The Impact of Community Socioeconomic Disadvantage on Diabetes and High Blood Pressure: Are Women More Vulnerable than Men?

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There is a growing consensus that community characteristics influence health outcomes, even when individual-level characteristics are held constant (Robert 1998, 1999). Community characteristics, such as the prevalence of poverty and high school dropout rates, are associated with a variety of health outcomes including self-rated health (Katz, Kling, and Liebman 2001; Malmstrom, Sundquist, and Johansson 1999; Ross and Mirowsky 2001), functional disability (Ross and Mirowsky 2001), mental health (Aneshensel and Sucoff 1996; Latkin and Curry 2003; Ross 2000; Ross, Reynolds, and Geis 2000; Schultz et al., 2000), and mortality (Huie, Hummer, and Rogers 2002; LeClere, Rogers, and Peters 1997; LeClere, Rogers, and Peters 1998). Research also suggests that community characteristics are related to the development of chronic conditions such as obesity (Boardman et al., 2005) and heart disease (Diez Roux, Link, and Northridge 2000; Diez Roux, et al., 2001). In this study, we extend this literature by investigating the association between community-level socioeconomic disadvantage and the likelihood of having diabetes and high blood pressure. We also examine whether the above associations differ by gender. The prevalence of diabetes and high blood pressure is growing rapidly in the United States, especially for minority groups, and constitutes a serious threat to public health (Mokdad, Ford, and Bowman 2000). While there are compelling reasons to expect that women may be particularly more vulnerable to the deleterious effect of community socioeconomic disadvantage on these outcomes, compared to men, previous research has not examined this possibility.

There are at least two mechanisms through which community socioeconomic disadvantage might affect the likelihood of having diabetes and high blood pressure: physical activity and diet. Previous research finds that there are fewer facilities for physical activity in disadvantaged communities, thus, making it harder for residents to maintain an active lifestyle (Gordon-Larsen, Nelson, Page, and Popkin 2006). Further, disadvantaged communities are more likely to have poorly maintained physical infrastructure than other communities. Poorly maintained sidewalks and streets, and a dearth of recreational areas may make being active more difficult in poor communities. The ease of maintaining a healthy diet may also be affected by community socioeconomic disadvantage. Previous research found that food choices vary greatly across residential areas, with healthy food being less available, and more expensive in disadvantaged communities (Horowitz, Colson, Hevert, and Lancaster 2004). For these reasons, we hypothesize that community socioeconomic disadvantage is positively associated with the probability of having diabetes and high blood pressure, net of many individual characteristics.

We further hypothesize that women will be more affected by community-level socioeconomic disadvantage than men. Disadvantaged communities are more likely to have high crime rates (Ross and Mirowsky 2001; Sampson and Groves 1989; Sampson, Raudenbush, and Earls 1997), and women may be more vulnerable to crime than men. If

so, leaving home to shop for groceries at stores of choice, or exercising outside will be more difficult for women than for men. Also, mothers with young children may find child rearing more time consuming in disadvantaged neighborhoods because the environmental threats therein may demand extra monitoring of children. This too may make exercise more difficult to integrate into busy schedules.

DATA AND METHODS

Sources of data

We test our hypotheses using data from two sources. Individual-level data come from the 2003 Medical Expenditure Panel Survey (MEPS). MEPS is a series of large-scale longitudinal surveys based on clustered and stratified samples of households that provide nationally representative estimates of health status, health care use, and socio-demographic characteristics for the U.S. non-institutionalized population (Cohen 1996, 1997). Information on characteristics of the communities in which individuals live is obtained from the 2000 U.S. Decennial Census at the block group level. Block groups are the smallest geographic area for which social statistics are available, containing between 600 and 3000 people (U.S. Census Bureau 2000). We link data from the MEPS and Decennial Census by geocoding respondents in the MEPS.

The 2003 MEPS collected data on 34,215 individuals, 96% of whom had complete data. Most of the missing data was due to individuals who could not be linked to a block group. Differences between individuals with and without geographic information were modest, thus, we deleted those with missing data. We restricted our analysis to adults over the age of 17, yielding a sample size of 22,227.

Diabetes and High Blood Pressure

Our two main outcome variables are whether individuals are diabetic and whether they have high blood pressure. Individuals were asked, "Has a doctor ever told you that you have….?" If an individual responds that they have been diagnosed with diabetes, they are coded as such. If an individual indicates that they have been told that they had high blood pressure, they were further asked if this diagnosis has been confirmed on more than one occasion. Individuals who report that they have had multiple diagnoses of high blood pressure are coded as having high blood pressure.

