociodemographic variables including gender, age, ethnicity, and marital status, Model 1 of Table 5 shows that age and ethnicity are significantly associated with increased odds of hypertension. A one year increase in age increases odds of hypertension by 4 % (logit=.04, OR=1.04). Compared to Other ethnicities, Ghana's main ethnic groups: the Akans (logit=1.43, OR=4.18), Ewes (logit=1.62, OR=5.04), Ga Adangbes (logit=1.90, OR=6.67), and Mole Dagbons (logit=1.54, OR=4.66) experience significantly greater odds of hypertension.

In Model 2 for Table 5, which adds risk and protective factors including BMI, alcohol use, tobacco use, and exercise, age and ethnicity are again associated with increased odds of hypertension. Among the risk factors, only BMI is associated with hypertension. An increase in BMI is associated with a 7 % increased odds of hypertension (logit=.07, OR=1.07).The third model in Table 5 adds social cohesion, health care system, and region variables. It shows that having health insurance increases the odds of hypertension. Compared to those without health insurance, those with health insurance have 62 % increased odds of hypertension (logit=.48, OR=1.62). This result regarding health insurance may be expected given that hypertension was measured by asking respondents whether they had been told by a health professional that they had the condition. Further, Model 3 shows several regional variations. Compared to living in the Greater Accra region, residing in the Ashanti, Brong Ahafo, Central, the Northern/Upper, Volta, and Western regions is associated decreased odds of self-reported hypertension. Living in the Ashanti region is associated with 56 % decreased odds of hypertension (logit=-.83, OR=.44); living in Brong Ahafo (logit=-1.52, OR=.22) and Volta (logit=-1.53, OR=.22) regions with a

78 % decrease; living in Central (logit=-2.26, OR=.11) and Northern/Upper regions (logit=-2.21, OR=.11) with an 89 % decrease; and living in the Western region (logit=-1.07, OR=.34) with a 66 % decreased odds of hypertension. Furthermore, in the presence of these community, health system, and regional variables, the association between age, ethnicity, BMI and increased self-reported hypertension remain relatively the same. Mole Dagbon ethnicity is the only variable that is no longer significantly associated with increased odds of hypertension in Model 3.

Model 4 include all previous variables and adds one dimension of SES: education. The model shows that education is not significantly associated with odds of hypertension. In the presence of education, age, Akan, Ewe, and BMI remain significantly associated with increased odds of self-reported hypertension in Model 4, Table 5. Being of Ga Adangbe ethnicity and having health insurance, which were both associated with increased odds of self-reported hypertension in the previous model, are no longer significant in Model 4. Furthermore, compared to residing in Greater Accra, living in all regions except the Northern/Upper and Western regions remain significantly associated with decreased odds of self-reported hypertension.

Model 5 in Tables 2 includes all previous variables, but includes only employment status as a measure of SES. Being employed is significantly associated with a 61 % decrease in the odds of hypertension (logit=-.94, OR=.39). Similar to Model 4 in Table 5, Model 5 shows that age, Akan, Ewe, and BMI are significantly associated with increased odds of hypertension. Unlike Model 4, however, living in the Ashanti region compared to the Greater Accra region is no longer associated with decreased hypertension. In Model 5, the two regions that were not significantly associated with self-reported hypertension in the presence of education in Model 4 are now significantly associated with hypertension in the presence of being employed. Specifically, compared to living in Greater Accra, living in the Northern/Upper regions is

associated with an 89 % decrease in the odds of hypertension (logit=-2.22, OR=.11), while and Western is associated with a 67 % decrease (logit=-1.11, OR=.33).

Model 6 considers the effect of the third dimension of SES: income. The model shows that an increase in income is associated with a 36 % increase in hypertension (logit=.31, OR=1.36). As in Model 3 in Table 5, Model 6 shows age, Akan, Ewe, Ga Adangbe, and BMI are associated with increased odds of hypertension. Further, like Model 5, Model 6 shows that living in the Brong Ahafo, Central, Northern/Upper, and Volta regions are associated with decreased odds of hypertension compared to living in the Greater Accra. In the presence of income, Model 6 shows that living in the Western region, which was significantly associated with decreased odds of hypertension in Model 5, is no longer significant.

The final model of Table 5 includes all study variables. In Model 7, only one dimension of SES—being employed—is significantly associated with history of hypertension. Being employed is associated with a 62 % decrease in odds of self-reported hypertension (logit=-.97, OR=.38). Consistent with Models 4 and 5, age (logit=.05, OR=1.05), Akan (logit=1.16, OR=3.20), and Ewe (logit=1.26, OR=3.52) ethnicities are significantly associated with hypertension in the full model. Finally, among the regions, living in Brong Ahafo, Central, and Volta are the only regions significantly associated with decreased odds of hypertension. Living in Brong Ahafo is associated with an 81 % decease (logit=-1.65, OR=.19); living in Central with a 91 % decrease (logit=-2.43, OR=.09); and living in the Volta region with an 80 % decrease (logit=-1.16, OR=.20) in the odds of hypertension compared to those living in the Greater Accra region.

Table 6. Logistic Regression Models of the Moderating Effect of Gender on Relationship between SES and Hypertension WHO SAGE, Ghana (N=4,219).

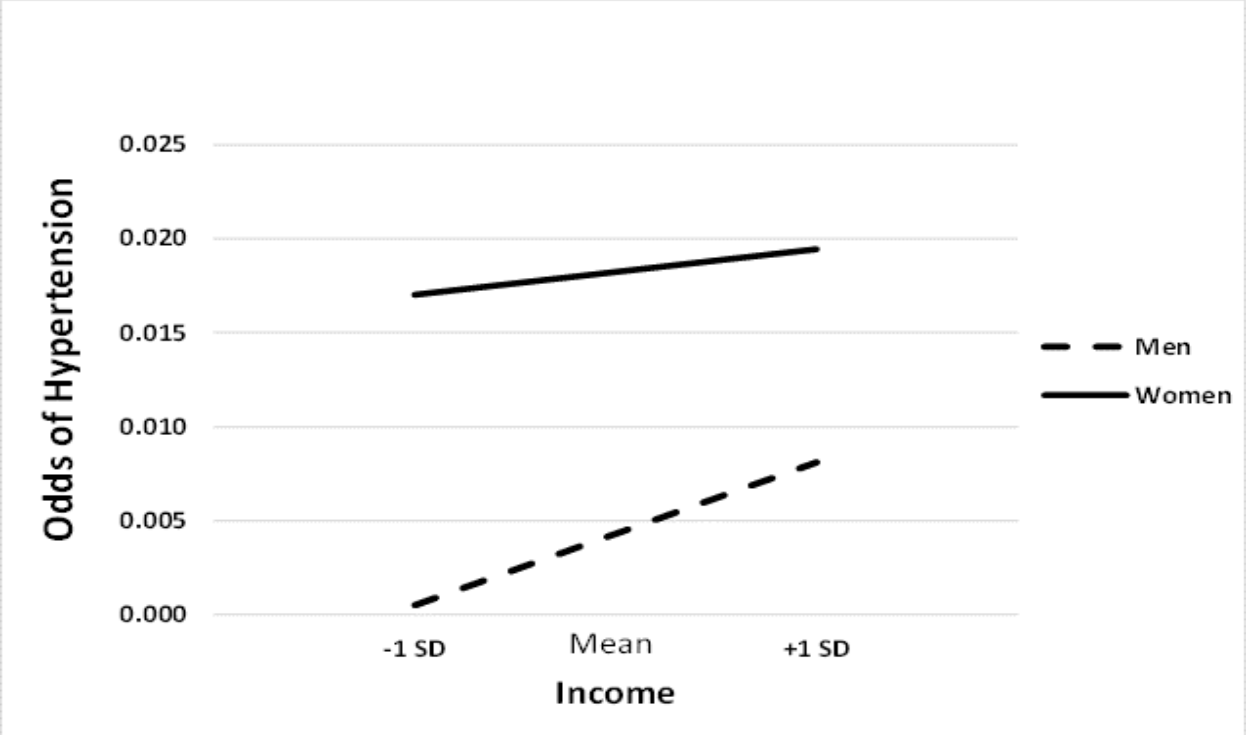
	Model 1		Model 2		Model 3	
	Logit	OR	Logit	OR	Logit	OR
Sociodemographic Characteristics						
Female	2.53 **	12.60	-.78	.46	.10	1.10
Age (years)	.05 ***	1.05	.06 ***	1.06	.05 ***	1.05
Ethnicity						
Akan	1.15 *	3.16	1.25 **	3.50	1.17 *	3.23
Ewe	1.17	3.22	1.15 *	3.17	1.20	3.33
Ga Adangbe	.84	2.32	.93	2.55	.82	2.26
Mole Dagbon	.82	2.27	.85	2.35	.81	2.25
Married	-.20	.82	-.18	.84	-.17	.85
Risk & Protective Factors						
Body Mass Index (BMI)	.05 *	1.05	.06 **	1.06	.06 **	1.06
Alcohol Use	-.05	.96	-.05	.95	-.05	.95
Tobacco Use	.73	2.07	.59	1.81	.63	1.88
Moderate Exercise	-.42	.66	-.45	.64	-.42	.66
Social Cohesion & Health Care Measures						
Social Cohesion (1:low to 5:high)	-.37	.69	-.40	.67	-.41	.66
Health Insurance	.38	1.47	.36	1.44	.38	1.47
Health System Responsiveness (1:low to 5:high)	.27	1.31	.33	1.39	.29	1.34
Region						
Ashanti	-1.02	.36	-1.11	.33	-1.05	.35
Brong Ahafo	-1.65 *	.19	-1.71 *	.18	-1.65 *	.19
Central	-2.44 *	.09	-2.45 ***	.09	-2.43 ***	.09
Eastern	-1.07	.34	-1.09	.34	-1.05	.35
Northern/Upper Regions	-1.67	.19	-1.45	.24	-1.55	.21
Volta	-1.57 ***	.21	-1.51 ***	.22	-1.59 ***	.20
Western	-1.06	.35	-1.04	.35	-1.03	.36
Urban	.04	1.04	.07	1.08	.07	1.08
Socioecomic Status						
Education (years)	.03	1.03	-.04	.96	.03	1.03
Employed	-.95 **	.39	-.97 **	.38	-1.39 **	.25
Income (1:low to 5:high)	.52 **	1.67	.22 **	1.24	.22	1.25
Interaction Effects						
Education X Female	.14	1.15				
Employed X Female			.73	2.07		
Income X Female					-.47 *	.63
Constant	-7.67 ***		-6.11 ***		-6.20 ***	

*** p <.001 ** p <.01 * p <.05.

The final table, Table 6, displays the results of the interactions between education, employment status, income and gender in predicting hypertension. While Models 1 and 2

respectively show that the interactions between education and gender and employment status and gender are not significant, Model 3 shows that gender moderates the effect of income on hypertension. Figure 2, which graphically displays this interaction, shows that at low levels of income Ghanaian men have little to no odds of hypertension compared to Ghanaian women. However, as one approaches average levels of income, there is an upward trajectory for men such that at high levels of income, the odds of hypertension for Ghanaian men increase significantly. Ghanaian women have higher odds of hypertension compared to Ghanaian men regardless of income level.

Figure 4. Interaction between Income and Gender in Predicting Hypertension



Discussion

This study investigated whether SES—measured by educational attainment, employment status, and income—was positively associated with hypertension among older adults in Ghana in

accordance with the reversal hypothesis (Pampel et al. 2012), which states that in LMICs like Ghana, high SES is associated with high morbidity and mortality from non-communicable diseases. I also examined whether the relationship between SES and hypertension varied by gender. In examining the SES measures separately, I did not find support for education (hypothesis 1a) or being employed (hypothesis 1b) increasing the odds of hypertension. However I did find support for income (hypothesis 1c) increasing the odds of hypertension, consistent with the reversal hypothesis. While education was not significantly associated with hypertension, being employed was; but contrary to the reversal hypothesis, being employed significantly *reduced* the odds of hypertension. When all three SES measured were entered into the full model, being employed remained significantly associated with decreased odds of hypertension. These findings suggest that different aspects of SES may work differently to predict hypertension; namely, there are features of attaining and maintaining employment that may be protective against hypertension, while increased income pay pose some risk for hypertension among Ghanaians.

I also examined whether the relationship between the SES variables and hypertension varied by gender. The gender interactions helped to further clarify the role income plays in predicting hypertension among Ghanaians. My interaction analyses revealed two patterns. First, women had higher odds of hypertension compared to men across all income levels. Gendered norms in Ghana requires that women be responsible for the gathering and preparation of food. Like many other African societies, norms surrounding health and beauty in Ghana favor fatness among women (de-Graft Aikins 2013; Prentice 2006). Perhaps there is something about fulfilling those traditional gender roles as well as assuming new ones as gender norms shift that are particularly detrimental to the non-communicable disease outcomes for women.

Second, the interaction effect showed increased income increased the odds of hypertension for Ghanaian men. The mechanisms by which income increases risk for hypertension among Ghanaian men still needs further exploration. As mentioned above, however, Ghana is largely patriarchal. Men in Ghana are expected to be head of households and providers and face stressors associated with fulfilling those roles. And while women in Ghana face many more barriers to access resources and power, those barriers are gradually eroding (Wrigley-Asante 2013). Men in Ghana are expected to head of households (even among matrilineal ethnicities), breadwinners, and providers. As more Ghanaian women enter assume career and social roles once held exclusively by high SES men, Ghanaian men may engage in traditionally masculine behaviors (e.g. drinking or tobacco use) that, while signaling their status also negatively affects their health and increase their risk for conditions like hypertension.

Furthermore, the literature from SES and gender health offer additional explanations for the findings supporting the reversal hypothesis uncovered in this study. One comes from the fundamental cause theory. While maintaining that the connection between SES and health is quite powerful, Phelan and colleagues (2010) conceded the possibility of other equally potent goals and motivations that could compete with this relationship. Specifically, scholars have noted the possibility of countervailing mechanisms to SES as a fundament cause. Countervailing mechanisms are powerful motivations aside from SES that are more readily attained by those of high SES but work to the detriment of health. For example, it is primarily high SES Ghanaians who can afford high caloric, high fat, and high salt foods from American chains like KFC, which opened in Ghana about four years ago in a global effort to expand to newer markets. In Ghana, being able to afford take your significant other or family to a KFC, is often a sign of status. As such, among the three SES indicators, income may be particularly important for shaping

hypertension among Ghanaian men because income reflects spending power and resources to purchase certain foods and lifestyles that conform to Ghanaian expectations of masculinity.

Some other findings worth noting in this study are the ethnicity and regional patterns in the risk for hypertension. As mentioned above, ethnicity and region are rarely considered in studies examining non-communicable diseases in Ghana. In this study, I found that two of the largest ethnicities, the Akans and Ewes consistently had higher odds of hypertension even after controlling for the SES, risk factors and other sociodemographic variables. This is consistent with previous research suggesting that these two groups in particular are at greater risk for factors associated with hypertension such as obesity (Awuah and Afrifa-Anane 2013). Moreover, the Akans are the largest ethnic group in Ghana and given that their ancestral land is rich in gold, they are arguably also the wealthiest and most influential ethnicity in Ghana. Although English in the official language in Ghana, the language of the Akans, Twi, is the vernacular language most used by all ethnicities in Ghana. In accordance with the reversal hypothesis, the Akans relatively high status in Ghanaian society may make them particularly susceptible to non-communicable diseases like hypertension. Given that few studies have taken ethnicity into consideration when examining hypertension among Ghanaians, this dissertation takes a small step in filling this gap.

With respect to regional variations, I found that most regions in Ghana consistently have lower odds of hypertension compared to the Greater Accra region. This finding is not terribly surprising given the literature indicating that it is urban and industrialized areas in LMICs that are experiencing the greatest increase in non-communicable diseases like hypertension. Compared to other regions in the country, Greater Accra region, where Ghana's capital is located, continues to receive the lion's share of investments in all sectors of society from the

economy, education, to health care. Given this imbalance in investment, residents from other regions in Ghana often migrate to the Greater Accra region in search of social and economic mobility. At the same time, living in the Greater Accra region exposes residents to urban and western lifestyles that researchers have implicated in the rise of non-communicable diseases like hypertension (Agyei-Mensah and de-Graft Aikins 2010; de-Graft Aikins 2013; Prentice 2006).

