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The Unexamined Link: Type II Diabetes and Poverty

Washington and Lee University

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I. Introduction

Imagine spending one out of every five days in a hospital ER, trapped in poverty in your mid-forties by a disease called type II diabetes. With a lack of education and quality primary care service, you repeatedly visit the hospital because your blood-glucose levels are constantly fluctuating, the wound on your foot won't heal, your vision is fading, and you have chest pain, which you assume is due to your obesity. For some, such as Frank Hendricks, this is a daunting reality that may never be escaped. Working in the service industry for many years, Frank attempted to make a good living as an auto detailer and cook in Camden, New Jersey. However, such factors as poor health habits, a lack of food access, minimal physical activity, and low income, contributed to Frank gaining weight, developing diabetes, and losing economic opportunity. In his mid-forties, Frank weighed 560 pounds while also having severe congestive heart failure, chronic asthma, and uncontrolled diabetes. Over one three year period, he spent more time in the hospital than out, finding himself uninsured, unreliably employed, and living in a welfare motel (Gawande). Although there were personal choices that led to Frank's eventual health and economic conditions, these outcomes, such as type II diabetes, were not completely within his control.

From the early 1990s to 2005, diabetes has increased worldwide from about 30 million to 230 million. As of 2011, there are currently about 25.8 million diabetics in the U.S., almost 10% of the population, and consequently diabetes is considered to be the nation's fastest growing health problem (Eriksen 551). The impact is largely on those of low socioeconomic status (SES), who have less access to resources and healthcare.

Unfortunately, the current papers in this field rarely examine the link between type II diabetes and poverty, and instead focus on biology, behavior, psychology, and culture to explain the causes of the disease and its high prevalence (Chaufan 74). This paper attempts to help fill that gap in the literature. In Section II, it describes the consequences of type II diabetes on individuals and families, as well as the impact on society as a whole. In Section III, it examines the causes of type II diabetes, particularly with respect to the poor, and in Section IV it identifies the barriers to better outcomes, including food insecurity and access, health illiteracy, and lack of access to healthcare. Finally, in Section V, it proposes potential solutions, including diet and exercise, improved therapy delivery, and health insurance reform.

II. The Problem

a. The Cost to Individuals and Their Families

Living with diabetes, unlike some other diseases, requires self-management and monitoring. Every day, diabetics have to try to maintain their blood glucose levels at or near normal levels. This requires patients to prick their finger, place their blood on a test strip, and have their blood glucose levels read by an electronic monitor multiple times per day, before and after every meal. Also, type II diabetics most often have more than one oral diabetes medication, some of which increase the production of insulin, lower glucose release into the blood stream, and increase insulin sensitivity. Furthermore, more than half of diabetics have to take insulin, further complicating the daily regimen (Rubin 459). Understandably, they are also advised to eat carefully and be physically active, but this is often a challenge for the newly-diagnosed diabetic, typically an adult of around 40 years of age (Rubin 458).

This condition is most challenging for those who take insulin or oral medicine that increases insulin production because of the risk of hypoglycemia, i.e., blood sugar falling below

normal blood glucose levels. Mild hypoglycemia results in shakiness, sweating, and rapid heart beating. More severe occurrences affect brain function, with symptoms including headache, confusion, and even unconsciousness. These symptoms can be treated through either ingesting glucose-rich foods like candy and orange juice or the injection of medications, like glucagon. Although this seems relatively simple, hypoglycemic people are often misperceived as being intoxicated, causing others to not take appropriate action. If the condition goes untreated, one can lose consciousness, requiring emergency help (Rubin 459). All of these daily life changes, not to mention the resulting future health risks, pose major life stresses to diabetics and especially those of low SES. These life stresses require considerable physical, emotional, and psychological accommodation and coping.

The most common consequences of type II diabetes diagnosis are anxiety, depression, social burden, and diabetes complications (Whitebird 2). A study by Li et al (2006) utilized a population sample from the 2006 Behavioral Risk Factor Surveillance System (BRFSS) to estimate the prevalence of anxiety diagnosis in adults with and without diabetes in the U.S. From their large population-based sample, they determined that people with diabetes had a 20% higher life time rate of anxiety diagnosis. Interestingly, they also found that Hispanics had the highest diabetes-anxiety association, which is concerning considering that one-half of the Hispanic children born in the year 2000 are expected to develop diabetes, compared to an expected one-third of the non-Hispanic population. In addition, they found that those diagnosed with a lifetime diagnosis of depression or major depression had a fifty-percent chance of a having a lifetime diagnosis of anxiety, showing a strong correlation between the two mental disorders (Li 880).

