

Georgia State University

ScholarWorks @ Georgia State University

Public Health Capstone Projects

School of Public Health

Fall 1-7-2017

Epidemiology of Type 2 Diabetes in populations of African Descent

Kenyatta Bruce

Follow this and additional works at: https://scholarworks.gsu.edu/iph_capstone

Recommended Citation

Bruce, Kenyatta, "Epidemiology of Type 2 Diabetes in populations of African Descent." , Georgia State University, 2017.

doi: <https://doi.org/10.57709/9465675>

This Capstone Project is brought to you for free and open access by the School of Public Health at ScholarWorks @ Georgia State University. It has been accepted for inclusion in Public Health Capstone Projects by an authorized administrator of ScholarWorks @ Georgia State University. For more information, please contact scholarworks@gsu.edu.

ABSTRACT

Epidemiology of Type 2 Diabetes in populations of African Descent

By

Kenyatta B. Bruce

12/09/2016

Type 2 Diabetes Mellitus (T2D) is a significant public health problem among populations of African descent around the world. In the United States alone, African descent populations are disproportionately affected by the growing epidemic of T2D and are greatly impacted by T2D-related complications. Over the last decade, there have been major advancements in access to care for minority populations. Despite these advancements, this population has the second highest prevalence of T2D compared to any other minority group. The objective of this literature review is to identify the burden of Diabetes Mellitus in the United States among populations of African descent. Ethnic and racial differences for T2D and T2D- related mortality will also be reviewed, as well as the examination of lifestyle risk factors, complications, and disparities for T2D in populations of African descent in the United States. Lastly, this review will summarize the current state of knowledge and identify areas for potential preventative strategies.

Epidemiology of Type 2 Diabetes in populations of African Descent

by

Kenyatta B. Bruce

BSN., CLAYTON STATE UNIVERSITY, 2012

A Thesis Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the
Requirements for the Degree

MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA
30303

APPROVAL PAGE

Epidemiology of Type 2 Diabetes in populations of African Descent by

Kenyatta B. Bruce

Approved:

___Dr. Dora Il'yasova_____
Committee Chair

___Dr. Ike Okosun_____
Committee Member

___12/9/2016_____
Date

Author's Statement Page

In presenting this thesis as a partial fulfillment of the requirements for an advanced degree from Georgia State University, I agree that the Library of the University shall make it available for inspection and circulation in accordance with its regulations governing materials of this type. I agree that permission to quote from, to copy from, or to publish this thesis may be granted by the author or, in his/her absence, by the professor under whose direction it was written, or in his/her absence, by the Associate Dean, School of Public Health. Such quoting, copying, or publishing must be solely for scholarly purposes and will not involve potential financial gain. It is understood that any copying from or publication of this dissertation which involves potential financial gain will not be allowed without written permission of the author.

____Kenyatta Bruce_____
Signature of Author

TABLE OF CONTENTS

Abbreviations	6
LIST OF TABLES.....	7
LIST OF FIGURES.....	8
I. INTRODUCTION.....	9
1.1 Background.....	9
1.2 Purpose of Study.....	10
II. REVIEW OF THE LITERATURE.....	11
2.1 Burden of Type 2 Diabetes	11
2.2 Type 2 Diabetes in Population of African Descent.....	12
2.3 Type 2 Diabetes in Children and Adolescents.....	15
2.4 T2D Complications.....	20
2.5 Mortality of Type 2 Diabetes.....	23
2.6 National Diabetes Prevention Programs.....	24
III. GAPS IN THE LITERATURE.....	26
IV. DISCUSSION AND	
CONCLUSION.....	29
Current State of Knowledge.....	29
Recommendations and Prevention Strategies.....	30
REFERENCES.....	31

Abbreviations

DM - Diabetes Mellitus

T2D - Type 2 Diabetes Mellitus

NHB - non-Hispanic black

NHW - non-Hispanic white

ADA- American Diabetes Association

CDC- Center for Disease Control and Prevention

NHIS - National Health Interview Survey

NHANES - National Health and Nutrition Examination Survey

SES - socioeconomic status

CVD - Cardiovascular disease

MI - myocardial infarction

DKA - Diabetic Ketoacidosis

RCTs- Randomized Control Trials

List of Tables

Table1: Risk Factors of Type 2 Diabetes

List of Figures

Figure 1 Estimated total number of adults (20-79 years) living with diabetes, 2015

Figure 2 Percentage of U.S adults age 20 or older with diagnosed diabetes by racial/ethnic group 2010-2012

Chapter I

1.1 Introduction

Diabetes Mellitus (DM) is a significant public health burden around the world. Globally, 1.5 million deaths are directly attributed to diabetes each year. In 2014, approximately 21 million people were diagnosed with diabetes in the United States, and \$245 billion is expended in medical cost, lost work, and wages for people with this disease (CDC, 2015). From 1980 to 2014, the number of new diabetes cases in the United States has tripled to more than 1.4 million in adults 18-79 years old. The global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014 (WHO, 2016). In the United States, diabetes disproportionally affects minority populations, specifically non-Hispanic blacks (NHB), at a prevalence of approximately 13.2% (Ng, 2015). According to the American Diabetes Association (ADA) (“Diagnosis and Classification of Diabetes Mellitus,” 2003), T2D accounts for 90-95% of those who are diagnosed with DM, and this burden of T2D is much higher among populations of African descent.

T2D is defined by the ADA (2014) as “a condition characterized by hyperglycemia resulting from the body’s inability to use blood glucose for energy...either the pancreas does not make enough insulin or the body is unable to use insulin correctly” (Blair, 2016). T2D is usually diagnosed in adulthood, but more cases are being seen in children and adolescents due to increasing prevalence of childhood obesity. In this report, the term Non-Hispanic Black (NHB) refers to African Americans, African Caribbeans, and African immigrants. In this review, reported studies that address these three

racial/ethnic populations fall under the term NHB. “African Caribbean” refers to people of African descent who migrated to the United States from Caribbean islands. “African immigrant” refers to people of Sub-Saharan African ancestral origins who also migrated to the United States and other countries, voluntarily, or during the slave trade.