There are, however, some important limitations of this study to note. First, the data employed for this study are cross-sectional. Although, the WHO SAGE data is longitudinal study, only Wave 1 is currently available. As such, it is difficult for this study to establish temporal ordering and identify causal associations among the variables examined. As additional waves of SAGE Ghana become available, researchers can better assess changes in SES and hypertension over time. Second, among non-communicable diseases, hypertension is often underdiagnosed. A major part of the danger with hypertension is that it has no warning signs or symptoms. Because many people are unaware they have it, hypertension is often referred to as the "silent killer" (CDC 2014; WHO 2013). Consequently, relying solely on self-report of hypertension may underestimate the number of people who actually have the condition. As such, future research examining hypertension in Ghana should include measured hypertension (i.e., readings from blood pressure meter) to ascertain the level of underreporting and to determine whether results change depending on which measure of hypertension is used. Third, although I used three different measures of SES to examine hypertension, perhaps other measures of SES based on living conditions, wealth, or religious affiliation are more salient for an LMIC in transition like Ghana. Future studies should make it a priority to examine other dimensions of SES in countries like Ghana aside from the commonly used indicators of education, income, and occupation. Finally, I was not able to examine differences by occupational prestige/status. Like

other countries, there is a hierarchy in Ghanaian occupations with professionals and business men and women at top and unskilled laborers at the bottom. Future studies should make it a priority to examine other dimensions of SES that allow more specificity in locating the social position of respondents.

Despite these limitations, there are three important contributions of this study to understanding the socioeconomic determinants of hypertension among men and women in Ghana. First, this study has the advantage of using a fairly new nationally representative dataset with large enough samples to examine how SES and gender interact to predict hypertension among older Ghanaians. Second, this is one of a few nationally representative studies focused on Ghana that takes ethnic and regional variables into consideration. This study is an important step in highlighting the added insight ethnicity brings to identifying groups that may be disproportionately affected by increased non-communicable conditions in LMICs like Ghana. Similarly, by considering region, this study helped confirm what previous studies have shown that areas undergoing rapid globalization, urbanization, and industrialization (i.e, the Greater Accra region) are most at risk for non-communicable disease like hypertension.

Conclusion

The main finding of this study: that income increases odds of hypertension in support of the reversal hypothesis, particularly among Ghanaian men needs to be placed in proper context. My findings should not be taken to mean that those of low SES are not at risk for non-communicable conditions like hypertension. Rather, the findings suggest that in LMICs like Ghana, effectively addressing non-communicable diseases requires a comprehensive approach that is inclusive of all segments of the population. As some scholars have noted, while those of

high SES in LMICs are at higher risk for developing chronic conditions (Agyei-Mensah and de-Graft Aikins 2010; Pampel et al. 2012), that burden is likely to shift to low SES individuals if countries are not proactive in their efforts.

Ultimately, policies that countries like Ghana could take to address this growing burden should focus not so much on treating each non-communicable condition that emerges (vertical approach), but rather on social, cultural, and political structures that place individuals at increased risk for developing preventable non-communicable diseases. This is because many of many of these conditions share similar risks and protections. Indeed, along with my previous study on diabetes, this study on hypertension highlights several similarities in the understandings and framing of non-communicable diseases of non-communicable diseases in LMICs like Ghana. While distinct in terms of awareness, diagnosis, treatment, and management, diabetes and hypertension share important risk factors such as age and obesity. By advancing policies that address some these underlying risk factors, LMICs like Ghana can make significant strides in effectively addressing the rise of numerous non-communicable diseases.

CHAPTER IV

(Un)Healthy Immigrant Effect? Gender and Non-Communicable Disease among African Immigrants in the United States

Introduction

Prevailing explanations of differences in health outcomes between immigrant and native-born populations in the United States (U.S.) focus on the healthy immigrant effect. The healthy immigrant effect describes a pattern observed among many researchers whereby immigrants arrive in the U.S. with a health advantage over their native-born counterparts (Antecol and Bedard 2006; David and Collins 1997; Hamilton and Hummer 2011; Hummer et al. 2007; Jasso et al. 2004; Palloni and Arias 2004; Singh and Siahpush 2002). While this line of research has predominantly focused on Latino and Asian groups (Jasso et al. 2004; Lopez-Gonzalez et al. 2005; John et al. 2012; Markides et al. 2005; Marmot and Syme 1976; Palloni and Arias 2004; Ryu et al. 2013), researchers have found a similar effect for black immigrant groups (Antecol and Bedard 2006; Elo et al. 2008; Hamilton and Hummer 2011; Read et al. 2005). The extant research shows that black immigrants have lower morbidity and mortality rates, and more favorable self-reports of health than native-born blacks (Antecol and Bedard 2006; Elo et al. 2008; Hamilton and Hummer 2011; Collins et al. 2002; David and Collins 1997; Hummer et al. 1999; Singh and Siahpush 2002). However, this health advantage dissipates over time; the longer immigrants are in the U.S. the closer their health profiles converge to that of their racial/ethnic native-born counterparts (Antecol and Bedard 2006; Goel et al. 2004; Hamilton and Hummer 2011; Venters and Gany 2011; Read et al. 2005).

The primary purpose of this paper is to examine the association among nativity, gender, and two non-communicable diseases outcomes: diabetes and hypertension among adults in the U.S. In doing so, I contribute to the literature in two important ways. First, while previous research on the healthy immigrant effect finds more favorable non-communicable disease outcomes among African immigrants in the U.S. compared to the native-born blacks, recent studies have shown increases in non-communicable diseases like diabetes and hypertension in African origin countries (Abegunde et al. 2007; Dalal et al. 2011; Stuckler 2008; Unwin et al. 2001). In this paper, I consider the changing epidemiologic profile of African origin countries in an attempt to provide more comprehensive context for the healthy immigrant effect in a major destination country like the U.S. Second, few scholars have paid little attention to whether the healthy immigrant effect varies by gender (Gorman et al. 2010), particularly as it relates to African immigrants. A wealth of research from the U.S. as well as African origin countries indicate significant gender differences in risk factors for diabetes and hypertension such as socioeconomic status, alcohol consumption, smoking, and weight (Agyemang et al. 2012; Antecol and Bedard 2006; Lucas et al. 2003; de-Graft Aikins et al. 2013). Thus, it is reasonable to expect that the associations among nativity, diabetes, and hypertension might also vary by gender. My specific goal in this paper is to answer the following two questions: 1) What is the relationships between nativity and (a) diabetes and (b) hypertension? 2) Does this relationship vary by gender; that is, the direction and magnitude of the associations between nativity, diabetes, and hypertension the same for African immigrant women and men?

Background

I draw on literatures on immigrant health, changing non-communicable diseases patterns in African countries, and gender disparities to guide this study. The first body of research focuses on the healthy immigrant effect, which provides an important theoretical framework for understanding why immigrants have better health outcomes relative to their U.S. born counterparts. The second provides context on increasing non-communicable diseases—specifically diabetes and hypertension—in African countries of origin that might have implications for the healthy immigrant effect. Finally, the third area by way of background provides the basis for understanding why the health outcomes of immigrant men and women may differ by examining gender roles and processes at both origin and destination contexts that differentially impact African men's and women's risk for diabetes and hypertension. Together, these bodies of research allow me to hypothesize the interaction of nativity and gender with respect to the aforementioned non-communicable disease conditions of diabetes and hypertension.

Theoretical Framework: The Healthy Immigrant Effect

The increasing presence of immigrants from African countries is altering the composition of the U.S. black population to such a degree that black ethnicity is increasingly entering the discourse of racial and ethnic health disparities (Elo et al. 2011; Hamilton and Hummer 2011; Lee and Bean 2004; Read et al. 2005). Consistent with studies on other immigrant groups (e.g., Latino and Asian immigrants), studies on African immigrants indicate better health, low rates of chronic and degenerative disease, and lower infant as well as adult mortality compared to native-born blacks, a phenomenon scholars refer to as the healthy immigrant effect or healthy

immigrant advantage (Antecol and Bedard 2006; Hamilton and Hummer 2011; Hummer et al. 2007; Jasso et al. 2004; Margai 2009; Palloni and Arias 2004; Singh and Hiatt 2006; Singh and Siahpush 2001). For instance, Hummer et al. (1999) found black immigrants to have lower mortality for all causes compared to their native-born counterparts. In Singh and Siahpush's (2002) comprehensive examination of ethnic-immigrant differentials in health behaviors, morbidity, and mortality in the U.S., the authors found lower mortality among black immigrants (foreign-born non-Hispanic lacks) compared to native-born blacks (U.S. born non-Hispanic blacks) in several leading causes of death including cardiovascular diseases, diabetes, hypertension, and other non-communicable diseases. Additionally, in their examination of the role nativity plays in health status and health behaviors among pregnant black women born the U.S., Caribbean, and Africa, Elo and Culhane (2010) found that foreign-born black women—particularly African-born women—were significantly less likely to engage in substance use and had better self-rated physical health and mental health than pregnant native-born black women. Finally, in a study comparing the health status, health insurance, and health care utilization patterns of immigrant black men to native-born black and white men in the U.S., Lucas and colleagues (2003) found that, despite lower rates of health insurance, immigrant black men reported better self-rated health than their native-born black counterparts. Indeed, the authors found that the health status of immigrant black men was similar to or slightly better than native-born white men across a number of health indicators and behaviors (Lucas et al. 2003).

Scholars have offered various explanations for the healthy immigrant effect observed among black immigrant groups compared to native-born blacks in the U.S. These fall into the two general categories of migrant selectivity and health behaviors/acculturation (Feliciano 2005; Hamilton and Hummer 2011; Margai 2009; Reed et al. 2012). Selectivity explanations assert that

good health is highly correlated with factors that also favor migrating. Primary among these selection factors is socioeconomic status (SES); particularly educational level (Reed et al. 2012). African immigrants in the U.S. tend to be higher on socioeconomic indicators that matter for health such as educational attainment, income, and employment compared to their native-born black counterparts (Doamekpor and Dinwiddie 2015; Elo et al. 2011; Hamilton and Kawachi 2013; Margai 2009; Kent 2007). Furthermore, scholars have noted Africa's greater distance to the U.S. and newer migrant networks increases immigration barriers for its population (Akresh and Frank 2008; Reed et al. 2012). As such, Africans who are able to migrate to the U.S. are highly selected and tend to have access to resources that matter for health compared to native-born blacks in the U.S. (Feliciano 2005; Hamilton and Hummer 2011).

The health behaviors and acculturation explanations for the healthy immigrant effect assert that African immigrants engage in healthier behaviors when they first arrive to the U.S. compared to their native-born counterparts. These behaviors, which are often linked to cultural values and norms of origin countries, include lower rates of cigarette smoking, alcohol consumption, healthier diets, and greater social support networks (Hamilton and Hummer 2011; Lucas et al. 2003; Margai 2009; Reed et al. 2012). Over time, as Africans become more acculturated and take on American cultural values and behaviors, they experience poorer health outcomes (Hummer et al. 2007). Scholars have often used length of residence or duration in the U.S. as proxy measure of immigration acculturation to U.S. values and health behaviors (Antecol and Bedard 2006; Goel et al. 2004; Margai 2009; Oza-Frank et al. 2011; Reed et al. 2012; Venters and Gany 2011; Williams et al. 2007). While there is a dearth of research that specifically examines diabetes and hypertension among African immigrants by duration, there are a few studies that have examined duration and non-communicable disease health outcomes

among black immigrant groups. In general, these studies have found that the health profile of black immigrants converge towards that of their native-born counterparts between 10 to 20 years of residence in the U.S. (Antecol and Bedard 2006; Goel et al. 2004; Koya and Egede 2007; Oza-Frank et al. 2011; Singh and Siahpush 2002; Williams et al. 2007). Ultimately, the health behaviors that help African immigrants maintain their health advantage erode with increased duration in the U.S.

Changing Health Profiles of African Countries of Origin

While previous studies on the healthy immigrant effect finds more favorable non-communicable disease outcomes among African immigrants in the U.S. compared to the native-born blacks, recent studies have shown rapid increases in non-communicable conditions such as diabetes and hypertension in African origin countries (Abegunde et al. 2007; Dalal et al. 2011; Stuckler 2008; Unwin et al. 2001). Indeed, low and middle-income countries (LMICs) in Africa are projected to see the most rapid increase in these conditions over the next two decades (Abegunde et al. 2007; Dalal et al. 2011; Stuckler 2008; Unwin et al. 2001; World Health Organization [WHO] 2006). In 2004, 25 % of all deaths in Sub-Saharan Africa were due to non-communicable diseases in 2004; this percentage is expected to rise to about 46% by 2030 (WHO 2006). The changing pattern of morbidity and mortality in African countries is part of an epidemiologic transition whereby infectious communicable diseases are displaced with chronic non-communicable diseases as the primary cause of morbidity and morbidity (Omran 1971/2005). The situation in Africa is especially dire because a historic focus on maternal-child health and infectious disease in the region means less research and resources have been devoted to eradicating non-communicable diseases (Dalal et al. 2011; de-Graft Akins 2007).

Among the non-communicable diseases of particular concern in African countries are diabetes and hypertension. While diabetes and hypertension are separate conditions, scholars have grouped them under an umbrella of cardiometabolic disorders, a constellation of diseases that, while distinct, share similar characteristics and have related risk factors and fatal outcomes (Kirk and Klein 2009; Mezuk 2010). Diabetes is characterized by abnormally high levels of blood glucose due to a deficiency in the production of insulin by the pancreas or the ineffectiveness in the use of the insulin produced (CDC 2011). Diabetes, specifically type 2 diabetes, accounts for well over 90% of all diabetes cases in African countries (Hall et al. 2011). Hypertension, also known as high blood pressure, is characterized by high force of blood pushing against the walls of blood vessels over an extended period of time (WHO 2013). Africa has the highest prevalence of hypertension in the world, with 46% of adults aged 25 and above affected (WHO 2013). Both diabetes and hypertension take a significant toll on families, communities, and national finances due to premature death, disability, personal and family disruption, loss of income and health care expenditure. The cost of treating/managing diabetes and hypertension is often prohibitively expensive for individuals in LMIC African countries; and many do not seek diagnosis and treatment as a result (Hall et al. 2011; Kirigia et al. 2009; WHO 2013).

Although this trend of increasing diabetes and hypertension is occurring in what may seem a world away, these changing morbidity and mortality patterns in Africa have implications for health patterns in the U.S. because of immigration. Between 2001 and 2006, immigration contributed to at least 20% of the growth in the U.S. black population (Kent 2007). Further, foreign-born Africans represent one of the fastest growing immigrant groups in the U.S., increasing by 166% in just a decade between 1990 and 2000 (Capps et al. 2012). The largest

group of African immigrants in the U.S. come from the West African region (35 percent), followed by East/Central Africans (26 %), Northern Africans (20 %), and finally Southern Africans, who comprise about 19 % of African immigrants in the U.S. (Margai 2009).

Gender and the Healthy Immigrant Effect among Africans

While research on the healthy immigrant effect has been robust, studies have paid little attention on the differential experiences of men and women (Gorman et al. 2010). Gender is important for understanding the health of African immigrants for two important reasons. First, there are important differences in the health of men and women, and the way in which sociodemographic and behavioral risk factors shape these gender disparities (Bird and Rieker 2008; Gorman et al. 2010; Gorman and Read 2006). In both origin and destination countries, women live longer but sicker lives compared to men (Waldron 1998; WHO 2009). Researchers have noted both biological and socio-behavioral factors in women's higher life expectancy but sicker lives than men (Gorman and Read 2006; Lopez-Gonzalez et al. 2005). Further, gendered social norms and pressures have often been implicated in explanations of men's poor health outcomes due to unhealthy behaviors such as alcohol and tobacco use (Charmaz 1995; Courtenay 2000a; Gorman et al. 2010).

A second key reason for considering gender in African immigrant health is that migration processes differ for African women and men. Although African women are closing the gap, African migration to the U.S. is still predominantly a male enterprise (Reed et al. 2012). According to selectivity, African men with high education and income are also more likely to migrate to the U.S. Moreover, assimilation and acculturation processes vary by gender due to lifestyle differences in African countries of origin and subsequent reception in U.S. society.

Many African countries of origin, including the top origin countries of Nigeria, Ghana, Ethiopia, and Kenya (Gambino et al. 2014; Kent 2007) are patriarchal societies (Addai and Adjei 2014; de-Graft Aikins 2006; Read et al. 2009). Despite gains in education and the labor market over time, African women remain largely subordinate to men and responsible for maintaining domestic life. African men are viewed as providers and primary breadwinners even when their wives have greater income (Addai and Adjei 2014).

The patriarchal context of African origin countries has important health implications. For example, in a study from the major origin country of Ghana, the authors found that Ghanaian women perceive their health status more negatively than men (Addai and Adjei 2014). The authors attributed the observed gender differences in overall health to higher levels of stress stemming for the multiple roles women in Ghana must fulfill in the care of children, other family members, and all household responsibilities (Addai and Adjei 2014). Moreover, when family members do become chronically ill, it is the primary responsibility of women to provide care (Addai and Adjei 2014). Studies have found that attending to the needs of chronically ill family members in non-institutionalized settings precipitates declines in in the caregivers' own health and well-being (Addai and Adjei 2014; de-Graft Aikins 2006; Read et al. 2009).

The health of African men is also affected by expectations to fulfill traditional male roles as providers (Dixon 2014; Adomako Ampofo and Boateng 2007). In the African context, masculinity is often measured by the ability to meet the material needs of wives, children and other family members; and an inability to do so often results in losing face and social stigmatization (Adinkrah 2012). For example, a study examining the impact of socioeconomic hardships on traditional male responsibility in Ghana linked economic hardship to men's increased abuse of a locally brewed gin, which in turn led to increased violence and negligent

behaviors that burdened women family members' responsibilities (Dixon et al. 2014; Luginaah 2008). Ultimately, women and men occupy different social roles that shape their health experiences in African countries of origin.

