Type 2 Diabetes Prevalence Across Wealth Quintiles

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Abstract

In this study, I examined diabetes mellitus type 2 prevalence across five wealth quintiles using data from the 2008 of the Health and Retirement Study (HRS), a longitudinal panel study that surveys a representative sample of approximately 20,000 Americans over the age of 50 every two years. Controlling for race, ethnicity, gender, age, and educational level, I hypothesized that wealth quintile placement would negatively correlate with diabetes prevalence. This correlation has previously been reported by research done by Saydah & Lochner (2010), which showed a positive correlation between diabetes risk and both low education level and family income; Smith (2007), who examined diabetes and socioeconomic status from a multidimensional perspective including race, gender, education level, etc.; Rabi et. al (2006), which looks at wealth quintiles (like this study), and also examines utilization of diabetes care services; Connolly et. al (1999), which analyzed both type 1 and type 2 prevalence; as well as many others. These studies all corroborate a negative correlation between SES and diabetes prevalence. One way in which this study is unique is that while many other studies assume a multidimensional approach to socioeconomic status analysis, I controlled for variables such as age, gender, education level, and race/ethnicity in order to obtain a measure of solely how wealth measured by total net assets can predict diabetes prevalence, and furthermore the strength of the correlation between all of these variables and diabetes prevalence.

Introduction

As the seventh leading cause of the death in the United States, diabetes mellitus poses one of the deadliest threats to American health and wellbeing. According to data from the

American Diabetes Association, there were a reported 69,071 death certificates listing diabetes as the major cause of death in 2010. In 2014, there were a near 30 million Americans living with diabetes, the vast majority of which (~90%) with diabetes type 2. In contrast with the far less common diabetes type 1, which is caused by a total lack of insulin-producing beta cells in the pancreas, diabetes type 2 results in a hyperglycemic state induced by a developed insulin resistance. The causes of diabetes type 1 are heavily linked to genetic and environmental factors in utero, and while diabetes type 2 has genetic determinants also, it is more heavily influenced by lifestyle factors.

Certain demographics are far more susceptible to diabetes type 2 than others, and two of these demographics are especially relevant to this study. The first is age. Currently over 25% of the American senior population (adults over the age of 65) is diagnosed with diabetes. Because this study used data from the NIA-sponsored Health and Retirement Study, which only surveys people over the age of 50, diabetes is more likely to be represented than if the subject pool had included people of all ages. Reasons for the prominence of diabetes among seniors primarily include the lack of exercise and onset of weight gain that often accompany old age. Decreased efficiency of cell function is also speculated to be a factor.

The second demographic relevant to this project is socioeconomic status (SES). It is well documented that people of a lower SES are more likely to be diagnosed with type 2 diabetes. The reasons behind this correlation can be traced to a variety of sources, one being a lack of education about disease risk factors and healthy lifestyle choices. This lack of information, or even misinformation, can lead to poor diets and health care habits that increase diabetes risk. Beyond education, a low SES is often indicative of the unaffordability of amenities like health

insurance and healthy food options, as well as a lack of leisure time for exercise. While SES is dependent on a combination of all these factors, one of the unique features of this study is that it primarily examines wealth as measured by reported total net assets. By only examining wealth, I can draw stronger conclusions about the direct effects that poverty has on diabetes prevalence. Of course, this is only a partial picture of the systemic connection between low SES and disease prevalence in America, but it can help point to why diabetes has reached a level of epidemic in the United States, and what steps need to be taken to reduce its damage.

Methods

Participants

The University of Michigan Health and Retirement Study (HRS) is a longitudinal panel study that surveys a representative sample of approximately 20,000 Americans over the age of 50 every two years. This subsample is drawn from the random 50% of the longitudinal panel who completed a 2.5 hour face-to-face interview in 2008 and completed a self-administered Psychosocial and Lifestyle questionnaire. The age of the participants ranged from 50 to 99 years (M = 69.54 years, SD = 9.710). Men comprised 40.2% of the sample. The majority of the sample participants identified as white (84.7%), and of the total sample, 56.3% had twelve years of schooling or less.