Particularly, because this growing epidemic affects ethnic minorities reducing the morbidity/mortality of T2D is paramount to countering this public health problem.

1.2 Purpose of Study

The objective of this literature review is to identify the burden of Diabetes Mellitus in the United States among populations of African descent. Ethnic and racial differences for T2D and T2D- related mortality will also be reviewed, as well as the examination of lifestyle risk factors, complications, and disparities for T2D in populations of African descent in the United States. Lastly, this review will summarize the current state of knowledge and identify areas for potential preventative strategies.

Chapter II

2.1 Literature Review- T2D

In the United States, DM is the 7th leading cause of death. Specifically, 9.3% of the American population has been diagnosed with diabetes, and an estimated 27.8% of individuals living with this disease are unaware that they have it. The National Health Interview Survey (NHIS) indicated that diabetes is most prevalent in adults ages 65-74 at a rate of (21.5 per 100) in the United States. The NHIS is a multistage probability survey that samples an average of 57,000 adults per year to estimate the health of the U.S. population, the prevalence and incidence of disease, the extent of disability, and the use of health care services (Gregg et al., 2014). Beginning in the 1980s, the incidence of diabetes in the United States has remained relatively constant: from 1990 to 2008, the number of new cases of diabetes increased sharply and then plateaued from 2008 to 2012 (Geiss et al., 2014). This sharp incline in new diabetes cases can be attributed to multiple factors, including the older adult population living longer, improved survival rates, the growth of the minority population at increased risk, and the increased incidence of obesity and sedentary lifestyles among adults in the United States (Geiss et al., 2014).

From 2012 to 2016, the incidence of diabetes each year has slowly begun to decline. Furthermore, the average medical expenditure is 2.3 times higher among people with diagnosed diabetes than for people without diabetes. Diabetes-related complications are responsible for approximately 11.5% of all hospitalizations among adults 18 years and older (CDC, 2014). Diabetics also have higher rates of disability—almost 30% of

those aged 45 to 60 years. Over 45% of those 70 years and older report some form of disability (Black, 2002). With increased hospitalizations and disability among adults, an average of \$176 billion is directly attributed to medical costs for diabetics to maintain a healthy lifestyle.

Globally, DM is one of the largest health emergencies of the 21st century (IDF, 2015). Prevalence has been on the rise in many middle and low-income countries. According to the IDF, Figure 1 shows the highest age-adjusted prevalence of DM, which is in North America and the Caribbeans (11.5%). The largest absolute burden (153.2 million individuals) is in the western pacific including China (Jaacks, Siegel, Gujral, & Narayan, 2016). By the year 2040, it is projected that 642 million people or one in every ten adults will be diagnosed with DM worldwide (IDF, 2015).

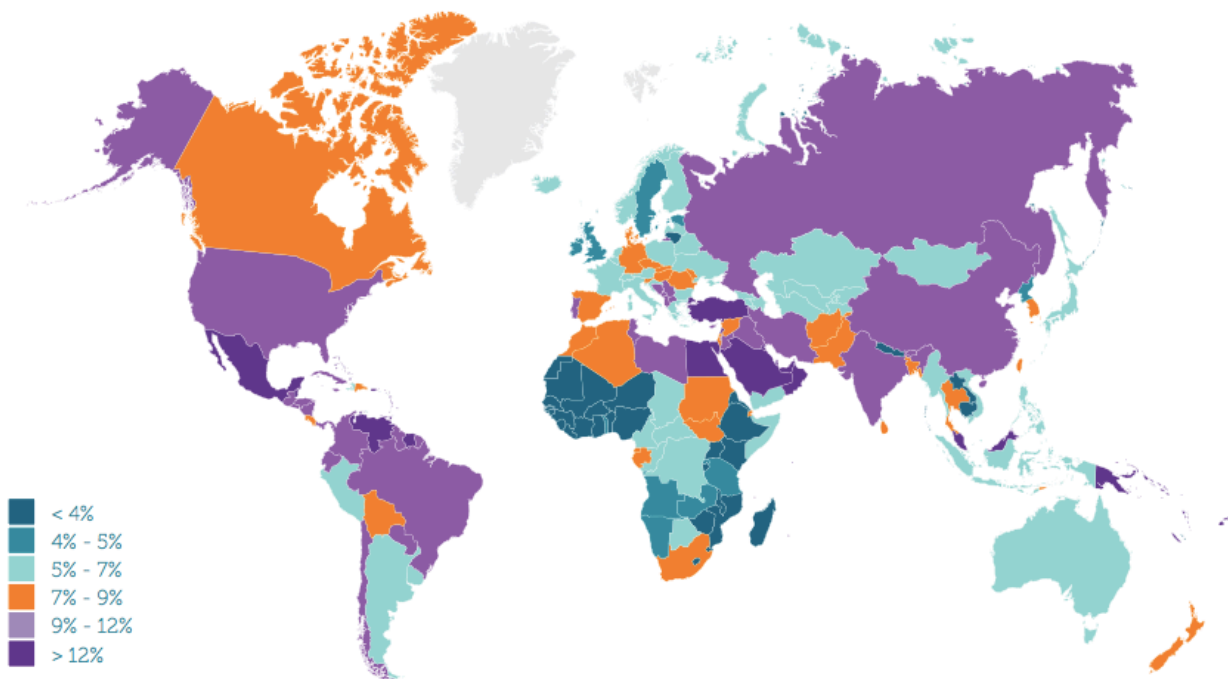


Figure 1: Estimated total number of adults (20-79 years) living with diabetes, 2015