After arriving in the U.S., gender relations among African men and women are reconstructed. Like other immigrant women, African women often make gains in independence and decision-making ability that reflect an improvement in status compared to gender relations in their countries of origin (Gorman et al. 2010; Read and Reynolds 2010; Williams et al. 2007). Conversely, African men lose some power and status, both within U.S. society and in comparison to women (Gorman et al. 2010; Williams et al. 2007). Furthermore, the ideals of masculinity still pertain in the U.S. context; making behaviors such as alcohol and tobacco use as well as reluctance to seek health care particularly detrimental to men's non-communicable disease outcomes (O'Brien et al. 2005; Read and Reynolds 2012). The impact of the gendered patterns of assimilation on non-communicable disease outcomes like diabetes and hypertension remains unclear. This paper aims to bring clarity to this issue.

Summary and Hypotheses

The health immigrant effect suggests that African immigrants arrive in the U.S. with better morbidity and mortality profiles than their native-born black counterparts due to selectivity and better health behaviors. However, the longer African immigrants remain in the U.S., the more their health profiles converge to those of native-born blacks. While research on the health of African immigrants in the U.S. is increasing, there are still unanswered questions about this population. One important question is whether the previously observed patterns expected by the healthy immigrant effect apply to non-communicable diseases like diabetes and hypertension

given current trends indicating rapid increases in these conditions in African countries of origin. Another question that requires further exploration is whether the healthy immigrant effect varies by gender among African immigrants. Because gender is a pervasive stratifying factor in health outcomes, the healthy immigrant effect may apply to African men and women differently. Using diabetes and hypertension as my main non-communicable disease outcomes, this paper provides some insight to these questions by assessing the following hypotheses:

Diabetes Hypotheses

Hypothesis 1a: African immigrants will have lower odds of diabetes than native-born non-Hispanic blacks.

Hypothesis 1b: African immigrants will have lower odds of diabetes than native-born non-Hispanic whites.

Hypertension Hypotheses

Hypothesis 2a: African immigrants will have lower odds of hypertension than native-born non-Hispanic blacks.

Hypothesis 2b: African immigrants will have lower odds of hypertension than native-born non-Hispanic whites.

In the models I develop below, I assess whether the relationships specified in hypotheses 1 and 2, vary by gender.

Within Group African Immigrant Hypotheses

Hypothesis 3a-b: Longer duration in the U.S. will increase the odds of (a) diabetes and (b) hypertension among African immigrants.

Hypothesis 4a-b: African men will have higher odds of (a) diabetes and (b) hypertension compared to African women.

In estimations used to test all hypotheses, I control for factors that vary among men and women that prior studies have shown are associated with diabetes and hypertension. These include sociodemographic characteristics such as age, socioeconomic status (i.e., educational attainment, employment, and income), marital status, region of residence as well as risk and protective factors including alcohol use, smoking status, body mass index (BMI), physical activity, and health insurance status.

Data and Measures

Data

Using ten waves of the National Health Interview Survey (NHIS) adult sample (2003-2012), I determine the odds of diabetes and hypertension among African immigrants compared to two other groups in the U.S.: native-born non-Hispanic blacks (hereinafter "African Americans") and native-born non-Hispanic whites (hereinafter "whites"). The NHIS is a nationally representative cross-sectional household survey of the non-institutionalized U.S. population that provides data on socioeconomic, demographic, behavioral, morbidity, health, and healthcare characteristics (http://www.cdc.gov/nchs/nhis.htm). Administered by the National Center for Health Statistics, the NHIS is one of the longest running annual federal health surveys that covers a broad range of physical and mental health topics for both adult and children. It includes measures of chronic conditions such as heart disease, diabetes, and stroke as well as key risk factors such as obesity, smoking, diet, physical activity, alcohol use, health insurance coverage, and preventive health screenings (Singh et al. 2013).

The NHIS is arguably the most important federally administered health survey with large sample sizes that allow researchers to examine multiple racial/ethnic and immigrant groups

(Singh et al. 2013). It provides a broad range of immigration variables including immigration status (U.S. or foreign born); geographic location of birth (USA, Africa, Europe, Mexico, Central America, Caribbean Islands, South America, Indian Subcontinent; Southeast Asia, and Asia); duration of residence in the U.S., and citizen status. Despite its reach, NHIS samples do not always provide enough cases to reliably study specific subpopulations such as African immigrants. Researchers often combine data from two or more survey years to achieve adequate sample sizes for these groups (e.g. Elo et al. 2011). Since I am interested in comparing the non-communicable health risk of African immigrants to other groups, I pool 10 waves of data (2003-2012) from the NHIS adult sample to ensure a large enough sample size. The NHIS data were extracted from the Integrated Health Interview Survey website located at the University of Minnesota (http://www.ihis.us/ihis/).

Measures

Outcomes. Diabetes and hypertension are my two dependent variables. In the NHIS, both conditions are measured by asking respondents of: "Have you ever been told by a doctor or other health professional that you had... [diabetes] [hypertension, also called high blood pressure]." For both diabetes and hypertension, I coded Yes responses as 1 and No responses as 0.

Race, Ethnicity, Nativity & Duration in the U.S. In this study, I include three groups: 1) Africans: respondents who were born in Africa and self-identified as black; 2) African Americans: respondents who were born in the U.S., self-identified their race as black, and are not of Hispanic ethnicity; and 3) whites: respondents who were born in the U.S., self-identified their race as white; and are not of Hispanic ethnicity. Because of their dominant placement within the hierarchy of U.S. society, I select whites as the comparison group. Further, I included duration in

the U.S. as a variable. Duration in the U.S. was measured categorically to include under 5 years, 5-10 years, 10-15 years, and over 15 years.

Gender and Sociodemographic Characteristics. In my models below, I am also interested in differences by gender. I produce models that show differences within and between group differences. Furthermore, I include other sociodemographic characteristics; namely, age, education, employment status, family income, marital status, and region of residence. Age is measured in years and I include all adult respondents aged 18 and above in my analyses. Education was also measured in years to represent the highest level of school completed. Employment status was ascertained by asking respondents what they were doing during the preceding week. I compared respondents who were working versus those who reported not working. Family income was measured categorically with family incomes between $0 and $34,999 (low income) compared to two other income categories: between $35,000 and $74,999 (middle income) and $75,000+ (high income). I compared respondents report low family income to those reporting middle and high family incomes because of literature consistently linking low income and poor health outcomes in the U.S. (Boykin et al. 2011; Braveman et al. 2010; Williams et al. 2010). I also include marital status, which compares those who are married or cohabitating to those who are single, divorced/separated, and widowed. Finally, I control for region of residence: Northeast, Midwest, South, and West. Because studies have consistently found residents of the South to have the higher rates of diabetes and hypertension (Kachan et al. 2014), I compare respondents from the South to those in the Northeast, Midwest, and West.

Risk & Protective Factors. I include measures of risk to health that research has shown contributes (whether positively or negatively) to diabetes and hypertension. These include alcohol use, smoking, weight, physical activity, and health insurance status. I measured alcohol

use as number of days per week the respondent had a drink; ranging from 0 to 7 days a week. I compared current smokers (1= yes) to former smokers and respondents who have never smoked. I used body mass index (BMI) as a measure of weight. BMI is a measure body fat based on height and weight that applies to adult men and women. NHIS calculated BMI using the following formula based on self-reported weight and height: [Weight in pounds/(Height in inches, squared)] multiplied by 703 (CDC 2015). I kept BMI as continuous rather than dividing it into dummy variables using the conventional cutoffs used in the U.S. because research suggests that the cutoffs may be less meaningfully among groups like Africans, who have not had as long a history with overweight and obesity (Sodjinou et al. 2008). Physical activity was assessed by how frequently (never, daily, weekly, monthly, and yearly) respondents engaged in light to moderate physical activity such as walking, bicycling, slow swimming, dancing, and simple gardening that caused light sweating or a slight to moderate increase in breathing or heart rate. In the models below, I compare those who never engage or are unable to engage in physical activity to all other groups. Finally, the NHIS asks respondents of their current health insurance status. I compare those with health insurance (1= Yes) to those without insurance.

Analytic Strategy

The analysis for this study was accomplished in two general steps. First, I generated a series of descriptive statistics for all study variables for black African immigrants, African Americans, and whites. Second, to establish the relationships among nativity and my two non-communicable disease outcomes, I conducted separated logistic regression by gender. The first model was a baseline model to establish the odds of diabetes and hypertension among Africans, African Americans, and whites. The second model built on the first and sociodemographic

characteristics (age, education, employment status, family income, marital status, and region of residence). The third, full model, built on the second model, adding risk and protective factors, including alcohol use, smoking status, BMI, physical activity, and health insurance status. These three models help establish the separate main effects of the variables of interest and well as how they operate in concert to predict the odds of diabetes and hypertension among African immigrant men and women in the U.S. Finally, because I am interested in the presence and size of the healthy immigrant effect, I compare African immigrants to both African Americans and whites as well as examine within group risk for diabetes and hypertension among African men and women.

Table 7. Descriptive Characteristics for Foreign- & Native-Born Black US Residents Aged 18+, National Health Interview Survey, 2003-2012[a]

Variables	Africans[b]		African Americans[b]		Whites[b]	
	Women	Men	Women	Men	Women	Men
NCDs						
Diabetes	5.56	7.67	13.85	14.24	8.61	9.38 ***
Hypertension	16.27	19.33	41.75	38.78 ***	30.28	30.83
Duration in the U.S.						
0-5 years	20.24	17.33				
5-10 years	31.75	28.17				
10-15 years	20.24	21.67				
15+ years	27.58	32.67				
Sociodemographic Characteristics						
Age	37.85	39.30	46.07	46.87 ***	50.07	48.33 ***
(standard deviation)	(11.76)	(11.81)	(17.90)	(16.94)	(18.60)	(17.53)
Education (Years)	15.59	17.07 ***	15.01	14.76 ***	16.05	16.10 **
(standard deviation)	(3.99)	(3.45)	(3.10)	(3.16)	(2.90)	(3.02)
Employment Status						
Employed	70.44	82.33 ***	54.56	57.70 ***	56.48	67.68 ***
Unemployed	8.73	6.67	7.96	8.44	3.14	4.00
Not in Labor Force	20.83	11.00 ***	37.48	33.86 ***	40.38	28.32 ***
Family Income						
$0-$34,999	53.77	48.67	66.17	54.32 ***	41.48	33.76 ***
$35,000-$74,999	31.94	35.33	24.19	30.30 ***	31.41	34.54 ***
$75,000+	11.90	11.67	6.85	10.97 ***	17.75	20.75 ***
Marital Status						
Married	42.66	43.67	19.54	33.03 ***	46.39	51.56 ***
Single	28.17	32.17	39.28	32.46 ***	15.75	22.76 ***
Separated/divorced	21.03	17.67	23.57	22.10 *	17.59	15.20 ***
Widowed	4.76	1.50 *	13.55	5.63 ***	15.04	4.82 ***
Region of Residence						
Northeast	25.99	21.33	13.23	10.85 ***	17.20	16.81
Midwest	21.63	21.50	19.19	18.23	28.84	28.93
South	37.30	38.83	59.47	60.50	34.36	33.68
West	15.08	18.33	8.11	10.43 ***	19.60	20.57 ***
Risk & Protective Factors						
Alcohol Use (days per week)	.41	.91 ***	.58	1.22 ***	.98	1.59 ***
(standard deviation)	(0.90)	(1.47)	(1.32)	(1.92)	(1.78)	(2.18)
Smoking Status						
Current Smoker	2.18	13.17 ***	20.09	28.72 ***	21.18	24.59 ***
Former Smoker	1.59	12.17 ***	13.37	20.27 ***	22.90	29.25 ***
Never Smoked	96.23	74.67	66.54	51.01 ***	55.93	46.16 ***
Body Mass Index (BMI)	26.75	26.11 *	29.21	27.98 ***	26.57	27.46 ***
(standard deviation)	(5.41)	(3.82)	(6.25)	(4.94)	(5.72)	(4.49)
Moderate Physical Activity						
Never/Unable	53.77	42.50 **	56.23	52.54 ***	39.28	39.49
Daily	12.30	13.50	10.68	11.85 *	15.06	15.09
Weekly	30.36	40.17 **	30.33	32.64 ***	42.93	41.60 ***
Monthly	3.17	3.50	2.43	2.37	2.22	3.10 ***
Yearly	.40	.33	.33	.59 *	.51	.72 ***
Health Insurance Status						
No Health Insurance (1=Yes)	28.17	30.67	17.84	22.17 ***	10.42	13.51 ***
Health Insurance (1=Yes)	71.83	69.33	82.16	77.83 ***	89.58	86.49 ***
Sample Size (N)	504	600	18,008	11,549	69,646	59,585

*** p <.001 ** p <.01 * p <.05.

[a] Values are percentages unless otherwise specified.

[b] African=black Africans; African Americans=native-born non-Hispanic blacks; Whites=native-born non-Hispanic whites.

Results

Descriptive Findings

Table 7 displays descriptive characteristics for all study variables among Africans, African Americans, and whites. With respect to the two non-communicable diseases examined in this study (diabetes and hypertension), there are no significant differences between African women and men. However, there are significant gender differences for these conditions among African Americans and whites. For African Americans, women report significantly higher rates of hypertension (41.75 % vs. 38.78 %). Among whites, men report significantly higher rates of diabetes compared to women (9.38 % vs. 8.61 %). Further, while a greater percentage of African men have been in the U.S. for over 15 years compared to African women, there are no significant gender differences in duration among African immigrants.

Examination of the sociodemographic variables show that Africans are younger, have higher educational attainment, employment status, income, and marital status compared to African Americans. The mean age for Africans is 37.85 years for women and 39.30 for women; for African Americans 46.07 years for women and 46.87 for women; and for whites 50.07 years for women and 48.33 for men. African American men are significantly older than women. For whites, women are significantly older than men.

In terms of education, while African men obtain significantly more years of education compared to African women (17.07 years vs. 15.59 years), African American women attain more years of education compared to their male counterparts (15.01 years vs. 14.76 years). The education pattern for whites is similar to that of Africans, with white men reporting significantly more years of education compared to white women (16.10 years vs. 16.05 years). With employment, men in all three groups are more likely to be employed compared to women; for

Africans 82.33 % of men are employed compared to 70.44 % of women; for African Americans 57.70 % of men compared to 54.56 % of women are employed; and for whites 67.68 % of men are employed compared to 56.48 % of women.

Furthermore, there is no significant difference between African men and women with respect to family income. However, for both African Americans and whites a greater percentage of men are middle $35,000-$74,999) or high income ($75,000+) while a greater percentage of women are low income ($0-$34,999). Also, while there are no differences between African men and women in terms of being married, single, or separated; a greater percentage of African American and white men are married compared to their respective female counterparts. Across all three groups, a greater percentage of women are widowed compared to men, which makes sense given that women tend to live longer than men. Finally, while there are no gender differences among Africans in terms of region of residence, for African Americans, a greater percentage of women live in the Northeast, while a greater percentage of men live in the West. For whites, a greater percentage of men live in the West compared to women.

Examination of risk and protective factors shows the familiar gendered pattern where men across all three groups are more likely to drink alcohol and smoke compared to women. While both African and African American women have higher BMIs than their male counterparts, white men have significantly higher BMI compared to white women. Additionally, a significantly higher percentage of African and African American women do not or are unable to engage in physical activity compared to their male counterparts; while a greater percentage of men in both of these groups engage in some sort of moderate physical activity on a weekly basis. Conversely, white women are more likely to exercise on a weekly basis compared to white men. Finally, with respect to health insurance, while there are no gender differences among Africans, a

greater percentage of African American and white women have health insurance compared to their male counterparts. Also, Africans are more likely to be uninsured compared to the two native-born groups.