Measures

Diabetes condition. This measure was one of eight chronic diseases conditions assessed. The question asked to participants was: “Has a doctor ever told you that you have diabetes of high blood pressure?” Responses were coded as “1” for “yes” and “5” for “no.” It should be

noted that, according to HRS literature, studies such as Burgess, Martel, & Wyman, 1971; Bush, Miller, Golden, & Hale, 1989; Colditz, Martin, Stampfer, Willett, Sampson, & Rosner, 1986; Kehoe, Wu, Leske, & Chylack, 1994; Kriegsman, Penninx, van Eijk, Boeke, & Deeg, 1996, etc. have found acceptable levels of agreement between self-report measures of chronic diseases and more "objective" measures, such as medical records.

Wealth quintiles. These measures are based on total net assets reported on the IRS W9 form. This is measured by calculating total assets - total liabilities. Subjects were separated into five equal groups based on this report, with the first quintile (Q1) being the lowest reported total net assets and the fifth quintile (Q5) being the highest.

Race/Ethnicity. Self-identified as white or black.

Age: Age at 2008 interview.

Education: Number of years of school completed.

Procedures

This study was performed using a dataset from the Health and Retirement study provided to the class. These data contained sociodemographic, health, and cognition variables collected in individual computer-assisted face-to-face interviews as well as data from the self-administered questionnaire. Statistical analyses were conducted using SPSS.

Results

Descriptives

Frequency distributions determined that 21.4% of the sample self-reported type 2 diabetes diagnosis and 78.6% did not (**Table 1a**). This figure is in line with reports from the

American Diabetes Association that 25.9% of adults over the age 65 have type 2 diabetes (it is slightly lower because it contains subjects aged 50-65 as well). **Table 1b** shows descriptive statistics for the five wealth quintiles used. These range from Q1 (*M* = 2383.96, *SD* = 25447.60), to Q5 (*M* = 503549.73, *SD* = 1289092.85).

Table 1a. Diabetes Condition Frequency Descriptives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	4931	78.6	78.6	78.6
	Yes	1342	21.4	21.4	100.0
	Total	6273	100.0	100.0	
Missing	System	3	.0		
Total		6276	100.0		

Frequency distribution for subjects who self-reported diabetes condition.

Table 1b. Wealth Quintile (Measured by Total Assets) Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	1255	2383.9614	25447.60241	718.33166	974.6970	3793.2258	-287580.41	31006.00
2	1259	78317.7387	29255.13738	824.49737	76700.1973	79935.2802	31035.00	132000.00
3	1249	209811.0495	49774.29545	1408.39314	207047.9700	212574.1291	132200.00	304848.00
4	1256	462943.6950	103817.3551	2929.37615	457196.6807	468690.7092	305000.00	670600.00
5	1257	1762269.635	2486391.517	70129.68313	1624685.398	1899853.871	671000.00	3.68E+7
Total	6276	503549.7319	1289092.854	16272.06737	471650.9130	535448.5507	-287580.41	3.68E+7

Descriptive statistics for wealth quintiles.

Chi-Squared

A chi-squared test was conducted to examine the main effects of wealth quintile placement on diabetes prevalence. This analysis revealed a significant differences in diabetes prevalence between the wealth quintiles (χ^2= 119.23, $p < .001$). The diabetes * wealth quintile cross-tabulation (**Table 2**) supports the hypothesis that there is a negative correlation between quintile placement and diabetes prevalence, with a slightly above average percent of seniors with

diabetes in the lowest quintile (26.8%), and a far below average percent in the highest quintile (11.7%).

Table 2. Diabetes * Wealth Quintiles Crosstabulation

			Wealth Quintiles					
			1	2	3	4	5	Total
Chronic Conditions - Diabetes	No	Count	895	937	974	1025	1100	4931
		% within Chronic Conditions - Diabetes	18.2%	19.0%	19.8%	20.8%	22.3%	100.0%
		% within Wealth Quintiles	71.3%	74.4%	78.1%	81.7%	87.5%	78.6%
	Yes	Count	360	322	273	230	157	1342
		% within Chronic Conditions - Diabetes	26.8%	24.0%	20.3%	17.1%	11.7%	100.0%
		% within Wealth Quintiles	28.7%	25.6%	21.9%	18.3%	12.5%	21.4%
Total		Count	1255	1259	1247	1255	1257	6273
		% within Chronic Conditions - Diabetes	20.0%	20.1%	19.9%	20.0%	20.0%	100.0%
		% within Wealth Quintiles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Notes: Wealth quintile ranges reported in **Table 1b.**

Regression

To examine the unique contribution of wealth quintile placement to the explanation of diabetes prevalence, a hierarchical multiple regression was performed. In step 1, variables known to be associated with diabetes prevalence were entered as controls; these included indicators for age group, gender, race/ethnicity, and education level. Step 2 added wealth quintile placement to the regression model. The results for Step 1 indicated that together age, gender, race/ethnicity, and education level accounted 21.4% of the variance in weight (R2). The addition of wealth quintile in Step 2 accounted for unique variance, R2 = .005 which was significantly different from zero, $F (1, 6096) = 41.21$ $p < .001$. The final model accounted for 21.9% of the variance in weight.