Source: International Diabetes Federation Atlas 2015

2.2 Morbidity of T2D in African Descent Populations

In regards to ethnic minorities, several studies have examined the racial differences that exist among Type 2 diabetics. Nationally, NHB's are second to be diagnosed with diabetes at 13.2% behind American Indians/ Alaska Native populations at, 15.9% (Figure 2). Data from the NHIS showed that NHB's had a 103% (4.7 per 100 to 9.5 per 100 population) increase in diabetes cases from 1990- 2014. From 1999 to 2010, a separate evaluation of National Health and Nutrition Examination Survey (NHANES) data, revealed an increase in the prevalence of diabetes among NHB's. Diabetes prevalence rose from 6.4% in 1999 to 10.3% in 2010 for non-Hispanic whites (NHW), whereas NHB's experienced almost a doubling as prevalence grew from 7.9% in 1999 to 14.1% in 2010 (Ferdinand & Nasser, 2015). To examine ethnic differences in risk of T2D, Shai et al. (2006) conducted a prospective study on a cohort of apparently healthy women. Results showed the age-adjusted relative risk were 1.43 for Asians, 1.76 for Hispanics, and 2.18 for blacks (Shai et al., 2006). In this study, the age-adjusted relative risk of T2D among blacks was more than twice than in whites (Shai et al., 2006). These results support the findings of previous research that NHB's and other minorities are at an increased risk for T2D.

Examining data collected from the NHIS, the age-adjusted incidence of diagnosed diabetes showed no significant change in NHB's from 1997 to 2014 (CDC, 2014). In

2011, NHB's had the lowest median age of diagnoses for diabetes at 49 yrs. Brancati et al. (2000) conducted a prospective study using baseline data collected from 1986 to 1989

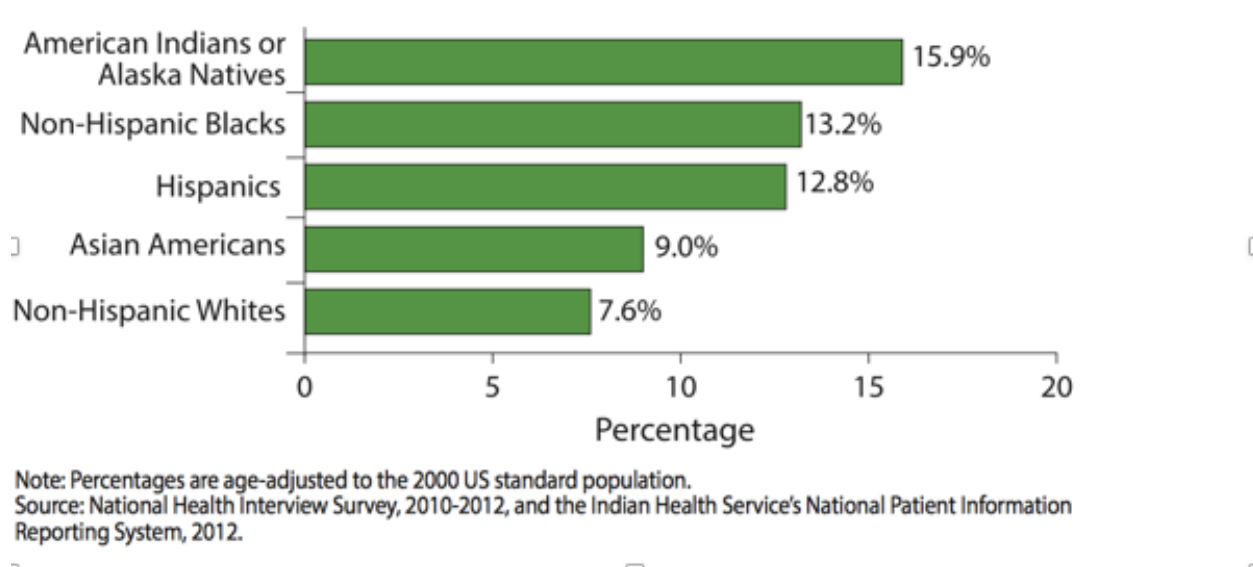


Figure 2: Percentage of U.S adults age 20 or older with diagnosed diabetes by racial/ethnic group 2010-2012

Atherosclerosis Risk in Communities Study. The researchers' objective was to determine the extent to which excess diabetes risk in African American was explained by racial differences and to compare the risk in the incidence of diabetes in African American vs. white adults. Diabetes incidence was about 2.4 times greater in African American women (25.1 per 1000 population) vs. white women (10.4 per 1000 population), and about 1.5 times greater in African American men (23.5 per 1000 population) vs. white men (15.9 per 1000 population) (Brancati et al., 2000). Results from this study indicated that African American men and women are at greater risk of developing T2D compared to their white counterparts.

To examine diabetes status in a multiethnic cohort, researchers (McBean, Li, Gilbertson, & Collins, 2004) conducted a retrospective study among fee-for-service Medicare beneficiaries greater than 67 years of age. This retrospective analysis comprised a sample of whites, blacks, Hispanics, and Asians. Researchers found that the prevalence in blacks (296 per 1000) and Hispanics (334 per 1000) were significantly higher than among Asians (243 per 1000), and whites (197 per 1000 population, $P < .00001$) (McBean et al., 2004). Notably, this study suggests that African descent populations and other minorities have a higher prevalence of T2D than NHW's.

2.3 T2D in Children and Adolescents

T2D is increasingly becoming more prevalent in children and adolescents. More than 20,000 United States youth younger than age 20 had T2D in 2009 (CDC, 2015). T2D now accounts for 20% to 50% of new-onset diabetes cases, and it has been suggested that this increase is a result of the frequency of obesity in pediatric populations (Dabelea et al., 2014). T2D is usually diagnosed in children over the age of 10 years and in those children who are in middle to late puberty (Reinehr, 2013). One of the very few studies that examined the prevalence of Type 1 and T2D among minority adolescents in the United States was conducted by Dabelea et al. (2014). The researchers estimated the prevalence of T2D in adolescents aged 10 to 19. Results showed the prevalence of T2D was highest in American Indian youth (1.20 per 1000), and black youth (1.06 per 1000), than among Hispanic youth (0.79 per 1000) and NHW youth (0.17 per 1000 population). In this study, NHB youth are second in prevalence behind American Indian children and adolescents for diagnosis of T2D. Overall, the researchers found a prevalence a 30.5%

increase (from 0.34 per 1000 to 0.46 per 1000 population) in T2D cases from 2001 to 2009 among children and adolescents in all ethnic groups.