Table 8. Regression Models Predicting Diabetes and Hypertension, Women Aged 18+, National Health Interview Survey (NHIS) 2003-2012

	WOMEN											
	Diabetes						Hypertension					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR
Race, Ethnicity, Nativity [a]												
Whites (ref.)												
Africans	.43	1.54	.71	2.03	.16	1.17	.07	1.07	.32	1.38	.70 *	2.01
African Americans	.48 ***	1.62	.52 ***	1.69	.24 ***	1.27	.53 ***	1.70	.78 ***	2.17	.62 ***	1.86
Sociodemographic Characteristics												
Age			.04 ***	1.04	.04 ***	1.04			.06 ***	1.06	.06 ***	1.07
Education (Years)			-.07 ***	.94	-.04 ***	.96			-.06 ***	.94	-.05 ***	.96
Employed			-.37 ***	.69	-.39 ***	.68			-.18 ***	.83	-.21 ***	.81
Family Income												
$0-$34,999 (ref.)												
$35,000-$74,999			-.10 **	.91	-.07	.93			-.01	.99	-.02	.98
$75,000+			-.46 ***	.63	-.23 ***	.80			-.26 ***	.78	-.12 **	.89
Married			.05	1.05	-.06	.94			.00	1.00	-.07 **	.93
Region of Residence												
South (ref.)												
Northeast			-.22 ***	.80	-.19 ***	.83			-.29 ***	.75	-.27 ***	.77
Midwest			-.09 *	.92	-.09 *	.91			-.12 ***	.89	-.15 ***	.86
West			-.20 ***	.82	-.12 *	.88			-.27 ***	.76	-.21 ***	.81
Risk & Protective Factors												
Alcohol Use (days per week)					-.16 ***	.85					.01	1.01
Current Smoker					.12 **	1.13					.16 ***	1.17
Body Mass Index (BMI)					.12 ***	1.13					.10 ***	1.10
No Physical Activity					.11 **	1.12					.08 ***	1.09
Health Insurance					.17 *	1.18					.18 ***	1.20
Constant	-2.31 ***		-2.82 ***		-7.11 ***		-.93 ***		-2.72 ***		-6.06 ***	
N	72,850											

*** p <.001 ** p <.01 * p <.05.

a Whites=native-born non-Hispanic white; African=black Africans; African Americans=native-born non-Hispanic blacks.

Note: Models adjust for survey year and duration in the U.S.

Multivariate Findings

Tables 8 and 9 present findings from the multivariate analyses for women and men, respectively. For these models, Africans and African Americans are compared to whites. In this presentation of results, I first consider women and men separately before comparing the two.

Women. Recalling that the first step in my model building strategy is to establish the association among race, ethnicity, nativity, and duration in predicting diabetes and hypertension, Model 1 of Table 8 shows that there is no significant differences in the odds of both diabetes and hypertension for African women compared to white women. However, African American women have significantly higher odds of diabetes and hypertension compared to their white counterparts. African American women experience 62 % higher odds of diabetes (logit=.48, OR=1.62) and 70 % higher odds of hypertension (logit=.53, OR=1.70) compared to white women.

In Model 2 of Table 8, I add sociodemographic variables including age, education, family income, marital status, and region of residence. The same patterns observed in Model 1 with respect to African immigrants and African Americans hold in Model 2. Indeed, in the presence of these sociodemographic variables the odds of diabetes and hypertension for African Americans increases: African American women have 69 % higher odds of diabetes (logit=.52, OR=1.69) and over two times the odds of hypertension (logit=.78, OR=2.17) compared to white women. Furthermore, the effects of the sociodemographic variables on the odds of diabetes work in the way we would expect from the literature. Specifically, age is associated with higher odds of diabetes and SES measured as years of education, being employed, and income are all associated with lower odds of diabetes. Increased age increases the odds of diabetes by 4 % (logit=.04, OR=1.04); increased education decreases the odds of diabetes by 6 % (logit=-.06,

OR=.94); and being employed decreases the odds of diabetes by 31 % (logit=-.37, OR=0.69). Further, compared to those with low family income ($0-$34,999), those with family incomes of $35,000-$74,999 have a 9 % decreased odds of diabetes (logit=-.10, OR=.91); and those with family incomes of $75,000+ have a 37 % decreased odds of diabetes (logit=-.46, OR=.63). However, in this model, marital status had no significant effect in predicting the odds of diabetes among women. Finally, compared to living in the South, living in the Northeast (logit=-.22, OR=.80), Midwest (logit=-.09, OR=.92), and West (logit=-.20, OR=.82) are all associated with lower odds of diabetes.

Model 2 for hypertension shows nearly the same pattern as observed for diabetes. Here again, age is associated with higher odds of hypertension while SES is associated with lower odds of hypertension. Increased age increases the odds of hypertension by 6 % (logit=.06, OR=1.06); increased education decreases the odds of hypertension by 6 % (logit=-.06, OR=.94); and being employed decreases the odds of hypertension by 17 % (logit=-.18, OR=0.83). While those with family incomes between $35,000-$74,999 are not significantly different from those with low family incomes of $0-$34,999, those with family incomes of $75,000+ have a 22 % decreased odds of hypertension (logit=-.26, OR=.78). Similar to diabetes, being married is not significantly associated with hypertension for women. Finally, compared to living in the South, living in the Northeast (logit=-.29, OR=.75), Midwest (logit=-.12, OR=.89), and West (logit=-.27, OR=.78) are all associated with lower odds of hypertension.

Model 3, the full model, adds risk and protective factors including alcohol use, smoking, BMI, physical activity, and health insurance. Interestingly, alcohol use is associated with decreased odds of diabetes (logit=-.16, OR=.85) for women. However, the remaining risk factors work in a way we would predict: smoking increases the risk of diabetes by 13 % (logit=.12,

OR=1.13); increased BMI also by 13 % (logit=.12, OR=1.13); and no physical activity by 12 % (logit=.11, OR=1.12). Further, having health insurance increases the odds of diabetes by 18 % (logit=.17, OR=1.18). This result regarding health insurance may be expected given that NHIS measured diabetes by asking respondents whether they had been told by a health professional that they had diabetes. Finally, consistent with previous models, African American women have higher odds of diabetes (logit=.24, OR=1.27) than their white counterparts while the odds of diabetes or African women remains not significantly different from white women.

The full model for hypertension tells a slightly different story than the full model for diabetes. First, it is immediately apparent that, here, African women have *higher* odds of hypertension compared to their white counterparts. African women have just over two times of the odds of hypertension (logit=.70, OR=2.01) as white women in this full model including risk and protect factors. African American women still have higher odds of hypertension compared to their whites counterparts (logit=.62, OR=1.86). The sociodemographic variables that were significantly associated with hypertension in Model 2 remain so in Model 3 with the exception of marital status. While being married showed no significant association in Model 2, being married significantly decreased women's odds of hypertension by 7 % (logit=-.07, OR=.93) in Model 3. With the exception of alcohol use, all risk factors variables significantly increase the odds of hypertension in the full model. Smoking increases the odds of hypertension by 17 % (logit=.16, OR=1.17); BMI by 10 % (logit=.10, OR=1.10), and no physical activity by 9 % (logit=.08, OR=1.09). Finally, similar to diabetes, having health insurance increases women's odds of being diagnosed with hypertension by 20 % (logit=.18, OR=1.20).

Table 9. Regression Models Predicting Diabetes and Hypertension, Men Aged 18+, National Health Interview Survey (NHIS) 2003-2012

	MEN											
	Diabetes						Hypertension					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR	Logit	OR
Race, Ethnicity, Nativity [a]												
Whites (ref.)												
Africans	.31	1.36	.61	1.83	1.12 ***	3.07	.14 ***	1.15	.30	1.35	.61 **	1.85
African Americans	.30 ***	1.35	.41 ***	1.50	.38 ***	1.46	.19 ***	1.21	.35 ***	1.42	.36 ***	1.43
Sociodemographic Characteristics												
Age			.05 ***	1.05	.05 ***	1.05			.05 ***	1.06	.06 ***	1.06
Education (Years)			-.04 ***	.97	-.02 ***	.98			-.02 ***	.98	-.01 ***	.99
Employed			-.35 ***	.70	-.38 ***	.68			-.21 ***	.81	-.31 ***	.74
Family Income												
$0-$34,999 (ref.)												
$35,000-$74,999			-.01	.99	-.10 *	.90			-.03	.97	-.10 ***	.90
$75,000+			-.23 ***	.80	-.29 ***	.75			-.11 ***	.89	-.18 ***	.83
Married			.20 ***	1.22	.03	1.03			.14 ***	1.15	.02	1.02
Region of Residence												
South (ref.)												
Northeast			-.24 ***	.79	-.26 ***	.77			-.16 ***	.85	-.17 ***	.84
Midwest			-.10 *	.91	-.14 **	.87			-.14 ***	.87	-.17 ***	.85
West			-.21 ***	.81	-.17 ***	.84			-.22 ***	.80	-.20 ***	.82
Risk & Protective Factors												
Alcohol Use (days per week)					-.14 ***	.87					.04 ***	1.04
Current Smoker					.13 **	1.14					.17 ***	1.18
Body Mass Index (BMI)					.13 ***	1.14					.12 ***	1.13
No Physical Activity					.03	1.03					.01	1.01
Health Insurance					.43 ***	1.53					.28 ***	1.32
Constant	-2.24 ***		-3.92 ***		-8.40 ***		-.77 ***		-2.88 ***		-6.64 ***	
N	67,762											

*** p <.001 ** p <.01 * p <.05.

a Whites=native-born non-Hispanic white; African=black Africans; African Americans=native-born non-Hispanic blacks.

Note: Models adjust for survey year and duration in the U.S.

Men. Table 9 presents the same analysis as above, but for men. Model 1 shows that while African men are not significantly different from white men with respect to diabetes, they have 15% higher odds of hypertension (logit=.14, OR=1.15) compared to their white counterparts. Here, African American men have 35 % higher odds of diabetes (logit=.30, OR=1.35) and 21 % higher odds of hypertension (logit=.19, OR=1.21) compared to white men. When I add the sociodemographic variables in Model 2, African men are no longer significantly different from white men for *both* diabetes and hypertension. For both conditions, African American men maintain their higher odds compared to white men.

Looking specifically at the sociodemographic variables, age is associated with higher odds of diabetes and SES measured as years of education, being employed, and income are all associated with lower odds of diabetes for men. Each year increase in age increases the odds of diabetes by 5 % (logit=.05, OR=1.05); increased education decreases the odds of diabetes by 3 % (logit=-.04, OR=.97); and being employed decreases the odds of diabetes by 30 % (logit=-.35, OR=0.70). Although the odds of diabetes for those with middle family income ($35,000-$74,999) is not significantly different from those with low family income ($0-$34,999), those with high family incomes of $75,000+ have a 20 % decreased odds of diabetes (logit=-.23, OR=.80). Additionally, compared to other marital statuses, being married increases the odds of diabetes by 22 % for men (logit=.20, OR=1.23=2). Recall that being married was not significant associated with diabetes for women. Compared to living in the South, living in the Northeast (logit=-.24, OR=.79), Midwest (logit=-.10, OR=.91), and West (logit=-.21, OR=.81) are all associated with lower odds of diabetes. Without exception, the same pattern observed in Model 2 for diabetes obtains for Model 2 for hypertension: age is associated with higher odds of hypertension while

SES (education, being employed, and high family income) and living in the Northeast, Midwest, and West are associated with lower odds of hypertension compared to living in the South.

Model 3, the full model, adds risk and factors including alcohol use, smoking, BMI, physical activity, and health insurance. In the presence of these risk factors, African *and* African American men have higher odds of *both* diabetes and hypertension compared to non-Hispanic white men. African men, who were not significantly different from white men in the previous model, now have over three times higher odds of diabetes (logit=1.12, OR=3.07) and 85 % higher odds of hypertension (logit=.61, OR=1.85) compared their white counterparts. African American men have 46 % higher odds of diabetes (logit=.38, OR=1.46) and 43 % higher odds of hypertension (logit=.36, OR=1.43) compared to their white counterparts.

Similar to women, the effects of sociodemographic variables on the odds of diabetes are consistent with the literature. Age increases the odds of both diabetes and hypertension while the SES measures of education, being employed, and family all work to decrease the odds of both of these conditions. Unlike in Model 2, being married is no longer associated with diabetes or hypertension in the full model. However, like Model 2 living in the Northeast, Midwest, and West are associated with decreased odds of both diabetes and hypertension compared to living in the South.

Examination of risk and protective factors show slightly different patterns for diabetes and hypertension. For instance, while alcohol use decreases the odds of diabetes by 13 % (logit=-.14, OR=.87), alcohol increases the odds of hypertension by 4 % (logit=.04, OR=1.04). With the exception of physical activity, the remaining risk and protective factors work in a way we would expect to predict diabetes and hypertension: smoking increases the odds of diabetes by 14 % (logit=.13, OR=1.14) and the odds of hypertension by 18 % (logit=.17, OR=1.18); increased

BMI increases the odds of diabetes by 14 % (logit=.13, OR=1.14) and increases the odds of hypertension by 13% (logit=.12, OR=1.13). Finally, similar models for women, having health insurance increases the odds of diabetes by 53% (logit=.43, OR=1.53) and hypertension by 32% (logit=.28, OR=1.32) for men.

Table 10. Regression Models Predicting Diabetes and Hypertension with White Reference, Adults Aged 18+, National Health Interview Survey (NHIS) 2003-2012

	DIABETES				HYPERTENSION			
	Women		Men		Women		Men	
	Logit	OR	Logit	OR	Logit	OR	Logit	OR
Race, Ethnicity, Nativity ł								
Whites (ref.)								
Africans	.16	1.17	1.12 ***	3.07	.70 *	2.01	.61 **	1.85
African Americans	.24 ***a	1.27	.38 ***b	1.46	.62 ***a	1.86	.36 ***b	1.43
Sociodemographic Characteristics								
Age	.04 ***a	1.04	.05 ***b	1.05	.06 ***a	1.07	.06 ***b	1.06
Education (Years)	-.04 ***a	.96	-.02 ***b	.98	-.05 ***a	.96	-.01 ***b	.99
Employed	-.39 ***	.68	-.38 ***	.68	-.21 ***a	.81	-.31 ***b	.74
Family Income								
$0-$34,999 (ref.)								
$35,000-$74,999	-.07	.93	-.10 *	.90	-.02 a	.98	-.10 ***b	.90
$75,000+	-.23 ***	.80	-.29 ***	.75	-.12 **	.89	-.18 ***	.83
Married	-.06	.94	.03	1.03	-.07 **a	.93	.02 b	1.02
Region of Residence								
South (ref.)								
Northeast	-.19 ***	.83	-.26 ***	.77	-.27 ***	.77	-.17 ***	.84
Midwest	-.09 *	.91	-.14 **	.87	-.15 ***	.86	-.17 ***	.85
West	-.12 *	.88	-.17 ***	.84	-.21 ***	.81	-.20 ***	.82
Risk & Protective Factors								
Alcohol Use (days per week)	-.16 ***	.85	-.14 ***	.87	.01 a	1.01	.04 ***b	1.04
Current Smoker	.12 **	1.13	.13 **	1.14	.16 ***	1.17	.17 ***	1.18
Body Mass Index (BMI)	.12 ***a	1.13	.13 ***b	1.14	.10 ***a	1.10	.12 ***b	1.13
No Physical Activity	.11 **	1.12	.03	1.03	.08 ***a	1.09	.01 b	1.01
Health Insurance	.17 *a	1.18	.43 ***b	1.53	.18 ***	1.20	.28 ***	1.32
Constant	-7.11 ***		-8.40 ***		-6.06 ***		-6.64 ***	
N	140,612							

*** p <.001 ** p <.01 * p <.05.

ł Whites=native-born non-Hispanic white; African=black Africans; African Americans=native-born non-Hispanic blacks.

Note: Models adjust for survey year and duration in the U.S.

a Significant difference with Men (p<.05).

b Significant difference with Women (p<.05).

Women and Men. A major purpose of this paper is to examine gender differences in the risk for diabetes and hypertension among African immigrants in comparison to African Americans and whites. My next set of analyses speaks to this by examining gender difference among all study variables. Specifically, I tested whether significant regression coefficients found

between men and women were statistically significantly different using a comparison z-statistic. The comparison z-statistic can be represented as:

$$\frac{b(x_1) - b(x_2)}{\sqrt{[se(x_1)]^2 + [se(x_2)]^2}}$$

where $b(x_1)$ represents the unstandardized coefficient for variable x in the first equation (i.e., men) and $b(x_2)$ represents the effects of that same variable x in the second equation (i.e., women). Further, $se(x_1)$ is the standard error for variable x in the first equation, while $se(x_2)$ is the standard error for variable x in the second equation. I used a two-tailed test of significance with +/- 1.96 cutoff ($p < .05$).

The results of this analysis for the full models are presented in Tables 10 and 11. Table 10 maintains Whites as the reference category, while Table 11 selects African Americans as the reference category. Table 10 makes the findings from previous tables quite apparent: while African women tend not to be significantly different than white women with respect to diabetes, African men have significantly higher odds of both diabetes and hypertension compared to white men. Table 10 also shows that African American women have higher odds of hypertension compared to African American men; while African American men have higher odds of diabetes compared to their female counterparts. This is to be expected, given the bivariate findings in Table 7 showing a greater percentage of native-born black women had hypertension compared to their male counterparts.

There are also notable gender differences in the effects of sociodemographic characteristics as well as risk and protective factors in Table 10. For instance, while age matters more for men in diabetes, it matters more for women with hypertension. Furthermore, increased education is more protective against both diabetes and hypertension for women compared to men, while being employed is more protective against hypertension for men. With respect to

income, middle income ($35,000-$74,999) is more protective for men against hypertension compared to women. Also, being married is more beneficial in decreasing the odds of hypertension for women compared to men.

