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A Neighborhood Wealth Metric for Use in Health Studies

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Abstract

Background—Measures of neighborhood deprivation used in health research are typically based on conventional area-based SES.

Purpose—The aim of this study is to examine new data and measures of SES for use in health research. Specifically, assessed property values are introduced as a new individual-level metric of wealth and tested for their ability to substitute for conventional area-based SES as measures of neighborhood deprivation.

Methods—The analysis was conducted in 2010 using data from 1922 participants in the 2008–2009 survey of the Seattle Obesity Study (SOS). It compared the relative strength of the association between the individual-level neighborhood wealth metric (assessed property values) and area-level SES measures (including education, income, and percentage above poverty as single variables, and as the composite Singh index) on the binary outcome fair/poor general health status. Analyses were adjusted for gender, categoric age, race, employment status, home ownership, and household income.

Results—The neighborhood wealth measure was more predictive of fair/poor health status than area-level SES measures, calculated either as single variables or as indices (lower DIC measures for all models). The odds of having a fair/poor health status decreased by 0.85 [0.77, 0.93] per $50,000 increase in neighborhood property values after adjusting for individual-level SES measures.

Conclusions—The proposed individual-level metric of neighborhood wealth, if replicated in other areas, could replace area-based SES measures, thus simplifying analyses of contextual effects on health.

Socioeconomic status (this term is used here to include socioeconomic position) is an important determinant of health, affecting the life course through various causal pathways[1–4] at the individual, household, and neighborhood levels.[5–8] Despite the evident complexity of the SES construct, U.S. health research often reduces SES measurement to three variables: educational attainment, employment, and earned income. The present study introduces a

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metric of wealth to capture multiple aspects of SES, including those of economic security and life-long access to resources. [4] Publicly available data were used on assessed residential property values at the tax parcel level. A test was made of their suitability as measures of SES for use in health research. Demonstrating that assessed property values are an appropriate SES metric for health-related research will fill a gap in currently available SES data and help to circumvent the methodologic issues associated with using conventional measures of SES.

Many studies address the multiple aspects of SES and related demographic determinants by considering not only education, occupation, and income, but also race/ethnicity, marital status, household size, and being single or female head of household, an immigrant, foreign-born, or non-English-speaking.[9, 10] Additional indicators of deprivation in the material environment include home value, owning or renting a home, owning one or more cars, and having plumbing and a telephone.[11] At the individual and household levels, those data are typically self-reported via surveys or interviews. However, since most medical records and public health surveillance systems lack individual- and household-level SES data, researchers have turned to using area-based SES measures (ABSMs) to monitor and assess socioeconomic inequalities in health.[12, 13] ABSMs are neighborhood-level SES variables obtained from secondary sources such as census and other governmental statistics[14, 15] and are available for predefined administrative areas.

Studies have shown that neighborhood-level factors affect health independently from individual-level SES.[16–18] Deprivation indices using ABSMs and combining many of the variables listed above have also effectively predicted health outcomes[19]: three such indices have long been used,[7, 20, 21] and two were developed more recently. [22–24]

The concomitant use of individual and area-based data in health research has linked two epidemiologic paradigms: individual risk factor epidemiology and ecologic approaches. [25] These paradigms have to be reconciled through multilevel analyses, producing results that are often difficult to interpret because they examine contextual (or neighborhood) effects on health, after adjusting for individual-level compositional effects of SES.[15, 26] Also, because ABSMs are aggregated data, bundled in different geographies with spatial units of different size or shape, research results can be tainted with the Modifiable Areal Unit Problem (MAUP).[27, 28] The MAUP is a shift in the observed relationship between environmental variables and outcomes of interest when the areal units are at different scales or of different spatial configurations.[29–33] The problem leads to unstable statistical results.[34, 35] In contrast, the current study used individual-level assessed property values to construct the proposed metric of wealth.

Methods

Population

Participants came from the Seattle Obesity Study (SOS), a population-based study of social disparities, diet quality, and health in King County, WA. A 20-minute telephone survey was conducted on a stratified random sample of 2001 adult residents who were randomly selected within each household. Administered between October 2008 and March 2009, the survey was approved by the University of Washington IRB. SOS participants were representative of the population in King County in terms of race and ethnicity, income, and household size; they were similar to the BRFSS 2007 sample in terms of age and gender. With a CASRO rate of 32%,[36] the survey response rate was higher than that of King County's BRFSS 2008 at 29%.[37]

Geocoding

The addresses of SOS respondents were geocoded to the centroid of the home parcel using the 2008 King County Assessor parcel data. Geocoding followed standard methods in ArcGIS, version 9.3.1 (ESRI, Redlands, CA). Address records that failed the automatic geocoding (30% [597/2001], using a 100% match score) were manually matched using a digital map environment with annotated layers from the reference data, augmented by online resources such as GoogleMaps. Each home point was double-checked by a separate technician for plausibility (i.e., that the parcel was designated for residential land use) and accuracy (i.e., that the location was on the correct parcel).