Mayer-Davis et al. (2009) conducted a multicenter observational study (SEARCH study) to describe the prevalence and incidence of Type 1 and T2D among NHB youth. The researchers found diabetes prevalence to be exceedingly rare among youth less than 10 years of age. Over a course of 4 years, 16 NHB youth were <10 years out of a total of 298 case subjects (5%) (Mayer-Davis et al., 2009). The investigators also found that 41.3% of NHB youth were diagnosed with T2D at a routine check-up, and greater than 70% reported at least one symptom of T2D. Children who were diagnosed with T2D were generally from low-income households and annual incidence among youth aged 10-14 years was doubled among girls (29.8 per 100,000 population) compared to the incidence among NHB boys (12.2 per 100,000) (Mayer-Davis et al., 2009). Although T2D may be more prevalent in American Indian youth, prevention strategies should be aimed at children and adolescents of African descent to reduce T2D and related complications in adulthood.

2.4 Risk Factors of T2D

A number of health behaviors and biological/non-biological conditions (Figure 3) can contribute to this increased risk of T2D. One of the biggest contributors to the development of T2D is obesity. It had been proposed that the increase in obesity in the United States, has lead to an increase in the prevalence of T2D. Among adults in the United States in 2009-2010, NHB's had the highest prevalence rate of age-adjusted obesity of 49.5%, compared to Mexican Americans (40.4%), and NHW's (34.3%)

(Spanakis & Golden, 2013). Several researchers have investigated the effect BMI has on the development of T2D. Data suggest that adult lifetime risk of diabetes is most strongly affected by BMI greater than 30 kg/m² (Narayan, Boyle, Thompson, Gregg, & Williamson, 2007). Between males and females adolescents, 2007-2008 NHANES data revealed that NHB girls (12-19 yrs.) had the highest prevalence rate of obesity (29.2%), compared to Mexican Americans (17.4%), and NHW girls (14.5%) (Spanakis & Golden, 2013). In comparison, NHB males (12-19 yrs.), and NHW males had a lower prevalence of obesity compared to Mexican American adolescents.

Additionally, another health behavior that has increased the prevalence of T2D is physical inactivity. Physical inactivity has become one of the leading risk factors for death worldwide. Individuals in today's society have become increasingly sedentary due to work, lifestyle practices, and/ or disability from chronic conditions. In 2010, 36.1% of adults (18+) who had diabetes were physically inactive (CDC, 2013). Women are more likely than men to be sedentary. In regards to ethnicity, NHB and Mexican American women are more likely than NHW's to be physical inactive (Black, 2002). According to World Health Organization, 60 to 85% of people in the world—from both developed and developing countries—lead sedentary lifestyles, making it one of the more serious yet insufficiently addressed public health problems of our time (WHO, 2015).

Smoking has also been known to contribute to increased T2D cases. Evidence suggests that Native Americans and Alaska Natives have higher smoking rates compared to NHB's and NHW's adults (Spanakis & Golden, 2013). In 2010, 18.3% of NHB's who had diabetes were smokers, second behind Native American and Alaska Natives.

Smokers are more likely than nonsmokers to develop T2D. Those smokers who have been diagnosed with T2D are more likely to suffer from severe long term complications from this disease. Smoking education and cessation are one of the key components to decrease the risk of T2D.

Table 1: Risk Factors for Type 2 Diabetes	
Family history of diabetes	Impaired glucose tolerance (IGT)
Overweight/Obese	History of gestational diabetes
Unhealthy diet	Poor nutrition during pregnancy
Physical inactivity	Elevated Cholesterol
Increasing age	Smoking
High blood pressure	Sex
Ethnicity	Education
Income	

Source: American Diabetes Association

Disparities

Many disparities exist that make minorities more vulnerable to develop T2D. One of the main contributors that is correlated with the development of T2D in populations of African descent is low socioeconomic status (SES). T2D disproportionately affects people of lower SES based on income, education, or occupation (Chatterjee, Maruthur, & Edelman, 2015). Diabetics tend to earn less, with a lower median household income than non-diabetics (Black, 2002). Chatterjee et al. (2015) examined cross-sectional data and found that adults living in NHB neighborhood's had a higher prevalence of T2D than adults living in predominantly NHW neighborhood's; and adults living in high-poverty

neighborhoods had a higher risk of T2D than adults living in low-poverty neighborhoods. Results also showed NHB adults had a higher prevalence of T2D in high-poverty neighborhoods, regardless of household income status. NHB's living in high-poverty neighborhoods are more likely to engage in unhealthy eating due to the lack of healthy places to eat, and are more likely to be physically inactive due to lack of places to exercise. Low SES has also contributed to access to care issues for healthcare among NHB's.

In the United States, access to care has been a major problem among ethnic minorities. Over the last few years, there has been substantial advancements in healthcare delivery and access to care with the beginning of Obamacare. Studies have shown that differences in access to care and/or insurance coverage before the age of 65 have contributed substantially to sociodemographic differences in health (McWilliams, Meara, Zaslavsky, & Ayanian, 2009). In 2010, approximately 85% of diabetics visited a doctor at least once for management of their disease. In this same year, a higher percentage of NHB (91.5%) diabetics visited a doctor at least once a year, compared to NHW (87.0%) and Hispanics (86.2%). Although there is a higher percentage of NHB's visiting a physician, they are still more likely to suffer from T2D-related complications. Access to adequate health care plays a strong role in controlling diabetes and preventing the development of T2D-related complications (Black, 2002).