It is estimated that one out of every four diabetics are affected by depression, which is the three times the population average (Whitebird 2). Some studies even suggest that 40% of people with diabetes have increased levels of symptomatology despite not being clinically depressed. Despite these alarmingly high rates, diabetics are underdiagnosed with depression, with only a third being properly diagnosed and treated (Rubin 460). These mental health statistics can only be compounded by the already strong correlation between SES and mental disorders. A study by Sturm and Gresenz (2002) found 18% of those in poorest fifth of the United States are diagnosed with a depressive disorder or anxiety order, almost three times the prevalence of these diagnosis in the highest income fifth. Such health inequality severely limits the daily functioning of people at the bottom of the demographic ladder, making it even more difficult for them to improve their economic status.

Effective self-management of diabetes is made more difficult by the social stigma of the disease. This stigma can result in a reluctance to engage in self-management, a condition referred to by diabetes educators as psychological insulin resistance (PIR). Initiating insulin therapy is one of the most difficult and challenging decisions that a diabetic has to make. It has been reported that 73% of type II diabetics are resistant to the idea of insulin therapy at the beginning of a diabetes education program (Brod 24). This is due to a lack of understanding of insulin therapy, an absence of the skills needed for insulin therapy, fear of injections, and a lack of quality information. Although 50% of diabetics utilize insulin, PIR is thought to be partially activated by patients' fear of public misunderstanding about the treatment and also the nature of diabetes as a chronic disease. For example, since vials and syringes are commonly linked with drug addiction or severe illness, patients fear that injecting themselves in public may result in social embarrassment and rejection. Some also believe they have to conceal their use of insulin

because it may make others uncomfortable. Consequently, they feel that it may affect their relationships with their friends and family who may not understand the reasons for the treatment (Brod 26).

PIR is also thought to be the result of a sense of personal failure or self-blame. Such symptoms are often the response of those who think that they have to undergo insulin treatment because they were not able to manage the disease on their own through diet, exercise, and oral medication. In addition, insulin is sometimes perceived to be a punishment for poor self-care, which results in anger and resistance from patients. Other common attitudes include the fear that they are now dependent like a drug addict, or that they aren't intelligent enough to deal with the daily routine of insulin therapy. Other attitudinal barriers include technical concerns, painfulness, fear of inflicting self-harm, and needle phobia (Brod 25). Although PIR is an understandable response to diabetes treatment methods, it can often have detrimental effects causing long periods of poor blood glucose control. If poor treatment occurs over a long period of time, diabetics are put at a much higher risk for microvascular and macrovascular complications (Brod 26).

When properly managed, diabetes is a very controllable disease that eventually becomes a part of one's daily routine. However, when diabetics neglect their care, particularly as they become older, the risk of costly complications greatly increases. The main complications of diabetes can be divided into two categories: microvascular complications, including neuropathy, retinopathy, and nephropathy (kidney disease); and macrovascular complications, which can result in stroke, coronary artery disease, and peripheral vascular disease. Currently, diabetic retinopathy is the leading cause of blindness in working-aged persons in the U.S. (Lloyd 392). In addition, about 15% of diabetics have foot problems due to blood vessel injury, which are the

leading causes of diabetic hospitalization. Diabetes is also responsible for more than half of the 88,000 non-injury amputations each year, 85% of which started with foot ulcers (NY Times 2011). The American Diabetic Association estimates that 75% to 80% of adult diabetic patients will die due to macrovascular complications (Lloyd 392). Heart attacks and strokes account for 60% and 25% respectively of deaths in patients with diabetes. This is due to type II diabetes increasing the effect of atherosclerosis, which is the hardening of the arteries. Diabetes is often connected with low HDL (good cholesterol) and high triglycerides, both of which are known to lead to coronary artery disease, heart attack, or stroke (NY Times 2011). All of these complications mean that proper management of diabetes is essential in order to avoid the high medical costs that will otherwise result. This is especially a concern to those of low SES, who are not only income disadvantaged but also more likely to lack access to proper healthcare.

So far, according to the World Health Organization and other sources, few studies have directly addressed how type II diabetes can contribute to poverty. Beyond the cost of diabetic therapy itself, diabetics also have a one in three chance of developing a second serious health problem, and 10% chance of developing a third health problem. On average, the cost of dealing with these complications is around \$10,000 per year. Even more concerning, according to the National Health Survey, 40% of adults with diabetes have a family income of less than \$35,000 per year (Manning 2007). Therefore, about 12 million diabetics are currently impoverished, or at a risk of poverty due to type II diabetes.