Participant SES and Outcome Variable

SOS survey questions used in this study were modeled on those of the BRFFS. [37] The participants' individual demographic and SES characteristics included age, gender, race, education, employment, annual household income, and home ownership. The health outcome termed general health status was determined from the survey question "Would you say that in general your health is: excellent/very good/good/fair/poor?" This health outcome was dichotomized into fair/poor health versus the other rating categories.

Property Values Metric

Data for the assessed property values of participant residences came from the 2008 King County assessor parcel data. In Washington State, assessment for tax purposes aims at establishing the full market value of a given property.[38] In King County, WA, assessment procedures begin with determining land value, which state law requires to be appraised as if land were vacant. Analyses of comparable bare land sales determine land value. Next in the assessment process is the study of sales of improved properties (i.e., built-on land) in each property's proximate area. The total market value is based on building square footage, year built, and other property characteristics. The county's assessment method is known to reliably capture the market value of properties.[39, 40] The assessor's data provided separate values for land and for the improvements attached to the land (e.g., buildings and driveways). Consistent with previous research,[41] assessed value per unit was calculated as the sum of a parcel's land and improvement values divided by the number of residential units on the parcel.

Two individual-level metrics were calculated for this study: (1) the mean assessed property value per residential unit in the parcel where the respondent lived (labeled personal wealth), and (2) the mean assessed property value per residential unit in the respondent's "neighborhood" (labeled neighborhood wealth). Having both types of metrics allowed examination of whether differences in results were due to using SES composition versus context measures. Such a determination is important as a previous study using assessed property values and median income as indicators of neighborhood SES in King County found that individual-level, but not area-level measures, predicted survival following out-of-hospital cardiac arrest, independent of demographic, circumstance, or care factors.[42]

Values for individual respondents' neighborhood wealth were calculated in geographic information systems (GISs). To account for large parcels, input data came in a 10-meter grid where each cell was assigned the mean assessed property value per residential unit of the underlying parcel. The focal mean function served to generate a continuous grid of 30-meter raster cells representing the mean assessed property value per residential unit within an 833-meter airline bandwidth from the center of each raster cell (ArcGIS 9, ESRI, Redlands, CA). The 30-meter raster size had been tested to capture both fine- and coarser-grained land subdivision patterns in urban and suburban areas, respectively.[43] The 833-meter bandwidth had been used in previous studies [44–46] and was selected to represent the individual proximal neighborhood within a 10-minute walk.

Area-Based SES

Neighborhood SES data came from the 2000 U.S. Census. Tract-level measures included median household income, percentage with college education or higher, percentage nonwhite, percentage below poverty level, and the Singh index. A composite measure of deprivation, the Singh index was derived for King County and was composed of 17 census variables representing material and social conditions and relative socioeconomic disadvantage.[22, 23] The 17 variables were selected through a factor analysis of an original list of 21. Factor score coefficients served to weight the individual variables in order to calculate the single index value. The largest coefficients were for poverty level, median income, and population with at least a high school diploma. The smallest coefficients were for households without complete plumbing, household crowding, and home ownership status. Singh index values are scaled around a mean of 100, so that values above and below 100 indicate above- and below-average deprivation. Area-based SES variables were categorized into quartiles in some of the analyses.

Statistical Analysis

Excluded were 37 participants whose address could not be geocoded or who lived outside of King County; five who did not provide a response to the primary health outcome of general health status; and 37 who did not provide complete demographic or SES information. A total of 1922 participants (96% of 2001) were included in this study.

First, a census tract–level analysis assessed the relationships between mean property values at the census tract level and census SES measures. Bivariable linear regression models were run with mean property values within a census tract as the outcome, and each census SES measure as the independent predictor. All 373 census tracts in King County were included to calculate the mean census-tract wealth and 95% CIs and the Spearman correlation coefficients.