Examination of the risk and protective factors shows that, not surprisingly, alcohol use is more harmful for men with respect to hypertension compared to women. Further, increased BMI is slightly more detrimental for men with both diabetes and hypertension compared to women. Not engaging in any physical activity is more damaging for women for hypertension compared to men. Finally, having health insurance increases the odds of men being diagnosed with diabetes compared to women.

Table 11. Regression Models Predicting Diabetes and Hypertension with Black Reference, Adults Aged 18+, National Health Interview Survey (NHIS) 2003-2012

	DIABETES				HYPERTENSION			
	Women		Men		Women		Men	
	Logit	OR	Logit	OR	Logit	OR	Logit	OR
Race, Ethnicity, Nativity ǂ								
African Americans (ref.)								
Africans	-.11	.89	.73 **	2.08	.32	1.37	.43 *	1.54
Whites	-.32 ***	.72	-.44 ***	.64	-.41 ***a	.67	-.20 ***b	.82
Sociodemographic Characteristics								
Age	.04 ***a	1.04	.05 ***b	1.06	.06 ***a	1.07	.06 ***b	1.06
Education (Years)	-.04 ***a	.96	-.02 **b	.98	-.04 ***a	.96	-.01 ***	.99
Employed	-.39 ***	.68	-.38 ***	.68	-.21 ***a	.81	-.31 ***b	.73
Family Income								
$0-$34,999 (ref.)								
$35,000-$74,999	-.07	.93	-.10 *	.91	-.03	.97	-.11 ***	.90
$75,000+	-.22 ***	.80	-.28 ***	.75	-.14 ***	.87	-.19 ***	.83
Married	-.05	.95	.04	1.04	-.09 ***a	.91	.01 b	1.01
Region of Residence								
South (ref.)								
Northeast	-.17 **	.84	-.24 ***	.79	-.28 ***	.76	-.18 ***	.83
Midwest	-.07	.93	-.12 **	.89	-.16 ***	.85	-.18 ***	.84
West	-.14 **	.87	-.20 ***	.82	-.27 ***	.76	-.24 ***	.79
Risk & Protective Factors								
Alcohol Use (days per week)	-.16 ***	.85	-.13 ***	.87	.01 a	1.01	.04 ***b	1.04
Current Smoker	.14 **	1.15	.14 **	1.15	.16 ***	1.18	.17 ***	1.18
Body Mass Index (BMI)	.12 ***a	1.13	.13 ***b	1.14	.10 ***a	1.10	.12 ***b	1.13
No Physical Activity	.10 **	1.11	.03	1.03	.09 ***a	1.09	.01 b	1.02
Health Insurance	.17 **a	1.19	.44 ***b	1.55	.18 ***	1.20	.28 ***	1.32
Constant	-6.92 ***		-8.11 ***		-5.67 ***		-6.42 ***	
N	140,612							

*** p <.001 ** p <.01 * p <.05.

ǂ Whites=native-born non-Hispanic white; African=black Africans; African Americans=native-born non-Hispanic blacks.

Note: Models adjust for survey year and duration in the U.S.

a Significant difference with Men (p<.05).

b Significant difference with Women (p<.05).

Up to this point, the analyses have used whites as the reference category. In Table 11, I used African Americans as the reference to directly compare the odds of diabetes and hypertension between African Americans and African immigrants. It is important to note that Table 11 is the same analysis as shown with Table 10 with the exception of the black reference group. Findings in Table 10 show that, contrary to what would be expected based on the healthy

immigrant effect, African men have significantly higher odds of both diabetes and hypertension compared to African American men, even after controlling for sociodemographic characteristics and risk and protective factors. African men have over two times of odds of diabetes (logit=.73, OR=2.08) and 54 % higher odds of hypertension (logit=.43, OR=1.54) compared to their African American counterparts. Table 5 further shows no significant difference in the odds of diabetes and hypertension between African and African American women.

In my final analysis, I further explored the gender differences in the odds of diabetes and hypertension found among African women and men by conducting subgroup analyses for African immigrants only. This analysis, displayed in Table 12, also allowed me to test my duration hypothesis. Table 12 shows that African women have significantly lower odds of diabetes (78 % lower) compared to African men, controlling for sociodemographic characteristics and risk and protective factors. For hypertension, while African women still have lower odds compared to African men, it is only marginally significant (logit=-.54, OR=.58). With respect to duration, only African immigrants who have been in the U.S. for 10 to 15 years had significantly lower odds of diabetes (79 % lower) compared those who have lived in the U.S. for more than 15 years. Conversely, for hypertension, African immigrants living in the U.S. less than 10 years had lower odds of the condition compared to immigrants who have been here for over 15 years. Immigrants with less than five years in the U.S. have 82 % lower odds of hypertension, while those with five to 10 years have 71 % lower odds of hypertension.

Table 12. Regression Models Predicting Diabetes and Hypertension, African Immigrants Aged 18+, National Health Interview Survey (NHIS) 2003-2012

	Diabetes		Hypertension	
	Logit	OR	Logit	OR
Women	-1.53 **	.22	-.54 †	.58
Duration in the U.S.				
15+ years (ref.)				
0-5 years	-1.81	.16	-1.70 **	.18
5-10 years	.76	2.13	-1.24 **	.29
10-15 years	-1.55 **	.21	-.50	.61
Sociodemographic Characteristics				
Age	.17 ***	1.19	.08 ***	1.09
Education (Years)	-.09	.92	-.04	.96
Employed	.92	2.52	.35	1.42
Family Income				
$0-$34,999 (ref.)				
$35,000-$74,999	-.35	.71	-1.10 ***	.33
$75,000+	-.27	.76	-.96 ***	.38
Married	.07	1.07	.10	1.11
Region of Residence				
South (ref.)				
Northeast	-.40	.67	-.12	.89
Midwest	-.36	.70	-.63	.53
West	-2.46 *	.09	.21	1.23
Risk & Protective Factors				
Alcohol Use (days per week)	-.33	.72	-.38 *	.68
Current Smoker	.55	1.74	.46	1.59
Body Mass Index (BMI)	.13 *	1.14	.14 ***	1.15
No Physical Activity	-.88	.42	-.51	.60
Health Insurance	-.48	.62	.66	1.93
Constant	-12.60 ***		-7.32 ***	
N	1,104			

*** p <.001 ** p <.01 * p <.05 †p <.10

Note: Models adjust for survey year.

a Significant difference with Men (p<.05).

b Significant difference with Women (p<.05).

Discussion

This study asked how African immigrant men's and women's diabetes and hypertension compare with their non-immigrant black and white counterparts. In doing so, the study provided additional insight into the healthy immigrant effect, which as conventionally articulated, expects more favorable health outcomes among African immigrants in the U.S. compared to their native-

born counterparts. Utilizing 10 waves of the NHIS, this paper examined the association between nativity, gender and two non-communicable disease outcomes among three groups in the U.S.: black African immigrants, African Americans, and whites. In accordance with the health immigrant effect, I expected in my first two sets of hypotheses that African immigrants would have lower odds of diabetes (H1a-b) and hypertension (H2a-b) compared to both African Americans and Whites. While I found that African women did not differ significantly from either African Americans or whites with respect to diabetes, I found that African men had significantly *higher* odds of diabetes compared to both African Americans and whites. For hypertension, African women had significantly higher odds of the condition compared to white women, but were not significantly different from African Americans women. Among men, African men again had higher odds of hypertension compared to both their African American and white counterparts. As such, I did not find support for my first two hypotheses, contrary to the healthy immigrant effect.

At the same time, closer examinations of the models point to possible factors that may help explain the patterns observed among Africans, African Americans, and whites with respect to diabetes and hypertension. For instance, African men's higher odds of diabetes and hypertension compared to their white counterparts becomes apparent after controlling for risk and protective factors such as alcohol use, smoking, BMI, physical activity, and health insurance. Indeed, for hypertension, while African men had significantly higher odds of the condition compared to white men in the first model, their odds of hypertension was no longer significant once I controlled for sociodemographic variables such as SES and region of residence. However, when I included the risk factors in the final model, African men's odds for hypertension again increased significantly. A similar pattern obtained for diabetes among men and hypertension

among women when moving from Models 2 to Models 3. Ultimately, these patterns suggest that among current African immigrants in the U.S., health behaviors associated with increased risk of diabetes and hypertension are driving their increased rates of these conditions more so than selectivity factors such as SES are protecting them.

The results from my third hypothesis with respect to duration in the U.S. provide additional insight about the healthy immigrant effect among African women and men living in the U.S. Based on the literature on immigrant health, I expected longer duration in the U.S. to be associated with higher odds of diabetes (H3a) and hypertension (H3b). I found that living in the U.S. 10 to 15 years was protective against diabetes, but living in the U.S. less than 10 years was protective against hypertension. In other words, my findings suggest that the diabetes health of newly arrived African immigrant women who have lived less than five years in the U.S. are not significantly different than those who have lived over 15 years in the U.S. Thus, I did not find support for hypothesis 3(a) but found support for hypothesis 3(b). It seems that for diabetes, newly arrived African immigrants are not significantly different from immigrants with longer duration in the U.S., while for hypertension, newly arrived African immigrants seems to be protected against the condition compared to those who have lived in the U.S. for 15 years or more. Finally, I found some support for my final hypothesis that among African immigrants, men would have higher odds of diabetes (H4a) and hypertension (H4b) than women. Specifically, I found that African women had significantly lower odds of diabetes (78% lower) and marginally lower odds of hypertension (42% lower) compared to their African male counterparts. Ultimately, one of the most consistent findings of this paper is that African men have the worst diabetes and hypertension: worse than African women and worse than native-born African American men.

Together, these findings about duration in the U.S. as well as the unexpected finding showing African men with the highest odds of diabetes and hypertension, raise important questions about the healthy immigrant effect and whether previously observed patterns will continue to hold in this period of increasing non-communicable diseases in African origin countries. Current migration data indicate that African immigrants are one the fastest growing immigrant groups in the U.S. (Capps et al. 2012; Gambino et al. 2014). While the healthy immigrant effect has been the prevailing framework to explain differences in health outcomes between immigrant and their native-born counterparts, each decade brings new immigrants with different health profiles than the previous. Scholars closely following epidemiologic trends in African countries have noted that it is primarily those of high status—both high SES and gender status (i.e. men)—that are at increased risk for non-communicable diseases like diabetes and hypertension (Addo et al. 2009; Agyei-Mensah and de-Graft Aikins 2010; Akarolo-Anthonly et al. 2014; Pampel et al. 2012; Ploubidis et al. 2013; Sodjinou et al. 2008). This scholarship regarding SES, gender, diabetes, and hypertension in African origin countries help put the results of this study in proper context. Because high SES African men are more likely to have diabetes and hypertension in their origin countries and high SES African men are also highly selected to migrate to the U.S., their higher odds of diabetes and hypertension compared to both native-born African American and whites make sense.

Aside from what may be happening in African origin countries, another possible explanation for the increased odds of diabetes and hypertension observed among African men relative to all other groups may be found in the U.S. destination. Specifically, access to healthcare may play a significant role in the diagnoses of treatment of these chronic non-communicable conditions. Like other immigrant groups, African immigrants are less likely to

have health insurance compared to native-born groups (Read and Reynolds 2012; Reed et al. 2012; Venters and Gany 2011). Although not significantly different from African women, I found in my bivariate analysis that African men were most likely to be uninsured compared to all other groups, i.e., African American and white men and women. This was the case despite African men having higher rates of education and employment relative to other groups examined in this study. Coupled with the situation in origin countries, African men may be disproportionately bearing the burden of condition like diabetes and hypertension in the U.S. given a lack of access and interaction with the health care system. Ultimately, paying more attention to conditions in both origin African countries as well as the U.S. will likely reveal new patterns and offer new insights to how race, ethnicity, nativity, and gender pattern health outcomes like diabetes and hypertension.

At the same time, this study is not without limitations. First, although I examine 10 waves of the NHIS, each wave is cross-sectional, which makes it difficult to establish causality. Second, the NHIS does not have a lot of information on immigrant status (documented vs. undocumented), which may help in explaining the persistent differences in health insurance coverage between African immigrants and African Americans (Lucas et al. 2003). Relatedly, this analysis did not allow for disaggregation of African immigrant populations. Although I limited my analysis to black Africans (as opposed to white Northern or Southern Africans), there is still much variation within the black African immigrant population owing to the different countries of origin represented in that group. Furthermore, the social and political conditions in each African origin country greatly impacts how African immigrants reach the U.S., i.e., whether as asylum seekers, refugees, or recipients of a diversity lottery visa. More studies such as one recently conducted by Hamilton (2014), should focus on incorporating variation within African origin

countries into their research design. Finally, there is a wealth of literature examining the impact of racial and ethnic discrimination on health outcomes like diabetes and hypertension among blacks in the U.S. (Boykin et al. 2011; Braveman et al. 2010; Dagadu and Christie-Mizell 2014; Feagin and McKinney 2003; LaVeist 2005; Williams and Collins 1995; Williams and Collins 2001; Williams et al. 2010). Whether such discrimination affects African immigrants in a similar way as observed among their native-born black counterparts is an important question to pursue in future studies.

Despite these limitations, this study has the advantage of using a nationally representative dataset to explore variation in diabetes and hypertension by nativity and gender among African immigrants, African Americans and whites. Further, this study provides an important impetus to updating the main tenets of the healthy immigrant effect to take current trends of increasing non-communicable diseases in African origin countries into account. The variability black immigrants introduce to the U.S. black population has important policy implications for understanding continuing disparities experienced by the black population. There are currently no policies in the U.S. that speak directly to the documented health disparities between black immigrants and their native-born counterparts. The main question for policy makers to think about is this: "Do African immigrants arrive in the U.S. with preexisting illnesses that are likely to widen racial/ethnic health disparities? My research suggests that in the context of increasing non-communicable diseases in Africa, the answer question is likely yes, but it also depends on gender.

Conclusion

The primary health initiative in the U.S. to improve the health of all Americans is *Healthy People 2020*. Launched in 2010, *Healthy People 2020* takes a very sociological approach to health by focusing on the ecological and social determinants of health and disease prevention. Specifically, *Healthy People 2020* operates from a framework that emphasizes multiple spheres of influence that determine health and health behaviors including the personal (biological and psychological); institutional, environmental (both social and physical), and policy levels (DHHS 2014). To achieve its health equity goals, *Healthy People 2020* uses certain indicators of progress. One such indicator is health disparities, which *Healthy People 2020* measures by tracking rates of chronic conditions, death, behaviors and other types of outcomes in relation to demographic factors such as race and ethnicity, gender, sexual identity and orientation, disability status, and geographic location (rural and urban). Missing from this list is immigrant status or nativity. Indeed, despite its comprehensive orientation and focus on the social determinants of health and health equity, *Healthy People 2020* lacks any data or policy objectives that target the health of U.S. immigrants (DHHS 2014; Singh et al. 2013). This policy omission may speak to the limited research on immigrants compared to native-borns generally, and black immigrants compared to African Americans particularly. It is difficult to see how health equity can be achieve in the U.S. today without more concerted efforts to include immigrant status in measures and examinations of health disparities.

Because African immigration into the U.S. is increasingly a major contributor of the ethnic variation in the U.S. black population, the rapid epidemiologic transition occurring in African origin countries is a major force impacting both the composition and health profile of the U.S. black population. Specifically, the demographic changes brought about by African

immigration is motivating new lines of inquiry to examine health disparities by race, ethnicity, as well as nativity. Because many survey instruments used to examine in health outcomes by race and ethnicity often do not take black immigration status into consideration, scholars may be underestimating disparities in non-communicable diseases like diabetes and hypertension and/or miss identifying groups that are disproportionately affected by these conditions. However, in anticipation of 2020 Census, the U.S. Census Bureau is testing new ways to ask the race and ethnicity question. Current findings suggest that the Census is moving towards allowing U.S. residents to select or write-in multiple categories of race and ethnicity (Compton et al. 2010). This diversification of the race and ethnicity question in the Census has important research implications for numerous nationally representative datasets that sociologists use to examine and interpret health disparities. Ultimately, studies that allow examination of health outcomes by more inclusive categories of race, ethnicity, and nativity will provide much needed evidence that influential policies *Healthy People* can incorporate into future objectives.

CHAPTER V

Conclusions

In this dissertation, I examined non-communicable diseases in two contexts: Ghana and the United States (U.S.) Ghana and the U.S., respectively, represent important origin and destination countries for Africans. Although gaining more traction in recent scholarship, the majority of studies on immigrant health focus on experiences at the origin or the destination, not both. Moreover, the impact of non-communicable diseases among Africans—whether at the origin or destination—has received little attention in the sociological literature. By analyzing data from both the origin (Ghana) and destination (U.S.), this study provided additional insights to how different contexts shape the non-communicable experiences of Africans. In my analyses, I considered two non-communicable diseases: diabetes and hypertension, which scholars have grouped them under an umbrella of cardiometabolic disorders, a constellation of diseases that, while distinct, share similar characteristics and have related risk factors and fatal outcomes (Kirk and Klein 2009; Mezuk 2010). Scholars have also identified these two conditions as significant causes of morbidity and mortality in African LMICs like Ghana and among blacks in the U.S.