When considering individual consequences, Amartya Sen explains that “basic capability” is what every person needs to participate in society. Sen recognizes that there is a variation in capacities among people, sometimes causing a problem for people to convert income into what he calls “effective freedom,” which is the ability to function productively (Sen). For example,

John Brown, a healthy recent college graduate, and Frank Hendricks have obviously different capacities to function. In addition, Frank Hendricks has to pay more of his income for medical expenses in order to function, thereby further reducing his basic capability.

Consequently, type II diabetics require extra assistance in order to attain full functioning; otherwise, the economic burden is beyond what families of modest means can bear. In addition to limiting the earning capacity of the diagnosed adult, the spouse has less time and energy to produce income because he or she must assume a greater share of responsibilities for the rest of the family in times of need.

b. The Cost to Society as a Whole

A 2007 American Diabetes Association Study estimated the total cost of diabetes to be \$174 billion, of which \$116 billion was for excess medical expenditures and \$58 billion was attributable to reduced national productivity (ADA 596). With such high prevalence, diabetes places a huge strain on our healthcare system, accounting for 22% of the 186 million hospital inpatient days and one in four nursing facility days (ADA 605). These numbers are startling considering only a little less than 10% of the population is diabetic. It is of no surprise then that \$1 of every \$5 health care dollars is utilized to treat diabetics (ADA 606). In addition to the burdens on the health care system itself, diabetics typically spend over twice as much for medical care as those of the same population without diabetes (\$11,744 vs. \$5,095 per year) (ADA 608). These high expenditures equal more than 50% of the current U.S. poverty threshold for a family of four, \$23,050, highlighting the potentially crippling effects of this disease on low SES families.

Beyond health costs, there are also many indirect costs that further affect the well-being of the impoverished. Some of the main indirect costs include: diabetes-attributed absenteeism

from work, reduced productivity at work, disability-induced unemployment, and premature mortality. The national cost of absenteeism was \$2.6 billion in 2007; however, the absenteeism cost per person with diabetes was \$493. Although this seems like a small amount, absenteeism has much higher implications for those of low SES due to low job security. The larger cost is the reduced productivity of those attending work while sick. This most affects those of high labor participation and high daily earners, males between the ages of 35-44, accounting for a loss of \$2,883 per person with diabetes. Also, of the 16 million people receiving unemployment SSI payments for disability, over a million had diabetes, leading to 107 million lost work days at a national cost of \$7.9 billion (ADA 608). In addition, it was estimated that 284,000 premature mortalities were due to diabetes, valued as a productivity loss of \$26.9 billion (ADA 609).

Overall, diabetes not only takes a terrible toll on individuals and families, it also places a heavy economic burden on society as a whole.

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III. Causes of the Problem

a. Biological

Type II diabetes develops when the body fails to produce enough insulin due to pancreatic malfunction or the cells are unresponsive to insulin. Insulin allows the body to uptake glucose from the blood into its cells, providing energy for biological processes. However, if blood glucose levels are left unchecked, it can lead to serious illness or disability, including blindness, kidney failure, foot amputations, nervous system disease, and early death (Chaufan 78). The most common explanation for the original insulin resistance is referred to as “genetic disposition,” which makes some populations more susceptible to the disease when engaging in sedentary life styles and high calories diets. Some pre-existing risk factors for type II diabetes includes women with polycystic ovarian syndrome, older patients who tend to develop

hyperglycemia, individuals with decreased glucose tolerance, and first degree relatives of type II diabetics (Kahn 844). Although these risk factors are linked to genetics, development of the disease depends also on environmental factors. For example, obesity results in fatty, adipose tissue releasing increased amounts of non-esterified fatty acids, glycerol, hormones, and pro-inflammatory cytokines, which when combined with other factors such as malfunctioning pancreatic β -cells, cells that release insulin, can lead to insulin resistance. (Kahn 840)