Second, individual-level personal and neighborhood wealth were examined in relation to the study participants' demographics and individual-level SES measures. Four models evaluated personal and neighborhood wealth outcomes as both continuous measures and dichotomized measures, with personal wealth either above or below $567,500 (2010 jumbo mortgage amount for King County), and neighborhood wealth either above or below $400,000. Linear regression with robust SEs was used for continuous outcomes, and logistic regression was used for binary outcomes.[47]

Third, analyses evaluated the association between general health status and SES at the individual and area levels. A series of analyses assessed the relative strength of the association of personal and neighborhood wealth metrics compared to area-based SES measures, on the binary outcome fair/poor general health status. Each analysis included one wealth or area-based SES variable, along with: (1) no adjustment, (2) adjustment for gender, categoric age, race, employment status, and home ownership, and (3) adjustment for all variables in analysis (2) plus household income, which was treated separately because of missing data for 229 participants (n = 1693). To account for correlation between individuals in the same or a neighboring census tract for the area-based SES measures, these variables were modeled using a Conditionally Autoregressive Regression (CAR) spatial model using convolution priors.[48] A Bayesian statistical framework was employed to compare the different models using a Deviance Information Criteria (DIC) statistic that quantifies goodness of fit of each model.[49] A lower DIC indicates a better model fit.

All analyses were conducted in R software, Version 2.10.1, R GUI system for Windows[50] and R2WinBugs, Version 2.1.6.[51] Models applying a Bayesian statistical framework used a burn in of 1000, 5000 iterations, and two chains for each model, and report 95% credible intervals instead of CIs. Two-sided statistical tests with p-values < 0.05 were considered significant.

Results

Associations between area-based census SES and wealth, aggregated at the census-tract level, showed that mean property values increased with the proportion of the population with a college education, and with median household income. They also increased as the proportion of the population living below the poverty level and the Singh index decreased (Table 1). The associations were significant with correlations above 0.60 for all measures.

Table 2 shows the unadjusted relationship between individual-level personal and neighborhood wealth measures and respondent characteristics (demographics and SES). Significant associations were found for race, education, employment, income, and housing tenure, with the higher values of personal assessed property value (>$567,500) and neighborhood assessed property value (>$400,000, the top 14 percentiles of neighborhood property values in the study).

Appendix A (available online at www.ajpm-online.net) summarizes individual-level demographics, SES characteristics, assessed property values, and census tract–level SES measures, by class of self-reported health status. Of the 1922 respondents included in the study, 13.5% reported their health to be fair or poor. The majority were women (62%) and white (80%). Fifty percent were aged >54 years, and 55% had at least a college degree. Mean household income was $75,000, with 61% employed, 8% unemployed, and 23% retired. Most of the respondents (80%) owned their homes; 50% lived in a residential unit assessed at <$272,000 and in a neighborhood where the mean assessed value was $246,000. These statistics showed that all measures of deprivation and wealth were distributed in a similar way among the respondents’ health status subgroups: reported health status increased with decreasing measures of deprivation or increasing measures of wealth.

The results of the logistic regression models assessing the strength of association of different measures of SES and wealth on fair/poor health status revealed associations between personal and neighborhood wealth measures and health status (Table 3). These associations were expectedly attenuated when adjusting for individual SES, excluding or including income (analyses including income not shown). Both personal and neighborhood wealth metrics were always more predictive of fair/poor health status when compared to area-level census measures (lower DIC measures for all models). The individual-level neighborhood wealth measure showed that the odds of fair/poor health status decreased by 0.85 (0.77, 0.93) per $50,000 increase in neighborhood property values, after adjusting for all individual-level SES measures. Similarly, the individual-level personal wealth measure showed that the odds of fair/poor health status decreased by 0.90 (0.84, 0.96) per $50,000 increase in personal property values. After adjusting for individual-level SES, both neighborhood and personal wealth measures were predictive of health status with similar magnitude (DIC not consistently smaller across models).

Discussion

Assessed property values proved to be strong proxies for the conventional area-based SES measures to predict health status. Both the personal and neighborhood wealth metrics performed better than the discrete census-based SES measures and even the composite

Singh index. This suggested that whenever feasible, assessed property values could substitute for area-based measures and indices of deprivation.