Education is another critical factor that affects the burden of T2D. Studies suggest that those with a lower education (less than a high school diploma) are more likely to

suffer from T2D, T2D- related complications and mortality (Dupre, Silberberg, Willis, & Feinglos, 2015). Dupre et al. (2015) investigated the association among education, Hemoglobin A_{1c}, and mortality in adults with diabetes. Results showed mortality risk associated with Hemoglobin A_{1c} ≥7 were significantly greater in lower-educated adults, compared to adults with a higher education (more than a high school diploma) (P<.0001). With this in mind, prevention initiatives should be aimed at more NHB populations with less than a high school diploma.

2.5 T2D Complications

Cardiovascular disease (CVD), retinopathy, renal disease, amputations, neuropathy, and hyperglycemic crisis are some of the complications that result from uncontrolled T2D. CVD is the leading cause of death for people with diabetes, accounting for >65% of all deaths in all populations (Hardy & Bell, 2004). Evidence suggests that hyperglycemia, the hallmark of diabetes, contributes to myocardial damage and atherosclerosis after ischemic events, increasing the risk of most types of CVD (Dokken, 2008 & Garber, 2002). Examining NHIS data, NHB's had a lower percentage (33.0%) of adults compared to NHW's (33.9%) that developed CVD complications from diabetes, however, NHB's are more likely to die from CVD complications from diabetes than NHW's. (CDC, 2014). Notably, diabetes is a major risk factor for CVD, and the impact of CVD complications differ across racial groups.

Diabetic retinopathy is another serious complication that results from T2D. In the United States, diabetes is the leading cause of adult blindness and vision impairment and

affects 25% of all adults, nearly 1.6 million Americans (Hardy & Bell, 2004). One of the greatest predictors of development and progression of retinopathy is the duration of the disease. Research has found that up to 21% of patients with T2D have some degree of retinopathy at the time of first the diagnosis of diabetes (Fong et al., 2003). Harris, Klein, Cowie, Rowland, & Byrd-Holt (1998) compared the risk of diabetic retinopathy in NHBs', Mexican Americans, and NHWs' adults with T2D in the United States. Examination of NHANES data revealed a 46% prevalence in NHB diabetics and 84% of Mexican Americans, compare to NHW's (Harris et al., 1998). It was also found that NHB's had higher rates of moderate to severe retinopathy, compared to their white counterparts.

Diabetic nephropathy is another complication that affects more people in populations of African descent. Nephropathy generally takes place when there is damage to the small vessels in the glomeruli of the kidneys (Blair, 2016). Evidence suggest that nephropathy is the leading cause of end-stage renal disease (ESRD) and is more common among ethnic minorities, smokers, and individuals who have uncontrolled hypertension. According to CDC, new cases of ESRD affected diabetics at a rate of (255.5 per 100,000 population) in 2008. Diabetics with ESRD are more prevalent among older adults between the ages of 65-74 yrs. at a rate of (319.7 per 100,000 population). The incidence rate for ESRD among NHB (males and females) was higher, compared to NHW's and Hispanics ethnic groups (CDC, 2015). Overall, new cases of diabetes-related ESRD was higher among NHB males than any other sex and ethnic group.

Lower extremity amputations due to T2D have been on the decline in recent years but still accounts for approximately 20% of diabetes- related hospitalizations (Hardy & Bell, 2004). Diabetic foot ulcers, neuropathy, and peripheral vascular disease all contribute to the increased prevalence of lower extremity amputations. It is estimated that more than 80% of amputations are caused by diabetic foot ulcers (Hicks et al., 2016). Based on the current literature, NHB's are between 1.7 to 7.6 times more likely to undergo an amputation than NHW's (Lefebvre & Lavery, 2011). The incidence of amputation among NHB's ranged from (5.0 to 6.0 per 10,000 population), compared to (1.2 to 2.5 per 10,000 population) among NHW's (Lefebvre & Lavery, 2011).

Hyperglycemic crisis complications are also responsible for a number of hospitalizations related to TD2M. According to the ADA, Diabetic Ketoacidosis (DKA) is a serious life-threatening complication that occurs when there isn't enough insulin in the body and is usually typically in Type 1 diabetics, but can occur in T2D. The average rate of discharge for DKA increased to about 140,000 in 2009 the highest since 1988 (CDC, 2015). In 2009, DKA affected NHB diabetics at a rate of (22.7 per 1,000 population) vs. NHW diabetics (14.3 per 1,000 population).

A study that examined the trends in incidence of some T2D-related complications previously discussed was by Gregg et al. (2014). The researchers examined NHIS 1990-2010 data to compare the incidence of lower-extremity amputations, ESRD, acute myocardial infarction (MI), stroke, and death from a hyperglycemic crisis (Diabetic Ketoacidosis and Hyperosmolar hyperglycemic state). Results showed the rates of all five major complications declined during this time period. Acute MI decline by (95.6 fewer

cases per 10,000), stroke by (58.9 fewer cases per 10,000) lower- extremity amputation by (30.0 fewer cases per 10,000), ESRD by (7.9 fewer cases per 10,000), and hyperglycemic crisis by (2.7 fewer cases per 10,000) (Gregg et al., 2014). Even though there has been a decline in incidence cases for most major T2D-related complications, prevention is still important to preserve quality of life.

2.5 Mortality of T2D

In 2014, the mortality rate for diabetes was (24.0 per 100,000 population) (CDC, 2014). In 2013, NHB's were twice as likely than NHW's to die from diabetes (CDC, 2014). Age-adjusted death rates for diabetes in NHB males were higher at (45.1 per 100,000) vs. NHW males (23.1 per 100,000 population). NHB females also had a higher mortality rate at (35.2 per 100,000) vs. NHW females (14.9 per 100,000 population). According to the American Diabetes Association (2014), diabetes was listed as the underlying cause of death on approximately 69,000 death certificates in the United States. It has also been listed as a contributing factor for the cause of death on approximately 234,000 death certificates.