In the final model all predictors were significant. The standardized regression coefficients (β) and are reported in **Table 3**. Identifying as black (β= -0.21), being a woman (β= -0.21), being

older (β=-.09), and lower education level were all associated with higher diabetes prevalence. Lower wealth quintile placement (β= 0-.07) was also uniquely associated with higher diabetes prevalence.

Table 3. Hierarchical Regression on Wealth Quintiles*

	Step 1		**Step 2**		
Predictor	*B*	*SE*	*B*	*SE*	*β*
Gender	-0.20	0.03	-0.21	0.03	-0.07
Age at Interview	0.01	0.01	0.01	0.01	0.09
Race	-0.91	0.05	-0.88	.048	-0.21
Years of Schooling	0.18	0.01	0.17	0.01	0.369
Diabetes			-0.26	0.11	-0.07

Notes: The final column represents standardized betas for the full model. *All values significant at p<0.001.

Discussion

According to the results of the analyses conducted, belonging to a lower wealth quintile is associated with higher prevalence of type 2 diabetes. This is consistent with previous studies examining diabetes prevalence and socioeconomic status, such as in the ones mentioned above in the abstract. It is especially interesting to note that while diabetes prevalence among subjects in the lowest quintile (Q1) is just above the average rate for seniors, the more noticeable difference is the greater than 50% decrease in diabetes prevalence among subjects of the highest quintile (Q5), which nears the average for the United States population as a whole (taking into account individuals younger than 65). This points to the sharp decline in health that many seniors with lower wealth face, often due to the unaffordability of health care services and insurance, as well as lack of access to healthy diet options, both of which, combined with long work hours, prevent

regular exercise. According to these data, a higher wealth for seniors could allow them to maintain a level of health similar to younger individuals and prevent, or at least lengthen the time until the onset of chronic conditions such as diabetes. This idea is in line with James Fries' Compression of Morbidity paradigm (1980) which maintains that "if the average age at first infirmity, disability, or other morbidity is postponed and if this postponement is greater than increases in life expectancy, then cumulative lifetime morbidity will decrease-- compressed between a later onset and the time of death" (2003).

Results also showed that while wealth quintile placement could independently predict diabetes prevalence while controlling variables such as race, gender, age, and education level, each of these variables also significantly explained this correlation. While other studies have demonstrated that identifying as black, being a women, being older, and having a lower educational level are all associated with higher diabetes prevalence, the large sample size of HRS also helped to contribute to their significance in this study.

The design of this study, in addition to its intention of being a straightforward demonstration of HRS data analysis, led to some limitations. One is that although many common variables were accounted for, one that was not examined was disease comorbidities. Comorbidities such as heart disease, kidney disease, and obesity are frequent precursors to diabetes, and genetic predisposition to these diseases can increase type 2 diabetes risk as well. This is especially important when studying low SES individuals, as such comorbidities are likely more prevalent among them. Along these lines but more broadly, genetics were not factored into our analysis; although type 2 diabetes is more widely associated with lifestyle factors, genetic makeup plays a distinct role in its onset. Finally, HRS data uses self-reported diabetes as a

measure of the disease prevalence, and thus there is likely some human error attributable to the data set.

Future studies could examine comorbidities linked with diabetes in order to determine what are common precursors and how these affect onset. Factoring in more variable for measures of SES rather than just educational level and total net assets, such as geographic location, familial situation, etc. could be used to better assess individual status. Measuring wealth based upon median household income rather than net assets could provide a more accurate depiction of purchasing power. Finally, health care services utilization, like as mentioned in the Rabi et. al article, could be more widely studied in order to best reduce diabetes risk and improve quality of life for diabetes patients, especially for those who are poor and/or elderly.

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