The personal and neighborhood wealth metrics captured compositional and contextual effects on health objectively.[5–8] The use of these individual-level disaggregate measures of SES would allow neighborhood effects to be included in health research while simplifying analyses and sidestepping the MAUP. Considering neighborhood effects in health research creates methodologic hurdles because individual-level associations cannot be inferred from group-level associations.[52, 53] In spite of this issue, increased awareness of the importance of social and institutional processes on health have continued to fuel the growth of studies that consider neighborhood effects.[54,55]

At the same time, research on the relative importance of contextual versus compositional effects on health has not produced definitive results.[10,56] The predictive value of area-level SES variables was found to vary by cause of death, yet to be less important than individual-level SES variables.[57] This finding suggests that models need to include only individual-level variables, but it has been found[24] that both individual- and area-level measures of SES are associated with inequalities in mortality and disability. However, other multilevel analyses of BMI in adults and children found that area-level SES measures were predictive of obesity even after accounting for individual-level SES measures.[58–62] Overall, the importance of area-level SES appeared to be dependent on health outcome and the population being studied. The present study suggests only that context can be measured at the individual level and need not rely on area-based data to define neighborhood.

The data used to measure the wealth metrics were publicly available, as were area-based measures of deprivation. Because parcel-level assessor's data were continually updated for large regions, they may be more current and reliable than those of the American Community Survey (ACS) and can be used in place of the decennial census data. According to the Census Bureau, the ACS sampling rates will provide estimates for smaller areas that are similar to (but with larger SEs and CIs) those of the Census 2000 by using multiyear averages (3–10 years).[63]

The personal wealth metric had the advantage of being an objective, and not a self-reported, measure of SES. Further, the use of neighborhood wealth, a contextual variable measured at the individual level, could bypass the need for multilevel analysis, which might lead to a loss of randomization, reduced df, and lower statistical power.[26, 64]

Finally, the neighborhood wealth metric was not based on an arbitrary definition of neighborhood such as that found in census variables. The administrative boundaries of ABSMs have been known to not correspond to the "lived-in"/actual neighborhoods of influence.[54] An individual might live in a census unit without neighborhood facilities, such as health clinics, fast-food restaurants, parks, and recreational centers, yet have access to such a facility across the street in the adjacent census unit. Thus, such boundary issues can affect results in studies focusing on exposure and access to neighborhood facilities.[65,66]

Recent research facilitated by developments in GIS bypassed this problem by taking point-to-point distance measurements between homes and facilities of interest.[44,45,67] Such measurements are not possible with neighborhood indicators that apply to areas rather than points in space (e.g., health service areas or voting districts).[54] To address this constraint, researchers have used GIS distance buffering techniques to allocate the values of each census unit proportionally to the area overlapping the buffer around an individual's home.[68] Others have adjusted the buffer to take into consideration the sizes of the units' populations.[69] In one study, census units were weighted based on the number of respondents living in them.[70] Although buffered measures of ABSMs can reflect different areas of influence and thereby allocate more realistic “neighborhood” values to an individual, they still draw from data that have been aggregated within the boundaries of their original spatial unit. The bias that spatial aggregation introduces to any type of measurement should not be overlooked.[35, 71, 72] Its power to affect measurement is best illustrated by practices such as gerrymandering, where political interests manipulate the boundaries of voting districts to secure their candidate’s victory.[73]

In the current study, the personal wealth metric was disaggregated at the parcel where the subject lived. As for the neighborhood wealth metric, the current study defined neighborhood as being within a 10-minute walk of the subjects’ homes. Future studies could use and test different neighborhood sizes to fit any neighborhood of interest, while avoiding the MAUP.

Substituting personal and neighborhood wealth measures for conventional SES deprivation measures and indices would simplify both the measurement of deprivation/wealth and the research analytic framework. The use of these individual-level measures would avoid many of the complications associated with aggregated multilevel data. [64,74,75]

Limitations

The study comprised a sample of King County’s adult population. Areas with populations that have a different distribution of reported health status and residential assessed values might yield different results. Reported health status has been successfully used as an indicator of overall health and correlated with neighborhood deprivation.[76,77] Some studies have indicated that associations may vary among health outcome, gender, and other demographic and socioeconomic characteristics.[14,78]

This study relied on assessed property values data that were by law closely associated with actual property sale values. In parts of the country where property taxes represent a small portion of public revenues, assessed property values might not consistently match actual values and may therefore not reflect actual wealth or deprivation. The neighborhood wealth metric assumed a neighborhood of 833 meters in radius. Future studies should base individual neighborhood size on carefully defined hypotheses and should test the effect of different sizes on the outcomes of interest.