2.6 National Diabetes Prevention Program

A national initiative helping to reduce the growing epidemic of T2D is the National Diabetes Prevention Program (DPP). In 2010, Congress authorized CDC to establish and lead the National DPP in an effort to disseminate prevention strategies and promote healthy lifestyles across the country. According to CDC, this program brings together public and private sectors to prevent or delay diabetes in the United States. Its foundation is a results-driven partnership that includes community-based organizations,

health insurers, employers, healthcare systems, academia, government agencies and businesses that focus on wellness (Albright & Gregg, 2013). This program provides participants with a curriculum to prevent diabetes, social support for over a year and a trained lifestyle coach. Health professionals and community workers are trained to teach participants to make lasting lifestyle changes which include: eating healthier, adding physical activity to their daily routine, and how to improve coping skills, and other ways to delay and prevent prediabetes and T2D. Randomized controlled trials (RCTs) have provided evidence that suggest lifestyle interventions help to decrease the risk of developing diabetes (Tuomilehto et al., 2001 & Lindström et al., 2006)). It is likely that without intervention, 15-30% of people with prediabetes will develop T2D within five years (CDC, 2016). A highly successful lifestyle intervention was administered 1,079 participants, which included 45% of ethnic minorities and resulted in a 58% decrease in the incidence rate of diabetes (Diabetes Prevention Program Research Group, 2002). The national DPP is an important initiative that has been shown to help decrease the incidence of prediabetes and T2D in all ethnic minorities.

Benefits of the National DPP in African Descent Populations

The national DPP initiative can benefit all ethnic groups especially populations of African descent. A study that carried out a similar protocol to the national DPP initiative in five African American churches in Georgia was by Boltri, Davis-Smith, Okosun, Paul Seale, & Foster (2011). Researchers found a decrease in weight, fasting glucose and BMI from participants. The mean fasting glucose reduced from 108.1 to 1.01mg/dl ($P=.037$)

for participants at the end of the intervention (Boltri et al., 2011). The mean weight decreased by 1.7 kg and there was also reduction in BMI from a mean of 33.2 to 32.6 (Boltri et al., 2011). Despite a small number of 37 subjects in the study, significant reductions were seen in weight and fasting blood glucose in African American participants.

The national DPP initiative can benefit NHB populations by providing education for healthier eating habits. Research has found that NHB's consume diets with a higher glycemic index and a higher glycemic load than NHW's (Chatterjee et al., 2015). NHB's also have lower rates of achieving adequate intake of fruits and vegetables, as do people with lower income (Chatterjee et al., 2015). Findings from animals and human studies suggest that foods high in glycemic index (carbohydrates) is associated with insulin resistance and foods with low-glycemic index can help with glycemic control. Educating and teaching African descent populations how to make healthier food choices is a great benefit of the national DPP initiative. Ultimately, this program will aid in the prevention of T2D and improve health outcomes.

Chapter III

Gaps in the Literature

Existing literature suggests that lifestyle interventions are effective at preventing and decreasing the risk of T2D. Researchers are still studying if lifestyle intervention programs will be effective in all NHB communities and how to incorporate these programs in other populations at high risk for developing the disease (children and adolescents). It is also not yet known what percentage of African descent populations utilize any type of intervention program in their community. If this is known, government funded agencies can begin to add more prevention programs in communities like long-term care facilities, fitness centers, schools/universities, and workplaces to target those individuals who have prediabetes and at risk for developing T2D.

Studies are necessary to understand how to implement an intervention program that specifically helps the parents of children who are at risk for prediabetes and/or T2D, and how much of a reduction the intervention will have on their children. Generally, diagnosis in this population is during a checkup and children and adolescents are unaware that they have T2D (Reinehr, 2013). This research should be geared towards ways to effectively screen for T2D in this population.

Research is also needed to unveil differences in self-care management between Type 1 and T2D in children and adolescent by ethnicity. This is specifically important because children and adolescent with T2D will have to incorporate behavioral interventions to everyday life. Another reason to examine these differences is because these individuals cannot utilize the same self-care practices that Type 1 diabetics use for

managing their disease. Furthermore, NHB and American Indian/Alaska Native children and adolescents can benefit from research since T2D prevails among these groups in adulthood.

Translating diabetes prevention initiatives into practice still remains a challenge throughout many NHB communities. To improve outcomes and to prevent the burden of T2D in NHB's, research should be geared towards integrating these programs in other communities outside of African American churches to target a bigger proportion of NHB populations.

Additionally, more clinical research would assess the cause of hospital admission and/or readmission for complications of T2D. In 2009, the average hospital stay for adults with diagnosed diabetes was approximately five days, and approximately 688,000 hospital discharges occurred in the same year (CDC, 2013). The researchers should examine the cause of an increased length of stay in the hospital for diabetics. The researchers should investigate some potential explanations of rising healthcare cost for each complication of T2D. Conducting retrospective and prospective studies in clinical practice would be beneficial for all ethnic minorities, especially NHBs. Further clinical research on this topic can also benefit children and adolescents who are affected by complications of T2D. Advantages of more clinical research can help to reduce the economic burden of this disease. It can also help with implementing prevention strategies to target more expensive complications of T2D among NHB populations.

Promising findings from the Literature

There is an abundance of research that identifies the burden T2D has in the United States. We have comprehensive amounts of knowledge on the racial/ ethnic differences that exist for T2D and T2D-related complications for African descent adults in comparison to other ethnic minorities. It is also known that lifestyle interventions are a successful way to prevent and reduce the risk of T2D. With this knowledge, we can begin to incorporate these strategies into the community and determine how we can effectively target additional NHB populations worldwide.

Chapter IV

Discussion

To summarize, populations of African descent are the second highest group to be diagnosed with DM, and millions are affected by this disease yearly. NHB's have a higher increase in prevalence, incidence, and mortality of T2D compared to NHW populations. In the last few decades, T2D has affected mainly older adults 65-74 years, but within the past few years there has been increase in T2D cases in children and adolescents. Evidence suggests that this surge in T2D cases coincides with the growing epidemic in childhood obesity. NHB youth also have a higher incidence of T2D, compared to NHW's. Healthcare cost has risen due to frequent hospitalizations and disability that results from this disease.