Although obesity results in higher insulin resistance risk, most obese individuals do not develop hyperglycemia, an over saturation of sugar in red blood cells, a key factor in diabetes diagnosis. In healthy individuals, the pancreatic β -cells properly release insulin when there are heightened levels of sugar, allowing the body to maintain its blood glucose equilibrium between 80 to 120 mg/dl. With obese, type II diabetics, β -cell dysfunction results in the inability for the body to release appropriate amounts of insulin, leading to heightened blood glucose levels. One of the problems with this disease is that β -cell dysfunction can exist without individuals being diagnosed with impaired glucose tolerance (Kahn 844). As a result, when individuals gain weight as they get older and their metabolism slows down, the body is unable to overcome the β -cell dysfunction with increased blood glucose levels, leading to hyperglycemia and therefore type II diabetes. Consequently, it is difficult to know whether the onset of diabetes is due to either lifestyle factors or genetic susceptibility alone. Most likely both of these factors contribute to onset, and this is why we must investigate the environmental factors that have a high correlation with diabetes rates.

b. Obesity

One of the common environmental factors that link type II diabetes and obesity is SES. In regards to linking obesity and SES, a study of Alameda County residents found that those best

educated faced a 9% rate of obesity while those of the low education levels had a 15% obesity rate. Between 1965 and 1999, participants in the study gained significant weight, with those of the lowest SES gaining the most. These data are especially ominous because obesity is one of the strongest predictors of type II diabetes. Consequently, the same inverse relationship is seen with the highest rate of diabetes corresponding with those of the lowest SES. Participants who had less than nine years of education were three times more likely to have diabetes than those with a GED. For the low, moderate, and high levels of education, the self-reported diabetes rates were correspondingly 4.5%, 2.5%, and 1.6%. In addition, throughout the 34 years of the study 5.1% of the participants developed diabetes, with the lowest SES bearing an 80% greater risk of developing the disease in comparison to the highest educated demographic (Everson 893).

As portrayed in the study, people today are consuming more calories and fat while exercising less, leading to increased calorie storage in the form of fat. Over the long term, this trend has been linked not only with obesity but also with reductions in insulin release.

Consequently, if β -cell function is already abnormal due to genetic disposition, individuals are at even higher risk for developing diabetes. Interestingly, improper proportions of dietary fat and carbohydrates have been noted to affect both insulin sensitivity and insulin within three days of a change in nutrient consumption balance (Kahn 844). This poses a significant challenge to those of lower SES because oftentimes they have irregular eating habits due to changing income levels, food accessibility, and varying work schedules.

c. Poor Diet and Lack of Physical Activity

One of the demographics of most concern is children, and the link between SES and the diabetes risk levels. Recently, type II diabetes has become the most common chronic disease afflicting school-aged children, with one in every 400-500 people under the age of 20 having it

(Eriksen 549). Children of low SES tend to be at higher risk because of such factors as physical inactivity and poor eating habits (Maty 1491). In a study of an Anaheim, California neighborhood, Erikson and Manke attempted to determine the high prevalence of these risk factors through investigating the “social and cultural underpinnings” of children at risk of developing type II diabetes (Eriksen 549). They found that shifting food cultures and recreational opportunities were of particular concern in impoverished, densely populated urban areas (Erikson 557). The quality of food access in Anaheim is typical of this shift, with 61% of retail food outlets being fast-food restaurants, 12% supermarkets, 5% produce stores, and no farmers’ markets. Consequently children are drawn into the consumer-driven, commercial food world which maximizes caloric intake and efficient availability. Fast-food restaurants are one of the reasons that Americans spend the lowest proportion of disposable income on food, around 12% (Drewnowski 36).

These food access results parallel with other recent studies that have shown that low-income, mainly African-American neighborhoods have fewer supermarkets, requiring extensive traveling, and higher concentrations of fast food restaurants (Baker 2). Such areas with limited access to quality, affordable, and nutritious food have been labeled as food deserts (Rutten 407). These areas are especially problematic because they strand impoverished individuals with no options, resulting in unhealthy, high caloric diets. Surprisingly, food deserts are not limited to rural areas, but rather have a high prevalence in urban neighborhoods, such as St. Louis, MO, Detroit, MI, and Camden, NJ.

In a study by Baker et al. of St. Louis, they examined the link between race, poverty, and access to quality food options. In order to assess this relationship, they performed audits of community supermarkets and fast food restaurants, assessing the location and availability of food

options with regard to the dietary guidelines set by the USDA. With 81 supermarkets in the study area, they calculated that the area had a rate of 8.9 supermarkets per 100,000 residents. Interestingly, they found there were 23 high quality supermarkets in the primarily white, wealthier southern region of the city, where the population size had predicted 9.7. On the other hand, zero high quality options existed in the primarily African-American, lower income northeastern region of the study area, where nine were expected (Baker 6). In addition, they found that the food quality was lower in primarily African American areas (regardless of income) than in the primarily white, higher-income communities. Although people don't necessarily eat where they live, the study found that 50% of residents did not have a vehicle, which means those of lower SES are less likely to access other food outlet options (Baker 8).