Conclusion

The personal and neighborhood assessed property values measures used in this study were more strongly related to reported health status than conventional area-based measures of neighborhood SES, including the Singh index. The use of these individual-level metrics of wealth or deprivation could help simplify future analyses.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE 1

Unadjusted association between assessed property value at the census tract–level and census SES measures

	Census Tract–Level Assessed Property Value		
	M (95% CI)		Spearman Corr
CENSUS AREA–LEVEL SES MEASURES			
% with College Education			
2.4%–20.9%	$196,677	($141,897, $251,457)	
21.0%–29.9%	$246,783	($186,267, $307,297)	
30.0%–45.1%	$324,084	($276,643, $371,525)	
45.2%–78.3%	$504,028	($465,559, $542,498)	
% College Educated per 10% Increase	$80,516	($67,674, $93,358)	0.72
Median Household Income			
$11,265–$39,554	$205,591	($146,879, $264,302)	
$39,555–$47,926	$245,213	($186,501, $303,925)	
$47,927–$60,125	$325,324	($275,429, $375,219)	
$60,126–$ 129,212	$489,147	($450,880, $527,416)	
Median Household Income per $10,000 Increase	$84,990	($74,121, $95,864)	0.72
% Below Poverty			
15.0%–49.6%	$225,115	($156,198, $294,032)	
9.8%–14.9%	$231,669	($167,123, $296,216)	
4.9%–9.7%	$342,755	($302,569, $384,940)	
0.2%–4.8%	$482,813	($439,400, $526,227)	
% Below Poverty per 10% Decrease	$114,454	($79,566, $149,342)	0.60
Singh SES Index			
124.3 – 197.8	$202,658	($132,731, $272,585)	
112.4 – 124.3	$219,806	($149,106, $29,0506)	
94.6 – 112.3	$287,279	($241,430, $33,3128)	
55.6 – 94.5	$476,964	($441,113, $51,2815)	
Singh Index per 10-point Decrease	$71,950	($60,492, $83,408)	−0.77

TABLE 2

Unadjusted association of personal and neighborhood wealth with individual-level demographics and SES

	Personal Wealth M	Neighborhood Wealth M	High Personal Wealth[a] OR	(95% CI)	High Neighborhood Wealth[b] OR	(95% CI)
INDIVIDUAL-LEVEL DEMOGRAPHICS						
Age (years)						
18–24	$325,400	$285,400	1.00		1.00	
25–34	$252,500	$248,500	0.27	(0.06, 1.13)	0.38	(0.15, 1.01)
35–44	$327,400	$279,200	1.06	(0.36, 3.18)	0.65	(0.28, 1.51)
45–54	$333,800	$288,000	0.92	(0.31, 2.70)	0.80	(0.36, 1.81)
55–64	$338,200	$278,700	1.06	(0.36, 3.10)	0.63	(0.28, 1.42)
65–74	$318,900	$278,300	1.36	(0.46, 4.07)	0.70	(0.30, 1.62)
≥75	$341,500	$287,800	1.22	(0.40, 3.73)	0.80	(0.34, 1.89)
Race and ethnicity						
White, non-Hispanic	$336,000	$285,100	1.00		1.00	
Black, non-Hispanic	$254,200	$254,300	**0.39**	(**0.17, 0.91**)	**0.44**	(**0.23, 0.85**)
Hispanic	$251,600	$247,100	0.32	(0.08, 1.32)	0.32	(0.10, 1.03)
Asian	$339,700	$277,000	0.88	(0.51, 1.54)	0.75	(0.45, 1.23)
Other	$252,700	$218,900	0.21	(0.03, 1.55)	0.14	(0.02, 1.01)
INDIVIDUAL-LEVEL SES						
Education						
High school graduate or less	$241,200	$238,400	1.00		1.00	
Some college or technical school	$274,600	$254,200	1.79	(0.85, 3.78)	1.18	(0.70, 2.00)
College graduate or higher	$381,100	$306,600	**5.92**	(**3.08, 11.35**)	**3.40**	(**2.19, 5.28**)
Employment						
Employed	$323,800	$278,200	1.00		1.00	
Homemaker	$445,900	$334,100	**3.54**	(**2.19, 5.73**)	**2.07**	(**1.30, 3.29**)
Student	$295,900	$255,800	0.96	(0.29, 3.18)	0.77	(0.27, 2.20)
Retired	$340,500	$284,500	**1.52**	(**1.07, 2.16**)	1.16	(0.85, 1.58)