Community Socioeconomic Disadvantage

We measure community-level socioeconomic disadvantage with three variables: the percentage of block group residents living below 125 percent of the federal poverty line; the percent of residents over age 18 with no high school diploma or GED; and the percent of residents who are unemployed. These variables are highly correlated, so they

cannot be included simultaneously in our models. We averaged them to form a scale with alpha 0.79. One unit shift in this scale corresponds to a ten point increase in the percent of block group residents living in poverty, the percent of residents who do not have a high diploma or GED, or the percent who are unemployed.

Individual-level Control Variables

There are several well-known individual-level correlates of diabetes and high blood pressure: socioeconomic status (SES), race and ethnicity, and immigrant status. We measure SES using income and educational attainment. Income is measured with a series of dichotomous variables indicating one's household income relative to the federal poverty line: below 125 percent, 125-200 percent, 200-400 percent, and over 400 percent. Educational attainment is captured with dichotomous variables indicating whether one has no high school degree or GED, a high school degree only, a college degree, a graduate or professional degree, or is under the age of 25. The last category identifies those who may not have finished their education. We measure race and ethnicity with dichotomous variables indicating whether one is Hispanic, Non-Hispanic white, African America, Asian, American Indian, or Other. Immigrant status is coded dichotomously indicating whether one is not born in the United States. We control for age (both as a continuous measure and a squared term) and marital status (married, divorced, widowed, never married, or under 16). Table 1 displays coding of a descriptive statistics for all of the variables in our analysis.

-- Table 1 about here --

Analytic Approach

As a preliminary test of our hypothesis, we estimate a series of logistic regression models for each health outcome. Model 1 includes only the neighborhood socioeconomic disadvantage scale, and gives an idea of the crude association between neighborhood disadvantage and the likelihood of having diabetes or high blood pressure. In Model 2, we add all individual-level variables to Model 1. This model indicates the extent to which the association between community-level disadvantage and access to health care is due to the composition of individuals within neighborhoods, and how much is due to community socioeconomic disadvantage itself. Finally, Model 3 examines interaction terms between the neighborhood socioeconomic disadvantage and gender.

A major methodological challenge in this study is the hierarchical structure of the data; individuals are nested within block groups. In addition, MEPS has a stratified and clustered sample, so clustering at the primary sampling unit must also be considered. If clustering in the sample is ignored, standard errors will be biased downward, increasing the chances of Type I errors. For our preliminary analyses, we deal with this problem by calculating standard errors using a first-order Taylor series linear approximation method, which adjusts for clustering at the PSU level (Levy and Lemeshow 1999; Statacorp 2001).

Though this method was designed to control for clustering due to sample design rather than nested data, it provides accurate variance estimates because block groups are contained within single PSUs (Goldstein 1999). All point estimates are calculated using sample weights. As an added check on the reliability of our results, we plan to estimate non-linear hierarchical linear models (HLM) as well as logistic regression models in the final paper.

PRELIMINARY RESULTS

Table 2 shows the results from three logistic regression models on the likelihood of having diabetes, and Table 3 shows the results for high blood pressure. Model 1 suggests that community socioeconomic disadvantage is strongly associated with both diabetes and high blood pressure. Model 2 suggests that the associations persist even when the individual-level variables are held constant. Net of individual-level characteristics, a one unit increase in the community socioeconomic disadvantage scale is associated with a 19% increase in the odds of having diabetes, and an 11% increase in the odds of having high blood pressure.

Model 3, however, indicates that the effect of community-level socioeconomic disadvantage is much stronger for women than for men for both outcomes. For example, the odds of having diabetes for women increases by about 30% (1.23 x 1.06) for a unit increase in the community socioeconomic disadvantage scale. In contrast, there is no significant increase for men for either outcome. These preliminary results generally support our hypotheses. We plan to examine further if there are significant differences in the above effects across women of different characteristics.

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Table 1. Descriptive Statistics of All Variables

	Mean	Max	Min
Dependent Variables			
Diagnosed with diabetes	0.06	0.00	1.00
Multiple diagnoses of high blood pressure	0.22	0.00	1.00
Community socioeconomic disadvantage variables			
Community disadvantage scale	1.22	0.00	6.98
Percent of block group residents with no high school degree/GED	19.30	0.00	100.00
Percent of block group residents who are unemployed	5.70	0.00	70.40
Percent of block group residents living in poverty	11.60	0.00	100.00
Individual-level variables			
Age	45.39	0.00	85.00
Age squared	2366.70	0.00	7225.00
Foreign born	0.15	0.00	1.00
Female	0.52	0.00	1.00
Race and ethnicity:			
Hispanic, any race	0.12	0.00	1.00
Non-Hispanic white	0.70	0.00	1.00
Non-Hispanic Black	0.11	0.00	1.00
Non-Hispanic Asian	0.04	0.00	1.00
Non-Hispanic American Indian	0.01	0.00	1.00
Non-Hispanic, other race	0.01	0.00	1.00
Income as a percent of the federal poverty line			
< 100%	0.11	0.00	1.00
100% - 125%	0.04	0.00	1.00
125% - 200%	0.13	0.00	1.00
200% - 400%	0.30	0.00	1.00
> 400%	0.41	0.00	1.00
Marital status:			
Married	0.55	0.00	1.00
Divorced	0.13	0.00	1.00
Widowed	0.07	0.00	1.00
Never married	0.25	0.00	1.00
Under 16	0.00	0.00	1.00
Educational attainment			
No high school diploma or GED	0.13	0.00	1.00
High school graduate or GED	0.50	0.00	1.00
College graduate	0.16	0.00	1.00
Professional or graduate degree	0.08	0.00	1.00
Under age 25, education may not be finished	0.13	0.00	1.00