Unfortunately, due to advancements in agriculture and food processing, energy-dense foods have become cheaper and more accessible, leading to higher consumption amongst the lowest SES. A survey of Seattle super markets in 2006 found that the energy cost of fresh produce was 10 times as much as vegetable oils and sugars. Consequently, the energy cost difference between healthy and unhealthy foods was several thousand percent. This is important when one considers that a low-income family allocates \$100 dollars as their food budget for four people per week, which is less than \$4 dollars a day per person. A diet this cheap can only consist of highly refined grains, added sugars, and added fats. Such data explain why healthier diets cost more, and are more often consumed by affluent families (Drewnowski 37). In addition, it indicates that unhealthy eating habits are not only due to a lack of education or laziness, but may be due to socioeconomic environmental factors.

In addition to diet, a lack of physical activity further exacerbates the problem. Eriksen and Manke found that despite the trends, parents and children, regardless of race, recognized the

importance of children remaining active and exercising regularly. However, since low income families tend to live in apartment complexes, outdoor activity space was severely limited. In comparison to its wealthier, neighboring city of Irvine, Anaheim has a total of 44 parks, consisting of 649 acres, while Irvine has 54 parks consisting of 16,000 acres (Eriksen 560). In addition to this limitation, children interviewed as part of the study consistently recognized that their neighborhoods are not safe. This view was accurate considering that Anaheim in 2007 had the third highest violent crime rate in Orange County and the highest rates of property crime. As a result, the majority of reported activities took place indoors, consisting of video games, working on the computer, and watching T.V. (Eriksen 559). With a lack of safe areas to enjoy outdoor activities, no wonder there are higher levels of obesity/type II diabetes in dense, impoverished urban areas.

IV. Barriers Washington and Lee University

a. Food Insecurity and Access

Before considering preventive and therapeutic options to curtail this epidemic, we need to assess the current barriers to care. Just as food insecurity contributes to increasing risk for diabetes onset, it also poses a threat to proper self-management. In 2008, 14.6% of households were food insecure, placing more economic pressure on those of low SES. This impairs diabetes self-management because food-insecure adults tend to have an energy-dense diet, the opposite of what is advised for proper glycemic control. Caloric intake is also more likely to vary on a day to day basis, complicating medication and insulin regimens. Lastly, the cost of food may compete with the cost of medication and supplies (Seligman 2). Seligman et al. assessed whether food insecurity was associated with various indicators of diabetes self-management (self-efficacy, medication-and glucose-monitoring adherence, hypoglycemia, or glycemic

control) among 40 low SES diabetics. Almost 40% of food-insecure diabetics reported taking less medicine than prescribed because they needed the money for food. In addition, 33% checked their blood sugar less frequently than supposed to because they couldn't afford supplies. Most concerning was that 28% reported going to an Emergency Room because their blood sugar was too low (Seligman 7). Such visits are completely preventable by supplying glucose tablets and basic education to this population.

Food insecurity and health costs have been linked with high diabetes rates in many impoverished neighborhoods. One of the best examples is Camden, N.J., one of the poorest and most violent cities in the U.S. With close to 60% of the city's children obese and 7,041 current type II diabetics, it seems that diabetes will be prevalent in the community for a long time to come (Vitiello 5). Such rates are only exacerbated by the fact there is only one full-service supermarket for close to 80,000 residents, one-eighth of the national average. Living in a food desert, diabetic residents accounted for 62,000 hospital ER visits over a five year period (2002-2008), accumulating charges of over \$1.2 billion (CCDC). In this community, food insecurity is just one barrier of many that have led to high social and economic costs.