The concept of health equity provided an important orienting lens for this dissertation. A health equity lens demands a more comprehensive view of morbidity and mortality transitions than prominent frameworks like the epidemiologic transition theory. Rather than relying primarily on macro level drivers to explain such transitions as the epidemiologic transition theory does (Omran 1971/2005), a health equity lens requires focusing on factors along other dimensions of social arrangement, such as community and individual level factors (Braveman

2006; Marmot 2012). As such, I paid particular attention to the key stratifying constructs of socioeconomic status (SES) and gender in my analyses to determine how such stratifications differentially affect the non-communicable disease outcomes of groups within countries.

Using education, employment status, and income as my three indicators of SES, the research questions that guided this dissertation were:

1. a. What is the relationship between socioeconomic status (SES) and non-communicable disease outcomes in Ghana?

   b. Does this relationship in 1(a) vary by gender?

2. a. What is the relationship between African immigrant status and non-communicable disease outcomes in the U.S.?

   b. Does this relationship in 2(a) vary by gender?

Chapters 2 and 3, which examined the stratifying role SES and gender play in predicting diabetes and hypertension in Ghana, respectively, addressed question 1 (a-b). In both of these papers, I tested whether SES—measured by educational attainment, employment status, and income—was positively associated with diabetes and hypertension among older adults in Ghana in accordance with the reversal hypothesis (Pampel et al. 2012), which states that in LMICs like Ghana, high SES is associated with high morbidity and mortality from non-communicable diseases. I also considered whether the relationship between SES and these two condition varied by gender. In Chapter 2, I found that while increased education and income separately increased the odds of diabetes, being employed decreased the odds. Furthermore, when the SES indicators were examined together, only education remained significantly associated with increased odds of diabetes, while income and being employed no longer were associated with diabetes. With respect to SES, gender, and diabetes, I found that (1) Ghanaian women had higher odds of

diabetes across educational levels, and (2) gender moderated the effect of education on diabetes such that increased years of schooling increased the odds of diabetes for Ghanaian men.

In Chapter 3, which focused on hypertension, I found similarities and differences from the previous paper on diabetes. As was the case with diabetes, when each SES measure was examined separately, income increased while being employed decreased the odds of hypertension. Unlike diabetes, being employed remained significantly associated with hypertension when all SES measures were considered together. The SES, gender, and hypertension analysis in Chapter 3 again resulted in similar yet different findings than for diabetes. Specifically, rather than education, it was income that interacted with gender to predict hypertension such that increased income increased the odds of hypertension for Ghanaian men. Here again, Ghanaian women had higher odds of hypertension across income levels.

Chapters 2 and 3 suggest that in LMICs in transition like Ghana, different dimensions of SES affect men and women's experiences of non-communicable diseases. As mentioned above, Ghana is largely patriarchal. Men in Ghana are expected to be head of households and providers and face stressors associated with fulfilling those roles. While Ghanaian women face many barriers to resources and power, those barriers are gradually eroding (Wrigley-Asante 2013). As more Ghanaian women assume career and social roles once held exclusively by high SES men, Ghanaian men may be engaging in masculine behaviors (e.g. eating in excess, drinking or tobacco use) that, while signaling their status also negatively affects their health and increase their risk for conditions like diabetes and hypertension.

Although increased education and income increased Ghanaian men's odds of diabetes and hypertension, it is important to emphasize that Ghanaian women had higher odds of these two conditions compared to men regardless of educational attainment or income level. Gendered

norms in Ghana still require that women be responsible for the gathering and preparation of foods as well as fulfilling roles associated with the care of all members of the household. While Ghanaian women face many barriers to resources and power, those barriers are gradually eroding as women gain more education and employment opportunities once solely held by Ghanaian men (Wrigley-Asante 2013). Fulfilling traditional gender roles as well as assuming new ones as gender norms seem to be particularly detrimental to the non-communicable disease outcomes for Ghanaian women.

The third paper addressed the second question with respect to the same two non-communicable diseases among African immigrants in the U.S. Specifically, Chapter 4 provided additional insight into the healthy immigrant effect by examining how African immigrant men's and women's diabetes and hypertension compared with their non-immigrant black and white counterparts. The main story of Chapter 4 is that African men have the worst diabetes and hypertension: worse than African women and worse than native-born African American men and native-born whites. I also found that African women did not differ significantly from either African Americans or whites with respect to diabetes. For hypertension, African women had significantly higher odds of the condition compared to white women, but were not significantly different from African Americans women. Furthermore, Chapter 4 showed that contrary to the healthy immigrant effect, newly arrived African immigrants did not consistently have better diabetes and hypertension outcomes than immigrants who have been in the U.S. for longer periods of time. Together, these findings about duration in the U.S. as well as the finding showing African men with the highest odds of diabetes and hypertension, raise important questions about the healthy immigrant effect and whether previously observed patterns will

continue to hold in this period of increasing non-communicable diseases in African origin countries.

Together, Chapters 2 through 4 raise new questions about SES, gender, and non-communicable diseases in both origin and destination countries. Chapters 2 and 3 showed that in the origin country of Ghana, men of high education and income are at increased risk for diabetes and hypertension. In Chapter 4, my findings showed that African immigrant men had the highest odds of both diabetes and hypertension when compared to their African immigrant female as well and native-born male counterparts. According to the selectivity argument of the healthy immigrant effect, it is men with high SES, i.e., education and income, who are also more likely to migrate to the U.S. from African origin countries like Ghana. Ultimately, in the context of increasing non-communicable diseases among high SES groups in African origin countries like Ghana, the healthy immigrant effect may no longer provide sufficient explanations for understanding the health of African immigrants in destination countries like the U.S.

Despite the insights this dissertation provides with respect to the reversal hypothesis and health immigrant effect, there is still much needed research on SES, gender, and non-communicable diseases in origin and destination contexts. First, it will be important for future research to examine these issues using longitudinal data. Both the World Health Organization Study on Global Ageing and Adult Health (SAGE) data for Ghana and National Health Interview Survey (NHIS) data for the U.S. provided cross-national data which did not allow determination of causality among variables used in this investigation. While the SAGE data is longitudinal by design and will allow this type of analysis in the future, the NHIS is not. As such, it will be equally important to have comparable data in the U.S. in order to examine patterns in a destination context.

Second, in an increasingly globalized and intertwined world where diseases and their risk factors move readily across borders—even non-contagious non-communicable diseases—it becomes increasingly important to conduct research that spans both origin and destination contexts. As such, future studies on this topic should consider multi-sited designs that would allow researchers to examine conditions in African countries of origin prior to migration as well as conditions in destination countries post migration. While such studies may not always be feasible given the expense and time required, they would provide much more nuanced contextual information about specific African origin countries like Ghana and help further elucidate factors that remain important for African immigrant health once they reach destination contexts.

Third, future studies should continue paying attention to gender and various indicators of SES when examining non-communicable diseases among Africans in both origin and destination contexts. As mentioned above, the rapid transition from a traditional agricultural society to an industrialized urbanized society occurring in Ghana has been accompanied not only by changes in the non-communicable disease morbidity and mortality profile of its population (Agyei-Mensah and de-Graft Aikins 2010; Minicuci et al. 2014), but has also changes in previous conceptions of status and gender roles (Wrigely-Asante 2013). While the SES indicators of educational attainment, income, and occupation have been a stalwart in health disparities research in high-income countries like the U.S., future studies examining disparities in LMICs like Ghana may benefit from considering from inclusion of indicators such as religious affiliation that are also significant stratifying factors in African origin countries.

Finally, the main findings from Chapters 2 and 3: that education increases odds of diabetes and income increases the odds of hypertension among Ghanaian men needs to be placed in proper context. This finding should not be taken to mean that those of low SES in LMICs like

Ghana are not at risk for non-communicable conditions like diabetes and hypertension. As some scholars have noted, while those of high SES in LMICs are documented as being at higher risk for chronic condition (Agyei-Mensah and de-Graft Aikins 2010; Pampel et al. 2012), low SES groups in LMICs are increasingly burdened by both communicable and non-communicable diseases (Agyei-Mensah and de-Graft Aikins 2010). Often times, these low SES populations are least likely to have access to health services and facilities to diagnose conditions like diabetes and hypertension. As such, studies that make a concerted effort to reach such marginalized populations in African origin countries are needed.

Despite the rapid increases in non-communicable diseases like diabetes and hypertension worldwide, these conditions are often preventable and do not have to be the inevitable consequence of industrialization or development. Future studies that build on the work of this dissertation will provide evidence necessary for crafting equitable policies in both origin and destination countries that are informed by stratifying factors like SES and gender.

REFERENCES

Abegunde, Dele O., Colin D. Mathers, Taghreed Adam, Monica Ortegon, and Kathleen Strong. 2007. "The Burden and Costs of Chronic Diseases in Low-Income and Middle-Income Countries." *The Lancet* 370: 1929-1938.

Abubakari, A.R., W. Lauder, M.C. Jones, A. Kirk, C. Agyemang, and R.S. Bhopal. 2009. "Prevalence and Time Trends in Diabetes and Physical Inactivity among Adult West African Populations: The Epidemic Has Arrived." *Journal of the Royal Institute of Public Health* 123: 602-614.

Acker, Joan. 2004. "Gender, Capitalism and Globalization." *Critical Sociology* 30(1): 17-41.

Addai, Isaac and Joes Adjei. 2014. "Predictors of Self-Appraised Health Status in Sub-Saharan Africa: The Case of Ghana." *Applied Research Quality Life* 9: 233-253.

Addo, Juliet, Charles Agyemang, Liam Smeeth, Ama de-Graft Aikins, A.K. Edusei, and Gbenga Ogedegbe. 2013. "A Review of Population-Based Studies on Hypertension in Ghana." Pp. 13-28 in *Chronic Non-Communicable Diseases in Ghana: Multidisciplinary Perspectives*, edited by A. de-Graft Aikins, S. Agyei-Mensah, and Charles Agyemang. Accra, Ghana: University of Ghana.

Addo, J., L. Smeeth, and D. A. Leon. 2009. "Socioeconomic Position and Hypertension: A Study of Urban Civil Servants in Ghana." *Journal of Epidemiology and Community Health* 63(8):646-650.

Adler, Nancy E. Thomas Boyce, Margaret A. Chesney, Sheldon Cohen, Susan Folkman, Robert L. Kahn, and S. Leonard Syme. 1994. "Socioeconomic Status and Health: The Challenge of the Gradient." *American Psychologist* 49(1): 15-24.

Adinkrah, Mensah. 2012. "Better Dead than Dishonored: Masculinity and Male Suicidal Behavior in Contemporary Ghana." *Social Science & Medicine* 74: 474-481.

Adomako Ampofo, Akosua and John Boateng. 2007. "Multiple Meanings of Manhood among Boys in Ghana. Pp 50-74 in T. Shefer (Ed.) *From Boys to Men: Social Constructions of Masculinity in Contemporary Society* (pp. 51e74). Lansdowne Cape Town, South Africa: Juta and Company Ltd.

African Development Fund (ADF). 2008. *Ghana Country Gender Profile*. Tunisia: African Development Bank Group.

Agyei-Mensah, Samuel and Ama de-Graft Aikins. 2010. "Epidemiological Transition and the Double Burden of Disease in Accra, Ghana." *Journal of Urban Health* 87(5):879-897.

Agyemang, Charles, Ama de-Graft Aikins, and Raj Bhopal. 2012. "Ethnicity and Cardiovascular

Health Research: Pushing the Boundaries by Including Comparison Populations in the Countries of Origin." *Ethnicity & Health* 17(6): 579-596.

Akarolo-Anthony, Sally N., Walter C. Willett, Donna Spiegelman, and Clement A. Adebamowo. 2014. "Obesity Epidemic Has Emerged among Nigerians." *BMC Public Health* 14: 455. Available online at http://www.biomedcentral.com/1471-2458/14/455.

Akresh, Ilana Redstone and Reanne Frank. 2008. "Health Selection among New Immigrants." *American Journal of Public Health* 98: 2058-2064.

Amoah, Albert G. B. 2003. "Sociodemographic Variations in Obesity among Ghanaian Adults. *Public Health Nutrition* 6(8): 751-757.

Amoah, A. G. B., Owusu, S. K., & Adjei, S. 2002. Diabetes in Ghana: A Community Based Prevalence Study in Greater Accra. *Diabetes Research and Clinical Practice* 56: 197-205.

Antecol H, Bedard K. 2006. "Unhealthy Assimilation: Why Do Immigrants Converge to American Health Status Levels?" *Demography* 43(2): 337–360.

Aryeetey, Genevieve C., Caroline Jehu-Appiah, Agnes M. Kotoh, Ernst Spaan, Daniel K. Arhinful, Rob Baltussen, Sjaak van der Geest, and Irene A Agyepong. 2013. "Community Concepts of Poverty: An Application to Premium Exemption in Ghana's National Health Insurance Scheme." 2013. *Globalization and Health* 9: 12.

Avilés, L.A. 2001. "Epidemiology as Discourse: The Politics of Development Institutions in the Epidemiological Profile of El Salvador." *Journal of Epidemiology and Community Health* 55: 164-171.

Awuah, Raphael Baffour and Ernest Afrifa-Asante. 2013. "Modifiable Risk Factors for Chronic Non-Communicable Diseases in Ghana: Insights from National and Community-Based Surveys." Pp. 109-123 in *Chronic Non-Communicable Diseases in Ghana: Multidisciplinary Perspectives*, edited by A. de-Graft Aikins, S. Agyei-Mensah, and Charles Agyemang. Accra, Ghana: University of Ghana.

Ayernor, P. K. 2012. "Diseases of Ageing in Ghana." *Ghana Medical Journal* 46(2 Supplement): 18-22.

Baliunas, Dolly O., Benjamin J. Taylor, Hyacinth Irving, Michael Roerecke, Jayadeep Patra, Satya Mohopatra, and Jurgen Rehm. 2009. "Alcohol as a Risk Factor for Type 2 Diabetes: A Systematic Review and Meta-Analysis." *Diabetes Care* 32: 2123-2132.

Bird, Chole E. and Patricia P. Rieker. 2008. *Gender and Health: The Effects of Constrained Choices and Social Policies*. New York, NY: Cambridge University Press.

Biritwum Richard, George Mensah, Alfred Yawson, Nadia Minicuci. 2013. *Study on Global*

Ageing and Adult Health (SAGE) Wave 1: The Ghana National Report. Geneva: World Health Organization. Available online at: apps.who.int/healthinfo/systems/surveydata/index.php/catalog/6/download/1940.

Bosu, William K. 2013. "Accelerating the Control and Prevention of Non-communicable Diseases in Ghana: The Key Issues." *Postgraduate Medical Journal of Ghana* 2(1).

Boykin, Shawn, Ana V. Diez-Roux, Mercedes Carnethon, Saudi Shrager, Hanyu Ni, and Melicia Whitt-Glover. 2011. "Racial/Ethnic Heterogeneity in the Socioeconomic Patterning of CVD Risk Factors in the United States: The Multi-Ethnic Study of Atherosclerosis." *Journal of Health Care for the Poor and Underserved* 22(1): 111-27.

Brown, Tyson H. and Taylor W. Hargrove. 2013. "Multidimensional Approaches to Examining Gender and Racial/Ethnic Stratification in Health." *Women, Gender, and Families of Color* 1(2): 180-206.

Braveman, Paula. 2006. "Health Disparities and Health Equity: Concepts and Measurement." *Annual Review of Public Health* 27: 167-194.

Braveman, Paula A. Catherine Cubbin, Susan Egerter, David R. Williams, and Elsie Pamuk. 2010. "Socioeconomic Disparities in Health in the United States: What the Patterns Tell Us." *American Journal of Public Health* 100(S1): S186-S196.

Braveman, P. and S. Gruskin. 2003. "Defining Health Equity." *Journal of Epidemiology & Community Health* 57: 254–258.

Brown, Phil. 1995. "Naming and Framing: The Social Construction of Diagnosis and Illness." *Journal of Health and Social Behavior* 35: 34-52.

Bruhn, John. 2009. "The Concept of Social Cohesion." Pp. 31-48 in The *Group Effect: Social Cohesion and Health Outcomes*, edited by J. Bruhn. New York, NY: Springer Science+Business Media, LLC.

Buor, Daniel. 2004. "Gender and the Utilisation of Health Services in the Ashanti Region, Ghana." *Health Policy* 69: 375-388.

Caldwell, J. 1986. "Routes to Low Mortality in Poor Countries." *PDR* 12(2): 171-220.

Capps, Randy, Kristen McCabe, and Michael Fix. 2012. *Diverse Streams: Black African Migration to the United States*. Washington, DC: Migration Policy Institute.

Caselli, Graziell. France Meslé, and Jacques Vallin. 2002. "Epidemiologic Transition Theory Exceptions." *Africa* 58(1): 1-34.

Centers for Disease Control and Prevention. 2015. "About BMI for Adults." *Healthy Weight – It's not a Diet It's a Lifestyle*. Atlanta, GA: CDC. Available online at: http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html.