Table 2. Odds Ratios from Logistic Regressions on Having Diabetes

	Model 1	*Model 2*	*Model 3*
Neighborhood Disadvantage Scale	1.32	1.19	1.06
	(0.000)**	(0.000)**	(0.338)
Age		1.32	1.32
		(0.000)**	(0.000)**
Age^2		1.00	1.00
		(0.000)**	(0.000)**
Foreign Born		0.71	0.71
		(0.003)**	(0.003)**
Female		0.90	0.70
		(0.195)	(0.005)**
Race and Ethnicity (reference = NH White)			
Hispanic of any race		1.48	1.49
		(0.001)**	(0.001)**
NH Black		1.57	1.56
		(0.000)**	(0.000)**
NH Asian or Pacific Islander		1.74	1.75
		(0.001)**	(0.001)**
NH American Indian		1.82	1.82
		(0.086)	(0.084)
NH Other Race		2.74	2.76
		(0.000)**	(0.000)**
Income relative to Federal Poverty Line (Reference = above 400%)			
< 100%		1.45	1.44
		(0.001)**	(0.001)**
100%-125%		1.46	1.46
		(0.018)*	(0.018)*
125%-200%		1.30	1.30
		(0.021)*	(0.020)*
200%-400%		1.21	1.21
		(0.031)*	(0.027)*
Marital Status (Reference = Married)			
Divorced		0.93	0.94
		(0.421)	(0.467)
Widowed		1.09	1.09
		(0.460)	(0.473)
Never married		1.02	1.03
		(0.867)	(0.846)
Educational Attainment (Reference = High School Graduate or GED)			
No high school diploma or GED		1.20	1.19
		(0.027)*	(0.030)*
College Graduate		0.66	0.65
		(0.000)**	(0.000)**
Profession/Graduate Degree		0.69	0.68
		(0.030)*	(0.023)*
Under age 25		3.55	3.51
		(0.000)**	(0.001)**
Neighborhood Disadvantage x Female			1.23
			(0.002)**
Observations	22,227	22,227	22,227

p values in parentheses
* significant at 5%; ** significant at 1%

Table 3. Odds Ratios from Logistic Regressions on Having Multiple Diagnoses of High Blood Pressure

	Model 1	*Model 2*	*Model 3*
Neighborhood Disadvantage Scale	1.07	1.11	1.02
	(0.014)*	(0.002)**	(0.727)
Age		1.21	1.21
		(0.000)**	(0.000)**
Age^2		1.00	1.00
		(0.000)**	(0.000)**
Foreign Born		0.72	0.72
		(0.000)**	(0.000)**
Female		0.96	0.81
		(0.380)	(0.003)**
Race and Ethnicity (reference = NH White)			
Hispanic of any race		0.74	0.74
		(0.000)**	(0.000)**
NH Black		1.85	1.85
		(0.000)**	(0.000)**
NH Asian or Pacific Islander		1.11	1.11
		(0.386)	(0.365)
NH American Indian		1.22	1.22
		(0.383)	(0.389)
NH Other Race		1.24	1.25
		(0.228)	(0.223)
Income relative to Federal Poverty Line (Reference = above 400%)			
< 100%		1.21	1.20
		(0.032)*	(0.041)*
100%-125%		1.27	1.27
		(0.021)*	(0.022)*
125%-200%		1.13	1.13
		(0.094)	(0.097)
200%-400%		1.11	1.11
		(0.062)	(0.058)
Marital Status (Reference = Married)			
Divorced		0.96	0.96
		(0.512)	(0.563)
Widowed		1.17	1.16
		(0.049)*	(0.052)
Never married		1.02	1.03
		(0.777)	(0.759)
Educational Attainment (Reference = High School Graduate or GED)			
No high school diploma or GED		1.04	1.04
		(0.581)	(0.596)
College Graduate		0.89	0.88
		(0.061)	(0.049)*
Profession/Graduate Degree		0.78	0.78
		(0.006)**	(0.004)**
Under age 25		1.11	1.10
		(0.663)	(0.681)
Neighborhood Disadvantage x Female			1.18
			(0.001)**
Observations	22,042	22,042	22,042

p values in parentheses
* significant at 5%; ** significant at 1%