b. Health Illiteracy

Another barrier to proper diabetes management is health literacy, which is a measurement of a patient's ability to read, comprehend, and act on medical instructions. Such patients have difficulties ranging from interpreting blood sugar value or dosing schedules to comprehending diet brochures, informed-consent documents, and glucose monitor instructions. In addition, patients with poor health literacy have difficulties processing oral communication and conceptualizing risk. This is especially problematic in today's modern health system, which relies on patients having greater technical and self-management skills. Poor health literacy is

most common among people of low educational attainment, immigrants, older patients, and racial/ethnic minorities (Schillinger 475). A study by Schillinger et al. assessed the association between health literacy and diabetes outcomes among patients in a San Francisco public hospital. The assessed population consisted of 408 patients who were ethnically diverse, had low income and educational attainment, and were mainly uninsured or publicly insured (Schillinger 478). In order to measure health literacy, they utilized the abbreviated form of the Test of Functional Health Literacy in Adults (TOFHLA). They measured proper self-management through tracking patients' hemoglobin A_{1c} levels (HbA_{1c}), an average of blood sugar control, over a six to 12 week period, with values ranging from 7.2% (tight glyceemic control) to 9.5% (poor glyceemic control) (Schillinger 479). They also looked at the presence of complications, such as retinopathy, damage to eye due to microvascular damage caused by diabetes.

After statistical analysis, they found that the 36-point range in the TOHFLA results accounted for almost a one percent difference of HbA_{1c}, significant considering the difference between tight and poor control is only 2.3%. More specifically, 20% of patients with inadequate health literacy showed tight glyceemic control, while adequate health literacy led to 33% of patients having tight glyceemic control. On the other hand, 30% of patients with inadequate health literacy had poor glyceemic control, whereas only 20% of patients with adequate health literacy had poor glyceemic control. They also found 36% of patients with inadequate health literacy were afflicted with retinopathy, compared to only 19% of patients with adequate health literacy (Schillinger 479). This study clearly demonstrates the value of health literacy when it comes to managing type II diabetes.

These trends are not only vital indicators of care quality, but also help predict what populations are most at risk for diabetes complications. One percentage point may not seem

significant, but it has been shown that reducing HbA_{1c} by one percent results in halving the risk of retinopathy. Health literacy is an important barrier to consider given that 80% of U.S. type II diabetes have only completed high school or less when compared to 40% of the general population. Not surprising, researchers in this study found that 66% of the patients with a high school education or less had inadequate or marginal health literacy (Schillinger 480). Although increased diabetes education clearly improves health literacy, it may not be able to completely overcome low educational levels.

c. Lack of Healthcare Access

Lack of access to healthcare is one of the critical barriers to decreasing the prevalence of chronic diseases, such as diabetes, among low SES groups and racial minorities. Utilizing data from the 2000 Behavioral Risk Factor Surveillance System (BRFSS), Nelson et al. studied the association between health insurance coverage and diabetes care. In order to assess the quality of care, they utilized three self-reported measures: having a dilated eye exam, at least one foot examination, and at least one HbA_{1c} test during the past year. They assessed diabetes self-management by examining two self-reported measures: performance of home blood glucose tests at least once daily, and attending a diabetes education class (Nelson 366). The results of this study are shown in table 1. These results clearly indicate that 885,000 uninsured diabetics in the year 2000 received significantly poorer quality health care than those with insurance. As expected, the majority of the uninsured were from low SES populations and minority populations. This study not only confirms the existence of this barrier, but also interestingly shows that the Veterans' Administration (VA) is performing exceedingly well at providing quality diabetes health care to veterans. Such high rates are reflective of the high integration of the VA health system and its commitment to improving diabetes care (Nelson 370). If similar,

high-quality care was somehow offered to those currently uninsured, they too would be able to reduce the costly complications of mismanaged diabetes.

	<i>(%)</i>						
	<i>Total</i>	<i>Private</i>	<i>Medicare</i>	<i>Medicaid/ IHS</i>	<i>Uninsured</i>	<i>Some VA</i>	<i>All VA</i>
Dilated eye exam/past year	65	69	68	67	42	74	67*
Foot exam/past year	63	64	65	62	48	74	84*
HbA1c/past year	78	82	74	70	65	81	92*
At least daily glucose monitoring	49	64	57	56	31	53	46*
Diabetes education	52	54	46	49	42	74	79*

χ^2 : * $p < .001$.
IHS, Indian Health Service; VA, Veterans Affairs; HbA1c, hemoglobin A1c.

Table 1: Percentage of Individuals under 65 Years with Reported Service by Type of Insurance (Nelson 367).

V. Solutions Washington and Lee University

A. Diet and Exercise.

We can now consider the solutions. These solutions are aimed at both the treatment of current low SES type II diabetics and the root causes of type II diabetes itself. Since the strongest indicating factor of type II diabetes is obesity, diet and exercise are key preventative measures. The Diabetes Prevention Program showed that the loss of 5-10% body weight through increased physical activity and diet prevents pre-diabetes from developing into full onset diabetes 58% of the time. Put another way, if our health care system incentivized 50% of Americans with pre-diabetes to change their lifestyles, it would result in 4.7 million fewer diabetes cases in 2025 and a cumulative savings of about \$300 billion (Rowley 4).