There is a multitude of risk factors that make NHBs at risk for developing T2D. Some of this factors include obesity, low SES, and diets high in glycemic load, and more sedentary lifestyles. NHB's are more likely to be physically inactive, and to live in high poverty neighborhoods than NHW's. NHBs are at a greater disadvantage for T2D related complications and mortality, compared to NHW's and Hispanics. Moreover, research has shown that changes in lifestyle behaviors, encouragement from social support groups, education/lectures from trained personnel can help to reduce the incidence of prediabetes and T2D. These interventions can also be geared toward individuals with diagnosed T2D to manage their disease and improve quality of life.

Conclusion

In conclusion, the epidemic of T2D has expanded across the globe. The majority of findings from this review suggest that T2D is a significant public problem in populations of African descent. Ethnic and racial differences exist in morbidity and mortality for this disease. Primarily, addressing and eliminating disparities among NHB groups can contribute to better health outcomes for this population. It has become increasingly clear that NHB individuals should implement lifestyle change interventions to prevent and decrease the risk of T2D. Prevention initiatives like the National DPP should be introduced to more ethnic minorities. Without these lifestyle interventions, African descent populations will continue to endure the burden of this disease.

References

- Albright, A. L., & Gregg, E. W. (2013). Preventing Type 2 Diabetes in Communities Across the U.S: The National Diabetes Prevention Program. *American Journal of Preventive Medicine*, 44(4 0 4), S346–S351.
<https://doi.org/10.1016/j.amepre.2012.12.009>
- Black, S. A. (2002). Diabetes, Diversity, and Disparity: What Do We Do With the Evidence? *American Journal of Public Health*, 92(4), 543–548.
- Blair, M. (2016). Diabetes Mellitus Review. *Urologic Nursing*, 36(1), 27–36.
<https://doi.org/10.7257/1053-816X.2016.36.1.27>
- Boltri, J. M., Davis-Smith, M., Okosun, I. S., Paul Seale, J., & Foster, B. (2011). Original Communication: Translation of the National Institutes of Health Diabetes Prevention Program in African American Churches. *Journal of the National Medical Association*, 103, 194–202.
- Brancati FL, Kao WHL, Folsom AR, Watson RL, Szklo M. Incident Type 2 Diabetes Mellitus in African American and White Adults The Atherosclerosis Risk in Communities Study. *JAMA*. 2000;283(17):2253-2259.
[doi:10.1001/jama.283.17.2253](https://doi.org/10.1001/jama.283.17.2253)
- Centers for Disease Control and Prevention. Diabetes Report Card 2014. Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services; 2015.
- Centers for Disease Control and Prevention. National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014. Atlanta, GA: US Department of Health and Human Services; 2014. Available from:
<http://www.cdc.gov/diabetes/data/statistics/2014StatisticsReport.html>
- Centers for Disease Control and Prevention (CDC), National Center for Health Statistics, Division of Health Interview Statistics, data from the National Health Interview Survey. Data computed by personnel in the CDC's Division of Diabetes

- Translation, National Center for Chronic Disease Prevention and Health Promotion.
- Centers for Disease Control and Prevention (CDC), National Center for Health Statistics, Division of Health Care Statistics, data from the National Hospital Discharge Survey
- Chatterjee, R., Maruthur, N. M., & Edelman, D. (2015). Novel Risk Factors for Type 2 Diabetes in African-Americans. *Current Diabetes Reports*, 15(12), 103. <https://doi.org/10.1007/s11892-015-0675-5>
- Data computed by personnel in CDC's Division of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion.
- Dabelea, D., Mayer-Davis, E. J., Saydah, S., Imperatore, G., Linder, B., Divers, J., ... Hamman, R. F. (2014). Prevalence of Type 1 and Type 2 Diabetes Among Children and Adolescents From 2001 to 2009. *JAMA*, 311(17), 1778–1786. <https://doi.org/10.1001/jama.2014.3201>
- Diabetes Prevention Program Research Group. (2002). REDUCTION IN THE INCIDENCE OF TYPE 2 DIABETES WITH LIFESTYLE INTERVENTION OR METFORMIN. *The New England Journal of Medicine*, 346(6), 393–403. <https://doi.org/10.1056/NEJMoa012512>
- Diagnosis and Classification of Diabetes Mellitus. (2003). *Diabetes Care*, 27(suppl 1), s5. <https://doi.org/10.2337/diacare.27.2007.S5>
- Dokken, B. B. (2008). The Pathophysiology of Cardiovascular Disease and Diabetes: Beyond Blood Pressure and Lipids. *Diabetes Spectrum*, 21(3), 160. <https://doi.org/10.2337/diaspect.21.3.160>
- Dupre, M. E., Silberberg, M., Willis, J. M., & Feinglos, M. N. (2015). Education, glucose control, and mortality risks among U.S. older adults with diabetes. *Diabetes Research and Clinical Practice*, 107, 392–399.
- Ferdinand, K. C., & Nasser, S. A. (2015). Racial/ethnic disparities in prevalence and care of patients with type 2 diabetes mellitus. *Current Medical Research and Opinion*, 31(5), 913–923. <https://doi.org/10.1185/03007995.2015.1029894>