Centers for Disease Control and Prevention (CDC). 2011. "The Problem of Noncommunicable Diseases and CDC's Role in Combating Them." Atlanta, GA: CDC Global Health-Noncommunicable Diseases. Available online at http://www.cdc.gov/globalhealth/ncd/overview.htm.

Chae, David H., Karen D. Lincoln, Nancy E. Adler, and S. Leonard Syme. 2010. "Do Experiences of Racial Discrimination Predict Cardiovascular Disease among African American Den? The Moderating Role of Internalized Negative Racial Group Attitudes." *Social Science & Medicine* 71: 1182-1188.

Charmaz, Kathy, 1995. "They Body, Identity, and Self: Adapting to Impairment." The *Sociological Quarterly* 36(4): 657–680.

Chatterji, Somnath, and Paul Kowal. 2013. WHO Study on Global AGEing and Adult Health (SAGE): Wave 1, 2007-2010. ICPSR31381-v1. Ann Arbor,MI: Inter-university Consortium for Political and Social Research. http://doi.org/10.3886/ICPSR31381.v1

Colditz, Graham A., Pauline Martin, Meir J. Stampfer, Walter C. Willett, Laura Sampson, Bernard Rosner, Charles H. Hennekens, and Frank E. Speizer. 1986. "Validation of Questionnaire Information on Risk-Factors and Disease Outcomes in a Prospective Cohort Study of Women." American Journal of Epidemiology 123(5): 894-900.

Collins, Patricia Hill. 1990/2008 *Black Feminist Thought: Knowledge, Consciousness and the Politics of Empowerment*. New York: Routledge.

Compton, Elizabeth, Michael Bentley, Sharon Ennis, and Sonya Rastogi. *2010 Census Race and Hispanic Origin Alternative Questionnaire Experiment: Final Report*. Washington, DC: U.S. Census Bureau.

Cook, Nicolas. 2009. *Ghana: Background and U.S. Relations*. Washington, DC: Congressional Research Service.

Courtenay, William H. 2000a. "Engendering Health: A Social Constructionist Examination of Men's Health Beliefs and Behaviors." *Psychology of Men & Masculinity* 1(1): 4-15.

Courtenay, William H. 2000b. "Constructions of Masculinity and their Influence on Men's Well-Being: A Theory of Gender and Health." *Social Science & Medicine* 50: 1385-1401.

Crenshaw, Kimberle. 1991. "Mapping the Margins: Intersectionality, Identity Politics, and Violence against Women of Color." *Stanford Law Review* 43(6): 1241–1299.

Daar, Abdallah S., Peter A. Singer, Deepa L. Persad, Stig K. Pramming, David R. Matthews,

Robert Beaglehole, et al. 2007. “Grand Challenges in Chronic Non-communicable Diseases.” *Nature* 450: 494-496.

Dagadu, Helena E. and C. André Christie-Mizell. 2014. “Heart Trouble and Racial Group Identity: Exploring Ethnic Heterogeneity among Black Americans.” *Race and Social Problems* 6: 143-160.

Dagadu, Helena E. and Evelyn J. Patterson. (*Forthcoming August 2015*). “Placing a Health Equity Lens on Non-communicable Diseases in sub-Saharan Africa.” *Journal for the Health Care of the Poor and Underserved.*

Dake, Fidelia A. A., Emmanuel O. Tawiah, and Delali M. Badasu. 2010. “Sociodemographic Correlates of Obesity among Ghanaian Women.” *Public Health Nutrition* 14(7): 1285-1291.

Dalal, Shona, Juan Jose Beunza, Jimmy Volmink, Clement Adebamowo, Francis Bajunirwe, Marina Njelekela, Dariush Mozaffarian, Wafaie Fawzi, Walter Willett, Hans-Olov Adami, and Michelle D Holmes. 2011. “Non-communicable Diseases in Sub-Saharan Africa: What We Know Now.” *International Journal of Epidemiology* 40: 885–901.

Danaei, Goodarz et al. 2011. “National, Regional, and Global Trends in Fasting Plasma Glucose and Diabetes Prevalence since 1980: Systematic Analysis of Health Examination Surveys and Epidemiological Studies with 370-Country Years and 2.7 Million Participants.” *The Lancet* 378: 31-40.

Danquah, Ina, George Bedu-Addo, Karl-Johann Terpe, Frank Micah, Yaw A. Amoako, Yaw A. Awuku, Ekkehart Dietz, Markus van der Giet, Joachim Spranger, and Frank P. Mockenhaupt. 2012. “Diabetes Mellitus Type 2 in Urban Ghana: Characteristics and Associated Factors.” *BMC Public Health* 12: 210.

David, Richard J. and James W. Collins, Jr. 1997. “Differing Birth Weight among Infants of U.S.-Born Blacks, African-Born Blacks, and U.S.-Born Whites.” *New England Journal of Medicine* 337: 1209-1214.

de-Graft Aikins, Ama. 2006. “Reframing Applied Disease Stigma Research: A Multilevel Analysis of Diabetes Stigma in Ghana.” *Journal of Community and Applied Social Psychology* 16(6): 426–441.

de-Graft Aikins, Ama. 2007. “Ghana's Neglected Chronic Disease Epidemic: A Developmental Challenge. *Ghana Medical Journal* 41(4): 154–159.

de-Graft Aikins, Ama, Nigel Unwin, Charles Agyemang, Pascale Allotey, Catherine Campbell and Daniel Arhinful. 2010. “Tackling Africa’s Chronic Disease Burden: From the Local to the Global. *Globalization and Health* 6: 5.

de-Graft Aikins, Ama. 2013. "The Socio-Cultural and Socio-economic Context of Africa's Chronic Disease Burden." Pp. 124-136 in *Chronic Non-Communicable Diseases in Ghana: Multidisciplinary Perspectives*, edited by A. de-Graft Aikins, S. Agyei-Mensah, and Charles Agyemang. Accra, Ghana: University of Ghana.

de-Graft Aikins, Ama, Ellis Owusu-Dabo, and Charles Agyemang. 2013. "Diabetes in Ghana: A Review of Research and Prevalence, Experiences and Healthcare." Pp. 41-55 in *Chronic Non-Communicable Diseases in Ghana: Multidisciplinary Perspectives*, edited by A. de-Graft Aikins, S. Agyei-Mensah, and Charles Agyemang. Accra, Ghana: University of Ghana.

Defo, Barthélémy Kuate. 2014. "Beyond the "Transition" Frameworks: The Cross-Continuum of Health, Disease and Mortality Framework." *Epidemiological Transitions—Beyond Omran's Theory* (Special Issue). Global Health Action 7: 24804 - http://dx.doi.org/10.3402/gha.v7.24804

Dixon, Jenna, Isaac Luginaah, and Paul Mkandawire. 2014. "The National Health Insurance Scheme in Ghana's Upper West Region: A Gendered Perspective on Insurance Acquisition in a Resource-Poor Setting." *Social Science & Medicine* 122: 103-112.

Dodu, S. R. A. and N. de Heer. 1964. "A Diabetes Case-Finding Survey in Ho. *Ghana Medical Journal* 3: 75-80.

Doamekpor, Lauren A. and Gniesha Y. Dinwiddie. 2015. "Allostatic Load in Foreign-Born and US-Born Blacks: Evidence From the 2001–2010 National Health and Nutrition Examination Survey." *American Journal of Public Health* 105: 591-597.

Du Bois, W.E. Burghardt. 1915. *The African Roots of War*. Available online through UMASS Amherst Library: http://www.library.umass.edu/spcoll/digital/dubois/WarRoots.pdf.

Durkheim, Émile. (1897 [1979]). *Suicide: A Study in Sociology*. G. Simpson (ed). J. A. Spaulding and G. Simpson (translators). New York, NY: The Free Press, A Division of Macmillan Publishing Co., Inc.

Elo, Irma T. and Jennifer C. Culhane. 2010. "Variations in Health and Health Behaviors by Nativity among Pregnant Black Women in Philadelphia." *American Journal of Public Health* 100: 2185-2192.

Elo, Irma T., Neil K. Mehta, and Cheng Huang. 2008. "Health of Native-born and Foreign-born Black Residents in the United States: Evidence from the 2000 Census of Population and the National Health Interview Survey." *University of Pennsylvania Scholarly Commons*. Available online at http://repository.upenn.edu/parc_working_papers/17.

Elo, Irma T., Neil K. Mehta, and Cheng Huang. 2011. "Disability among Native Born and Foreign Born Blacks in the United States." *Demography* 48(1): 241-265

Feagin, Joe R., and Karyn D. McKinney. 2003. *The Many Costs of Racism*. Rowman & Littlefield Publishers, Inc.

Feliciano, Cynthia. 2005. "Educational Selectivity in U.S. Immigration: How Do Immigrants Compare to Those Left Behind?" *Demography* 42(1): 131-152.

Frenk, Julio, Jose E. Bobadilla, Jaime Sepulveda, and Malaquais Lopez Cervantes. 1989. "Health Transition in Middle-Income Countries: New Challenges for Health Care." *Health Policy and Planning* 41(1): 29-39.

Gambino, Christine P., Edward N. Trevelyan, and John Thomas Fitzwater. 2014. "The Foreign-Born Population from Africa: 2008-2012." *American Community Survey Briefs*. Washington, DC: U.S. Census Bureau.

Gaylin, Daniel S. and Jennifer Kates. 1997. "Refocusing the Lens: Epidemiologic Transition Theory, Mortality Differentials, and the AIDS Epidemic." *Social Science & Medicine* 44(5): 609-621.

Gerth, H.H. and C. Wright Mills. 1946. *From Max Weber: Essays in Sociology*. New York, NY: Oxford University Press.

Ghana Statistical Service (GSS). 2012. 2010 *Population & Housing Census: Summary Report and Final Results*. Accra, Ghana: Ghana Statistical Service.

Ghana Ministry of Health. 2012. *National Policy for the Prevention and Control of Chronic Non-Communicable Diseases in Ghana*. Accra, Ghana: Republic of Ghana Ministry of Health.

Goel, Mita Sanghavi, Ellen P. McCarthy, Russell S. Phillips, and Christina C. Wee. 2004. "Obesity Among U.S. Immigrant Subgroups by Duration of Residence." *Journal of the American Medical Association* 292(23): 2860-67.

Gorman, Bridget K. and Jen'nan Ghazal Read. 2006. "Gender Disparities in Adult Health: An Examination of Three Measures of Morbidity." *Journal of Health and Social* Behavior 47: 95-110.

Gorman, Bridget K., Jen'nan G. Read and Patrick M. Krueger. 2010. "Gender, Acculturation, and Health among Mexican Americans." *Journal of Health and Social Behavior* 51: 440-457.

Griffith, Derek M. 2012. "An Intersectional Approach to Men's Health." *JMH* 9(2): 106-112.

Griffith, Derek M., Jonetta L. Johnson, Rong Zhang, Harold W. Neighbors, and James S. Jackson. 2011. "Ethnicity, Nativity, and the Health of American Blacks." *Journal of Health Care for the Poor and Underserved* 22(1): 142-56.

Hall, Victoria, Reimar W. Thomsen, Ole Henriksen, and Nicolai Lohse. 2011. "Diabetes in Sub Saharan Africa 199-2011: Epidemiology and Public Health Implications. A Systematic Review." *BMC Public Health* 11:564. Available online at http://www.biomedcentral.com/1471-2458/11/564.

Hamilton, Tod G. 2014. "Do Country-of-Origin Characteristics Help Explain Variation in Health Among Black Immigrants in the United States?" *Social Science Quarterly* 95(3): 817-834.

Hamilton, Tod G. and Robert A. Hummer. 2011. "Immigration and the Health of U.S. Black Adults: Does Country of Origin Matters? *Social Science & Medicine* 73: 1551-1560.

Hamilton, Tod G. and Ichiro Kawachi. 2013. "Changes in Income Inequality and the Health of Immigrants. *Social Science & Medicine* 80: 57-66.

Harlow, Siobán D. and Martha S. Linet. 1989. "Agreement Between Questionnaire Data and Medical Records: The Evidence for Accuracy of Recall." *American Journal of Epidemiology* 129(2): 233-248.

Hosseinpoor, Ahmad Reza, Nicole Bergen, Shanthi Mendis, Sam Harper, Emese Verdes, Anton Kunst, and Somnath Chatterji. 2012. "Socioeconomic Inequality in the Prevalence of Noncommunicable Diseases in Low- and Middle-Income Countries" Results from the World Health Survey. *BMC Public Health* 12: 474 http://www.biomedcentral.com/1471-2458/12/474.

Hummer, Robert, Daniel Powers, Starling Pullum, Ginger Gossman and W. P. Frisbie. 2007. "Paradox found (again): Infant Mortality among the Mexican-Origin Population in the United States." *Demography* 44: 441-57.

Hummer, Robert A., Richard G. Rogers, Charles B. Nam, and Felicia B. LeClere. 1999. "Race/Ethnicity, Nativity, and U.S. Adult Mortality." *Social Science Quarterly* 80(1): 136-153.

Hurt, L. S., C. Ronsmans, and S. Saha. 2004. "Effects of Education and Other Socioeconomic Factors on Middle Age Mortality in Rural Bangladesh." *Journal of Epidemiology and Community Health* 58: 315-320.

Ida, Aya Kimura and C. André Christie-Mizell. 2012. "Racial Group Identity, Psychosocial Resources, and Depressive Symptoms: Exploring Ethnic Heterogeneity among Black Americans." *Sociological Focus* 45(1): 41-62.

Jasso, G., Massey, D. S., Rosenzweig, M. R., & Smith, J. P. 2004. "Immigrant Health, Selectivity and Acculturation." Pp. 227-266 in *Critical Perspectives on Racial and Ethnic Differences in Health in Late Life*, edited by N. B. Anderson, R. A. Bulatao, & B. Cohen. Washington, D.C: National Acedemy Press.

Jehu-Appiah, Caroline, Genevieve Aryeetey, Ernst Spaan, Thomas de Hoop, Irene Agyepong, and Rob Baltussen. 2011. "Equity Aspects of the National Health Insurance Scheme in Ghana: Who is Enrolling, Who is Not and Why?" *Social Science & Medicine* 72: 157-165.

John, Dolly A., A.B. de Castro, Diane P. Martin, Bonnie Duran, and David T. Takeuchi. 2012. Does an Immigrant Health Paradox Exist among Asian Americans? Associations of Nativity and Occupational Class with Self-Rated Health and Mental Disorders." *Social Science & Medicine* 75(12): 2085-2098.

Kalmijn, Matthijs. 1996. "The Socioeconomic Assimilation of Caribbean American Blacks." *Social Forces* 74(3): 911-930.

Kent, Mary Mederios. 2007. "Immigration and America's Black Population," *Population Bulletin* 62(4).

Kim, Eric S., Nansook Park, and Christopher Peterson. 2013. "Perceived Neighborhood Social Cohesion and Stroke." *Social Science & Medicine* 97: 49-55.

Kim, Eric S., Armani M. Hawes, and Jacqui Smith. 2014. "Perceived Neighbourhood Social Cohesion and Myocardial Infarction." *Journal of Epidemiology & Community Health* 68: 1020-1026. doi:10.1136/jech-2014-204009

Kirk, Erik P. and Samuel Klein. 2009. "Pathogenesis and Pathophysiology of the Cardiometabolic Syndrome." *Journal of Clinical Hypertension* 11(12): 761-765.

Kirigia, Joses M., Hama B. Sambo, Luis G. Sambo, and Saidou P. Barry. 2009. "Economic Burden of Diabetes Mellitus in the WHO African Region." *BMC International Health and Human Rights* 9:6.

Koya, Deepika L. and Leonard E. Egede. 2007. "Association between Length of Residence and Cardiovascular Disease Risk Factors Among an Ethnically Diverse Group of United States Immigrants." *Journal of General Internal Medicine* 22(6): 841-846.

Kuhn, Randall. 2010. "Routes to Low Mortality in Poor Countries Revisited*." Population and Development Review* 36(4): 655-692.

LaVeist, Thomas A. 2005. "Conceptual Issues in Race/Ethnicity and Health." Pp. 15-29 in *Minority Populations and Health: Introduction to Health Disparities in the United States*. San Francisco, CA: Jossey-Bass.

Lee, Jennifer and Frank K. Bean. 2004. "America's Changing Color Lines: Immigration, Race/Ethnicity, and Multiracial Identification." *Annual Review of Sociology* 30: 221-242.

Levitt, N. S. 2008. "Diabetes in Africa: Epidemiology, Management and Healthcare Challenges." *Heart* 94(11): 1376-1382.

Link, Bruce G. and Jo Phelan. 1995. "Social Conditions as Fundamental Causes of Disease." *Journal of Health and Social Behavior*. (Extra Issue): 80-94.

Lopez-Gonzalez, Lorena, Veronica C. Aravena, and Robert A. Hummer. 2005. "Immigrant Acculturation, Gender and Health Behavior: A Research Note." *Social Forces* 84(1): 581-593.