Childhood obesity can be effectively combated through increased physical activity and improved lunches in local schools. However, many schools have cut back on their physical education and health education programs, creating a higher barrier to better health. Currently, only 3.8% of elementary schools, 7.9% of middle schools, and 2.1% of high schools provide daily physical education over the entire school year. The solution is better funding for physical education, which leads to better academic performance and provides students with a strong concept of a healthy lifestyle (Wamp 55).

On the dietary side of the equation, the National School Lunch Program (NSLP) and the School Breakfast Program (SBP) provide meals to 33 million students each day. Both provide reduced cost meals to children whose families' gross income is below 185% of the poverty line, and free meals for those below 130% of the poverty line (Hofferth 707). However, these school lunches create a barrier to good health by being higher in fat than foods prepared at home, providing a higher portion of children's food energy from fat (38%) than recommended ($\leq 30\%$).

Because school lunches and breakfasts together account for 58% of children's daily dietary intake, a child that eats school lunches is 10% more likely to be overweight than a child that does not. Such statistics are exacerbated by the fact that more than half of students eat at least five times per day, consuming over 100% of the recommended daily allowance (Hofferth 723). The solution is to regulate school food programs more thoroughly in order to ensure that children, especially the poor, are receiving healthy diets. This should include a ban on soft drinks and candy in vending machines on campus, a step that has been taken in some public school districts across the nation.

Obesity also can be reduced through providing safer environments for after-school participation in both structured and unstructured activities. This can be attained through

installing sidewalks, bike paths, safe playgrounds, and parks. Some attributes that positively influence park use by children and adolescents are a variety of facilities that support structured activities, such as baseball and basketball, and unstructured activities, such as swings and slides. Adult use is most highly predicted by the presence of constructed and natural trails, which are often used for biking or running. Park amenities like picnic tables, clean bathrooms, and water fountains were also predictors of high utilization (McCormack716). Another important factor, especially in places like Camden, N.J., is lighting at night that helps to deter crime. If urban parks contain more of these characteristics, they are more likely to be used by the general population, increasing community physical activity and reducing risk factors.

In order to address adult obesity, employers should utilize workplace wellness programs targeting overall health improvement. A study by Baicker et al. found that for every dollar spent on wellness programs, medical costs fall by about \$3.27. In addition, absentee costs fall by about \$2.73 for every dollar spent (Baicker 1). Many of these programs utilize a health risk assessment (HRA), which provides the employer with self-reported employee health data so that they can devise any subsequent intervention. These assessments are often coupled with a clinical screening of risk factors, including blood pressure, cholesterol, and body mass index. In addition, most programs offer a combination of self-help educational materials, individual counseling with health care professionals, and on-site group activities led by trained personnel (Baicker 7).

One example of a successful program is the WellAware program utilized by Northeast Utilities. In order to earn an annual cash incentive, participants had to complete a four-step program: (1) take the HRA; (2) complete and document a weight management or healthy eating program;(3) participate in at least one health education program; and (4) participate in 30

minutes of continuous cardiovascular exercise three times per week for at least 12 weeks. They allowed employees to reach exercise goals through a variety of activities, including attendance at group exercise class, home exercise log, and a pedometer walking program. After the twelve-week on-site weight management program was complete, the average weight loss per employee was seven pounds (Heinen 109). Such health outcomes are not only beneficial to risk factor reduction, but also increase the productivity of workers, benefiting employers.

Another important preventative measure is addressing the issue of food access by providing tax breaks and financial incentives to supermarkets that open in economically disadvantaged neighborhoods. Supermarket development is known to enhance local economic growth by providing jobs for local residents and increasing the local tax base. It also makes foods available at lower prices, increasing the spending power of residents and providing them with the option to avoid energy-dense food. In order to make such initiatives successful, a food system planning approach needs to be undertaken to ensure that market location benefits the greatest number of residents. Equitable access could be attained through utilizing rerouting of public transportation and integrating them with supermarket locations (Zenk 665). Although supermarkets certainly do not guarantee healthy eating habits, it allows the locus of responsibility to fall more directly on those of low SES, largely eliminating food access as a root cause of diabetes.