- Fong, D. S., Aiello, L., Gardner, T. W., King, G. L., Blankenship, G., Cavallerano, J. D., ... Klein, R. (2003). Retinopathy in Diabetes. *Diabetes Care*, 27(suppl 1), s84.
<https://doi.org/10.2337/diacare.27.2007.S84>
- Garber, A. J. (2002). Attenuating CV risk factors in patients with diabetes: clinical evidence to clinical practice. *Diabetes, Obesity and Metabolism*, 4, 5–12.
<https://doi.org/10.1046/j.1462-8902.2001.00038.x>
- Geiss, L. S., Jing Wang, Cheng, Y. J., Thompson, T. J., Barker, L., Yanfeng Li, ... Gregg, E. W. (2014). Prevalence and Incidence Trends for Diagnosed Diabetes Among Adults Aged 20 to 79 Years, United States, 1980-2012. *JAMA: Journal of the American Medical Association*, 312(12), 1218–1226.
- Gregg, E. W., Li, Y., Wang, J., Rios Burrows, N., Ali, M. K., Rolka, D., ... Geiss, L. (2014). Changes in Diabetes-Related Complications in the United States, 1990–2010. *New England Journal of Medicine*, 370(16), 1514–1523.
<https://doi.org/10.1056/NEJMoa1310799>
- Hardy, L. R., & Bell, R. A. (2004). An Epidemiological Perspective on Type 2 Diabetes Among Adult Men. *Diabetes Spectrum*, 17(4), 208.
<https://doi.org/10.2337/diaspect.17.4.208>
- Harris, M. I., Klein, R., Cowie, C. C., Rowland, M., & Byrd-Holt, D. D. (1998). Is the Risk of Diabetic Retinopathy Greater in Non-Hispanic Blacks and Mexican Americans Than in Non-Hispanic Whites With Type 2 Diabetes?: A U.S. population study. *Diabetes Care*, 21(8), 1230.
<https://doi.org/10.2337/diacare.21.8.1230>
- Hicks, C. W., Selvarajah, S., Mathioudakis, N., Sherman, R. L., Hines, K. F., Black, I., James H., & Abularrage, C. J. (2016). Clinical Research: Burden of Infected Diabetic Foot Ulcers on Hospital Admissions and Costs. *Annals of Vascular Surgery*, 33, 149–158.
- Information came from the Center for Disease Control and Prevention's Behavioral Risk Factor Surveillance System. Data computed by personnel of the CDC's Division of Diabetes Translation.

- Jaacks, L. M., Siegel, K. R., Gujral, U. P., & Narayan, K. M. V. (2016). Type 2 diabetes: A 21st century epidemic. *Diabetes Prevention*, 30(3), 331–343.
<https://doi.org/10.1016/j.beem.2016.05.003>
- Lefebvre, K. M., & Lavery, L. A. (2011). Disparities in Amputations in Minorities. *Clinical Orthopaedics and Related Research*, 469(7), 1941–1950.
<https://doi.org/10.1007/s11999-011-1842-x>
- Lindström, J., Ilanne-Parikka, P., Peltonen, M., Aunola, S., Eriksson, J. G., Hemiö, K., ... Tuomilehto, J. (n.d.). Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: follow-up of the Finnish Diabetes Prevention Study. *The Lancet*, 368(9548), 1673–1679. [https://doi.org/10.1016/S0140-6736\(06\)69701-8](https://doi.org/10.1016/S0140-6736(06)69701-8)
- Mayer-Davis, E. J., Beyer, J., Bell, R. A., Dabelea, D., D'Agostino, R., Imperatore, G., ... for the SEARCH for Diabetes in Youth Study Group. (2009). Diabetes in African American Youth: Prevalence, incidence, and clinical characteristics: the SEARCH for Diabetes in Youth Study. *Diabetes Care*, 32(Suppl 2), S112–S122.
<https://doi.org/10.2337/dc09-S203>
- McBean, A. M., Li, S., Gilbertson, D. T., & Collins, A. J. (2004). Differences in Diabetes Prevalence, Incidence, and Mortality Among the Elderly of Four Racial/Ethnic Groups: Whites, Blacks, Hispanics, and Asians. *Diabetes Care*, 27(10), 2317.
<https://doi.org/10.2337/diacare.27.10.2317>
- McWilliams, J. M., Meara, E., Zaslavsky, A. M., & Ayanian, J. Z. (2009). Differences in control of cardiovascular disease and diabetes by race, ethnicity, and education: U.S. trends from 1999 to 2006 and effects of medicare coverage. *Annals Of Internal Medicine*, 150(8), 505–515.
- Narayan, K. M. V., Boyle, J. P., Thompson, T. J., Gregg, E. W., & Williamson, D. F. (2007). Effect of BMI on Lifetime Risk for Diabetes in the U.S. *Diabetes Care*, 30(6), 1562. <https://doi.org/10.2337/dc06-2544>
- Ng, M. C. Y. (2015). Genetics of Type 2 Diabetes in African Americans. *Current Diabetes Reports*, 15(10), 74. <https://doi.org/10.1007/s11892-015-0651-0>

- Reinehr, T. (2013). Type 2 diabetes mellitus in children and adolescents. *World Journal of Diabetes*, 4(6), 270–281. <https://doi.org/10.4239/wjd.v4.i6.270>
- Shai, I., Jiang, R., Manson, J. E., Stampfer, M. J., Willett, W. C., Colditz, G. A., & Hu, F. B. (2006). Ethnicity, Obesity, and Risk of Type 2 Diabetes in Women. *Diabetes Care*, 29(7), 1585. <https://doi.org/10.2337/dc06-0057>
- Spanakis, E. K., & Golden, S. H. (2013). Race/Ethnic Difference in Diabetes and Diabetic Complications. *Current Diabetes Reports*, 13(6), 10.1007/s11892-013-0421-9. <https://doi.org/10.1007/s11892-013-0421-9>
- Tuomilehto, J., Lindström, J., Eriksson, J. G., Valle, T. T., Hämäläinen, H., Ilanne-Parikka, P., ... Uusitupa, M. (2001). Prevention of Type 2 Diabetes Mellitus by Changes in Lifestyle among Subjects with Impaired Glucose Tolerance. *New England Journal of Medicine*, 344(18), 1343–1350. <https://doi.org/10.1056/NEJM200105033441801>
- What Is the National DPP? (2016). Retrieved November 29, 2016, from <http://www.cdc.gov/diabetes/prevention/about/index.html>
- WHO | Physical inactivity a leading cause of disease and disability, warns WHO. (n.d.). Retrieved November 26, 2016, from <http://www.who.int/mediacentre/news/releases/release23/en/>