Lucas, Jacqueline W., Daheia J. Barr-Anderson, and Raynard S. Kington. 2003. "Health Status, Health Insurance, and Health Care Utilization Patterns of Immigrant Black Men." *American Journal of Public Health* 2003(93): 1740-1747.

Luginaah, Isaac. 2008. Local Gin (*Akpeteshie*) and HIV/AIDS in the Upper West Region of Ghana: The Need for Preventive Health Policy. *Health & Place* 14: 806-816.

Lutfey, Karen and Jeremy Freese. 2005. "Toward Some Fundamentals of Fundamental Causality: Socioeconomic Status and Health in the Routine Clinic Visit for Diabetes." *American Journal of Sociology* 110(5): 1326-1372.

Luy, Marc. 2004. "Causes of Male Excess Mortality: Insights from Cloistered Populations." *Population and Development Review* 29(4): 647-676.

Margai, Florence M. 2009. "Acculturation and the Health of Black Immigrants in the United States." Pp. 164-182 in *The New African Diaspora*, edited by I. Okpewho and N. Nzegwu. Bloomington, IN: Indiana University Press.

Markides, K. S. and Eschbach, K. 2005. Aging, Migration, and Mortality: Current Status of Research on the Hispanic paradox. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 60(Special Issue 2): S68-S75.

Marmot, Michael. 2007. "Achieving Health Equity: From Root Causes to Fair Outcomes." *The Lancet* 370(9593): 1153-1163.

Marmot, Michael. 2012. "Health Equity: The Challenge." *Australian and New Zealand Journal of Public* Health 36(6): 513.

Marmot, Michael and Leonard Syme. 1976. "Acculturation and Coronary Heart Disease in Japanese Americans." *American Journal of Epidemiology* 104(3): 225-247.

Marx, Karl. 1848/1983. "Manifesto of the Communist Party." Pp. 203-241 in *The Portable Karl Marx,* edited by E. Kamenka. New York: Vikings Penguin Inc..

Mbanya, J. N., Motala, A. A, Sobngwi, E., Assah, F. K., & Enoru, S. T. 2010. "Diabetes in sub-Saharan Africa." *Lancet* 375: 2254-2266.

Mezuk Briana. 2010. "Epidemiology of Diabetes and Cardiovascular Disease: The Emergence of Health Disparities over the Life Span." Pp. 77-97 in *Health Inequalities: Life Course*

Perspectives on Late Life Outcomes, edited by T.C. Antonucci and J.S. Jackson. New York, NY: Springer Publishing.

Minicuci, Nadia, Richard B. Biritwum, George Mensah, Alfred E. Yawson, Nirmala Naidoo, Somnath Chatterji, and Paul Kowal. 2014. Sociodemographic and socioeconomic patterns of Chronic Non-communicable Disease among Older Adult Population in Ghana." *Global Health Action* 7: 21292 - http://dx.doi.org/10.3402/gha.v7.21292.

Minnesota Population Center and State Health Access Data Assistance Center. 2012. "National Health Interview Survey 2003-2012." *Integrated Health Interview Series: Version 5.0.* Minneapolis: University of Minnesota. Available online at http://www.ihis.us.

Nettleton, Sarah. 1995. *The Sociology of Health and Illness*. Cambridge, UK: Polity Press.

Nimako, Belinda Afriyie, Frank Baiden, Samuel Oko Sackey, and Fred Binka. 2013. "Multimorbidity of Chronic Diseases among Adult Patients Presenting to an Inner-City Clinic in Ghana." *Globalization and Health* 9: 61.

O'Brien, Rosaleen, Kate Hunt, and Graham Hart. 2005. "'It's Caveman Stuff, but That is to a Certain Extent How Guys Still Operate': Men's Accounts of Mascu linity and Help Seeking." *Social Science & Medicine* 61: 503-16.

Omran, Abdel R. 1971/2005. "The Epidemiologic Transition: A Theory of the Epidemiology of Population Change." *The Milbank Quarterly* 83(4): 731-757.

Owiredu, W. K. B. A., M. S. Adamu, N. Amidu, E. Woode, V. Bam, J. Planger-Rhule and C. Opoku-Okrah. "Obesity and Cardiovasular Risk Factors in a Pentecostal Population in Kumasi-Ghana." *Journal of Medical Sciences* 8(8): 682-690.

Owusu, George and Samuel Agyei-Mensah. 2011. "A Comparative Study of Ethnic Residential Segregation in Ghana's Two Largest Cities, Accra and Kumasi. *Population and Environment* 32(4): 332-352.

Oza-Frank, Reena, Rob Stephenson, and K. M. Venkat Narayan. 2011. "Diabetes Prevalence by Length of Residence among US Immigrants." *Journal of Immigrant and Minority Health* 13: 1-8.

Palloni, Alberto and Elizabeth Arias. 2004. "Paradox Lost: Explaining the Hispanic Adult Mortality Advantage." *Demography* 41(3): 385-415.

Pampel, Fred C., Justin T. Denney, and Patrick M. Krueger. 2012. "Obesity, SES, and Economic Development: A Test of the Reversal Hypothesis." *Social Science & Medicine* 74: 1073-1081.

Parmar, Divya, Gemma Williams, Fahdi Dkhimi, Alfred Ndiaye, Felix Ankomah Asante, Daniel

Kojo Arhinful, Philipa Mladovsky. 2014. “Enrolment of Older People in Social Health Protection Programs in West Africa – Does Social Exclusion Play a Part?” *Social Science & Science* 119: 36-44.

Phelan, Jo C., Bruce G. Link, Ana Diez-Rouz, Ichiro Kawachi, and Bruce Levin. 2004. “’Fundamental Causes’ of Social Inequalities in Mortality: A Test of the Theory.” *Journal of Health and Social Behavior*. 45: 265-285.

Phelan, Jo C., Bruce G. Link, and Parisa Tehranifar. 2010. “Fundamental Causes of Health Inequalities: Theory, Evidence and Policy Implications.” *Journal of Health and Social Behavior* 51(S): S28-S40.

Ploubidis, George B., Wanjiku Mathenge, Bianca De Stavola, Emily Grundy, Allen Foster, and Hannah Kuper. 2013. “Socioeconomic Position and Later Life Prevalence of Hypertension, Diabetes and Visual Impairment in Nakuru, Kenya. *International Journal of Public Health* 58: 133-141.

Prentice, Andrew M. 2006. “The Emerging Epidemic of Obesity in Developing Countries. *International Journal of Epidemiology* 35: 93-99.

Preston, Samuel H. and Paul Taubman. 1994. “Socioeconomic Differences in Adult Mortality and Health Status.” Pp. 279-318 in *Demography of Aging*, edited by L. G. Martin and S. H. Preston. Washington, D.C.: National Academy Press.

Read, Jen’nan Ghazal and Michael O. Emerson. 2005. “Racial Context, Black Immigration and U.S. Black/White Health Disparity.” *Social Forces* 84(1): 181-199.

Read, Jen’nan Ghazal, Michael O. Emerson, and Alvin Tarlov. 2005. “Implications of Black Immigrant Health for U.S. Racial Disparities in Health.” *Journal of Immigrant Health* 7(3): 205-12.

Read, Jen’nan Ghazal and Megan M. Reynolds. 2012. “Gender Differences in Immigrant Health: The Case of Mexican and Middle Eastern Immigrants.” *Journal of Health and Social Behavior* (53): 99-123.

Read, Ursula M., Edward Adiibokah, and Solomon Nyame. 2009. Local Suffering and the Global Discourse of Mental Health and Human Rights: An Ethnographic Study of Responses to Mental Illness in Rural Ghana. *Globalization and Health* 5: 13. doi:10.1186/1744-8603-5-13

Reed, Holly E., Catherine S. Andrzejewski, Nancy Luke, and Liza Fuentes. 2012. “The Health of African Immigrants in the U.S.: Explaining the Immigrant Health Advantage.” Presented at the annual meeting of the Population Association of America Meeting, May 3-5, San Francisco, CA. Retrieved January 7, 2015 (http://paa2012.princeton.edu/papers/121718).

Risman, Barbara J. 2004. “Gender as a Social Structure: Theory Wrestling with Activism.” *Gender and Society* 18(4): 429-450.

Rogers, Richard G., Bethany G. Everett, Jarron M. Saint Onge, and Patrick M. Krueger. 2010. “Social, Behavioral, and Biological Factors, and Sex Differences in Mortality.” *Demography* 47(3): 555–578.

Ryu, So Yeon, Catherine M. Crespi, and Annette E. Maxwell. 2013. “A Bi-National Comparative Study of Health Behaviors of Koreans in South Korea and Korean Americans in California.” *Journal of Immigrant and Minority Health* 15: 1073-1081.

Schmitz, Mieke Fry, Nancy Giunta, Nina S. Parikh, Katherine K. Chen, Marianne C. Fahs, and William T. Gallo. 2012. “The Association between Neighbourhood Social Cohesion and Hypertension Management Strategies in Older Adults.” *Age and Ageing* 41: 388-395.

Shaw, J.E., R.A. Sicree, and P.Z. Zimmet. 2010. “Global Estimates of the Prevalence of Diabetes from 2010 to 2030.” *Diabetes Research and Clinical Practice* 87(1): 4-14.

Shaya, Fadia T., Viktor V. Chirikov, DeLeonardo Howard, Clyde Foster, Julian Costas, Soren Snitker, Jeffrey Frimpter, and Kathrin Kucharski. 2013. “Effect of Social Networks Intervention in Type 2 Diabetes: A Partial Randomised Study.” *Journal of Epidemiology & Community Health* 68: 326-332. doi:10.1136/jech-2013-203274

Singh, G.K and R. A. Hiatt. 2006. Trends and Disparities in Socioeconomic and Behavioural Characteristics, Life Expectancy, and Cause-Specific Mortality of Native-Born and Foreign-Born Populations in United States, 1979-2003.” *International Journal of Epidemiology* 35(4): 903-919.

Singh, Gopal K., Alfonso Rodriguez-Lainz, and Michael D. Kogan. 2013. “Immigrant Health Inequalities in the United States: Use of Eight Major National Data Systems.” *The Scientific World Journal* 2013: 1-21.

Singh, Gopal K. and Mohammad Siahpush. 2002. “Ethnic-Immigrant Differentials in Health Behaviors, Morbidity, and Cause-Specific Mortality in the United States: An Analysis of Two National Data Bases” *Human Biology* 74(1): 83-109.

Singh, Gopal K. and Mohammad Siahpush. 2001. “All-Cause and Cause-Specific Mortality of Immigrants and Native Born in the United States” *American Journal of Public Health* 91(3):3 92-399.

Sodjinou, Roger, Victoire Agueh, Benjamin Fayomi, and Hélène Delisle. 2008. “Obesity and Cardio-Metabolic Risk Factors in Urban Adults of Benin: Relationship with Socio-economic Status, Urbanisation, and Lifestyle Patterns. *BMC Public Health* 8: 84. doi: 10.1186/1471-2458-8-84

Sossou, Marie-Antoinette. 2011. “We Do Not Enjoy Equal Political Rights: Ghanaian Women’s

Perceptions on Political Participation in Ghana." *SAGE Open*. doi:10.1177/2158244011410715

Springer, Kristen W., Olena Hankivskym and Lisa M. Bates. 2012. "Gender and Health: Relational, Intersectional, and Biosocial Approaches." *Social Science & Medicine* 74: 1661-1666.

Stuckler, David. 2008. "Population Causes and Consequences of Leading Chronic Diseases: A Comparative Analysis of Prevailing Explanations." *The Milbank Quarterly* 86(2): 273-326.

Subramanian, S. V., Daniel J. Corsi, Malavika A. Subramanyam, and George Davey Smith. 2013. "Jumping the Gun: The Problematic Discourse on Socioeconomic Status and Cardiovascular Health in India." *International Journal of Epidemiology* 42: 1410-1426.

Tuller, Madeline Anne. 2013. "The Healthy Migrant Hypothesis and Internal Migration in Accra, Ghana." M.A. thesis, Department of Geography, San Diego State University, San Diego, CA.

U.S. Department of Health and Human Services (DHHS). 2014. *Health People 2020*. Office of Disease Prevention and Health Promotion. Washington, DC. Available at http://www.healthypeople.gov/2020/About-Healthy-People.

Unwin, N. and K. G. Alberti. 2006. "Chronic Non-Communicable Diseases." *Annals of Tropical Medicine and Parasitology* 100(5-6): 455-464.

Unwin, Nigel, Philip Setel, Seif Rashid, Ferdinand Mugusi, Jean-Claude Mbanya, Henry Kitange, Louise Hayes, Richard Edwards, Terry Aspray and K.G.M.M. Alberti. 2001. "Noncommunicable Diseases in Sub-Saharan Africa: Where do they Feature in the Health and Research Agenda?" *Bulletin of the World Health Organization* 79: 947-953.

Venters, Homer and Francesca Gany. 2011. "African Immigrant Health." *Journal of Immigrant Minority Health* 13: 333-344.

West, Candace, and Don H. Zimmerman. 1987. "Doing Gender." *Gender and Society* 1(2): 125-151.

Waldron, Ingrid. 1976. "Why Do Women Live Longer than Men?" *Journal of Human Stress* 2(2): 19-30.

Waldron, Ingrid. 1983a. "Sex Differences in Illness Incidence, Prognosis and Mortality: Issues and Evidence" *Social Science & Medicine* 17(16): 1107-1123.

Waldron, Ingrid. 1983b. "Sex Differences in Human Mortality: The Role of Genetic Factors." *Social Science & Medicine* 17(6): 321-333.

Waldron, Ingrid, Christopher C. Weiss, and Mary Elizabeth Hughes. 1998. "Interacting Effects of Multiple Roles on Women's Health." *Journal of Health and Social Behavior* 39(3): 216-236.

Waldron, Ingrid. 1998. "Gender and Health-Related Behavior." Pp. 193-208 in *Gender and Health-Related Behavior: Emerging Research Perspectives* by D. S. Gochman (ed.). New York, NY: Springer Science+Business Media.

Whitehead, Margaret and Göran Dahlgren. 2006. *Concepts and Principles for Tackling Social Inequities in Health: Leveling up Part 1*. Copenhagen, Denmark: World Health Organization Regional Office for Europe.

Williams, David R. and Chiquita Collins. 1995. "US Socioeconomic and Racial Differences in Health: Patterns and Explanations." *Annual Review of Sociology* 21:349-386.

Williams, David R. and James S. Jackson. 2000. "Race/Ethnicity and the 2000 Census: Recommendations for African American and Other Black Populations in the United States. *American Journal of Public Health* 90(11): 1728-30.

Williams, David, Hector M. González, Harold Neighbors, Randolph Nesse, Jaime M. Abelson, Julie Sweetman, and James S. Jackson. 2007. "Prevalence and Distribution of Major Depressive Disorder in African Americans, Caribbean Blacks, and Non-Hispanic Whites: Results From the National Survey of American Life." *Archives of General Psychiatry* 64(Mar): 305-315.

Williams, David R., Selina A. Mohammed, Jacinta Leavell, and Chiquita Collins. 2010. "Race, Socioeconomic Status, and Health: Complexities, Ongoing Challenges, and Research Opportunities." *Annals New York Academy of Sciences* 1186: 69-101.

World Bank. 2014. *Updated Income Classifications*. Washington, D.C.: The World Bank Group. Available online at http://data.worldbank.org/news/2015-country-classifications.

World Health Organization (WHO). 2006. *Global Burden of Disease. Projections of mortality and burden of disease, 2002–2030.* http://www.who.int/topics/global_burden_of_disease/en/.

World Health Organization (WHO). 2009. *Women and Health: Today's Evidence Tomorrow's Agenda*. Geneva: World Health Organization.

World Health Organization (WHO). 2013. *A Global Brief on Hypertension: Silent Killer, Global Public Health Crisis*. Geneva, Switzerland: World Health Organization.

World Health Organization (WHO). 2014b. *Ghana Country Assessment Report on Ageing and Health*. Geneva, Switzerland: World Health Organization.

Wrigley-Asante, C. 2013. “Women Becoming Bosses: Changing Gender Roles and Decision Making in Dangme West District of Ghana.” *Ghana Journal of Geography* 3: 60-87.

Yin, Sandra. 2007. “Gender Disparities in Health and Mortality.” *Population Reference Bureau*. Available online at: http://www.prb.org/Publications/Articles/2007/genderdisparities.aspx.

Young, Fiona, Julia A. Critchley, Lucy K. Johnstone, and Nigel C Unwin. 2009. “A Review of Co-morbidity between Infectious and Chronic Disease in Sub Saharan Africa: TB and Diabetes Mellitus, HIV and Metabolic Syndrome, and the Impact of Globalization. *Globalization and Health* 5: 9. doi:10.1186/1744-8603-5-9

Zhang, Luxia, Gary C. Curhan, Frank B. Hu, Eric B. Rimm, John P. Forman. 2011. “Association between Passive and Active Smoking and Incident Type 2 Diabetes in Women.” *Diabetes Care* 34: 892–897.