B. Improved Therapy Delivery

We cannot reduce the effects of type II diabetes without improving our overall approach to the delivery of diabetes therapy. One way to improve our current tracking and care of type II diabetics would be through the wide implementation of electronic medical records (EMR). Surprisingly, hospitals have been quite slow to adopt information technology systems. Current

estimates show that basic electronic health records are used in less than 30% of health care settings, with some estimates as low as 7.6%. EMR can accurately address problems such as patient safety concerns, medical errors, and rising medical costs. EMR systems typically consist of a clinical data repository, computerized patient records, decision support applications, integration capability with others systems, and transaction processing capabilities (Angst 1220). These systems allow physicians to more accurately track the lifelong health records of people and adjust treatment methods in order to improve health outcomes. It also provides a resource for data analysis, so health care providers can see which patients are costing the system the most, providing a clear basis for direct intervention.

These “super-users” frequently visit hospitals for emergency care or basic treatment. For example, in Camden, N.J., 36 diabetic super-users averaged 62 hospital and ER visits per month, at an average cost of \$1.2 million per month. By focusing on these individuals, healthcare professionals were able to reduce hospital visits by 40% and monthly hospitals bills by 56% (Gawande). A study by Wang et al. estimates that the net benefit from using an EMR system for a 5-year period was \$86,000. These savings were mainly the result of reduced drug expenditures, improved radiology test utilization, better capture of charges, and decreased billing errors (Wang 397).

One must also look at an increase in diabetes education in order to improve self-management. As we have seen, health illiteracy is one of the major barriers to individuals properly managing their own care. Currently, only about 50% of American diabetics participate in formal diabetes education (Duncan 753). To address this issue, educational programs need to be modified to the local population conditions, providing structured advice on how to modify food consumption based upon community availability, make efficient use of low income

budgets, and modify medication use under emergency situations. This should be seen as a community based effort in which weekly classes are held at a central location and at various times throughout the day in order to maximize participation.

Another possible therapeutic approach would be the creation of Diabetes Care Centers (DCC). Based upon diabetes prevalence data, these centers would be located in high diabetic population locations throughout cities and rural locations. These centers would provide access to primary care physicians, community pharmacists, nurse diabetic specialists, and diabetes educators, embedding each of these services directly in the target community. As a result, patients would be able to attend doctor visits, pick up medications, and attend diabetes education classes all within the same vicinity. This would also help connect diabetics and encourage self-management as a collaborative effort in which individuals could share with one another how they are able to cope with their disease in the local environment.

C. Health Insurance Reform

The last and most obvious preventative solution is increased health insurance coverage. A single-payer-system may not be the only solution to this problem, but a substantial government health care plan would be an important first step. Using a “sliding fee” approach, this program would provide free healthcare to those at 200% of the poverty line and would adjust fees gradually upward with increased income (Currie 153). As a result, those above a certain income level would pay the market price of healthcare insurance, which could be through the unsubsidized government plan or a private healthcare entity. This would prevent everyone from leaving their private healthcare insurance and keep a competitive market in which private insurers could offer alternative services and protection. Such a development would also create an equal opportunity for the poor to gain and maintain the same basic functioning capability as

others. No longer would the blame be upon the system, rather it would be peoples' responsibility to manage their physician and hospital service needs.

With an increase in access, patients could visit their primary care physician more often, and pre-diabetic conditions could be addressed earlier. Although this does not guarantee that patient self-management would drastically improve, it provides incentives for the government to more accurately assess health costs and create solutions. In addition, this helps eliminate the current reliance upon employee-based health care plans. The impoverished have been a victim of this system due to the fact that they are often not steadily employed for long periods of time. As a result, their health care needs would no longer depend on the market place, securing their care as a moral obligation to provide increased opportunity to reach basic functioning capability.

VI. Conclusions

Type II diabetes is a growing epidemic, with intricate causes and far-reaching implications that have not been adequately examined, particularly as to the poor. Our failure to meaningfully address this problem has had vast economic implications, not only taxing our health care system but also preventing individuals and families from escaping the cycle of poverty. As technology and research continue to advance, the management of diabetes will become easier, but purely therapeutic improvements are not enough. Only by improving access to quality food, more physical activity, and better overall healthcare can we directly influence the most vital risk factor, obesity. Unless a cure is found, we will never be able to eradicate type II diabetes, but we can meet our moral obligation to ensure that low income type II diabetics have an equal opportunity to flourish in our competitive and unforgiving economy.

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