	Personal Wealth M	Neighborhood Wealth M	High Personal Wealth[a] OR (95% CI)		High Neighborhood Wealth[b] OR (95% CI)	
Unemployed	$229,400	$246,200	**0.21**	(**0.07, 0.68**)	**0.39**	(**0.19, 0.77**)
Annual Household Income						
< $25,000	$207,900	$226,000	1.00		1.00	
$25,000-$34,999	$241,200	$242,400	2.39	(0.56, 10.12)	2.52	(0.97, 6.55)
$35,000-$49,999	$256,400	$243,000	2.30	(0.60, 8.76)	1.99	(0.81, 4.93)
$50,000-$74,999	$298,100	$266,800	**4.27**	(**1.24, 14.74**)	**3.31**	(**1.43, 7.68**)
$75,000-$99,999	$329,600	$282,600	**5.21**	(**1.51, 18.02**)	**4.71**	(**2.05, 10.85**)
≥ $100,000	$460,900	$342,900	**21.62**	(**6.77, 69.05**)	**12.67**	(**5.81, 27.66**)
Own or Rent Current Residence						
Own	$360,600	$293,300	1.00		1.00	
Rent	$192,700	$227,000	**0.20**	(**0.11, 0.38**)	**0.26**	(**0.16, 0.42**)

[a]High personal wealth is assessed property value that are >$567,500 (Jumbo Loan Cut-off for King County in 2009–2010 and close to the top 10th percentile of $555,900 in study)

[b]High neighborhood wealth is assessed neighborhood property values that are >$400,000 (Top 14th percentile of neighborhood property values in study)

Bold indicates significance at the *P*<0.05 level for the Ors

TABLE 3

Unadjusted and adjusted associations of a self-reported Fair or Poor general health status with individual-level personal and neighborhood wealth and area-level SES variables

	UNADJUSTED ANALYSES			ADJUSTED ANALYSES (without Income)[a]		
	OR (95% CI)		DIC *b*	OR (95% CI)		DIC *b*
INDIVIDUAL-LEVEL SES						
Personal Wealth						
$19,907–$208,000	1		1451	1		1365
$208,001–$272,000	**0.71**	(**0.52, 0.98**)		0.97	(0.67, 1.41)	
$272,001–$379,590	**0.35**	(**0.24, 0.51**)		**0.51**	(**0.32, 0.77**)	
$379,591–$3,069,000	**0.19**	(**0.12, 0.29**)		**0.34**	(**0.20, 0.57**)	
Personal Wealth per $50K Increase	**0.85**	(**0.80, 0.89**)	1468	**0.93**	(**0.88, 0.97**)	1378
Neighborhood Wealth						
$70,381.16–$193,184.09	1		1485	1		1376
$193,184.10–$246,173.14	0.84	(0.60, 1.18)		0.88	(0.62, 1.24)	
$246,173.15–$331,233.57	**0.66**	(**0.46, 0.93**)		0.76	(0.52, 1.10)	
$331,233.58–$1,315,833.63	**0.27**	(**0.17, 0.41**)		**0.41**	(**0.25, 0.65**)	
Neighborhood Wealth per $50K Increase	**0.81**	(**0.75, 0.87**)	1482	**0.87**	(**0.81, 0.94**)	1374
AREA-LEVEL SES						
College Education (%)						
2.4–20.9	1		1507	1		1394
21.0–29.9	0.82	(0.56, 1.19)		0.92	(0.63, 1.35)	
30.0–45.1	**0.60**	(**0.40, 0.89**)		0.78	(0.52, 1.16)	
45.2–78.3	**0.41**	(**0.25, 0.64**)		0.63	(0.38, 1.02)	
College Educated per 10% Increase	**0.78**	(**0.70, 0.87**)	1499	**0.87**	(**0.77, 0.98**)	1385
Median Household Income						
$11,265–$39,554	1		1501	1		1384
$39,555–$47,926	1.02	(0.71, 1.51)		1.15	(0.77, 1.72)	

	UNADJUSTED ANALYSES			ADJUSTED ANALYSES (without Income)[a]		
	OR	(95% CI)	DIC [b]	OR	(95% CI)	DIC [b]
$47,927–$60,125	**0.57**	(**0.38, 0.87**)		0.67	(0.43, 1.04)	
$60,126–$129,212	**0.44**	(**0.27, 0.71**)		0.62	(0.37, 1.01)	
Median Household Income per $10K Increase	**0.77**	(**0.69, 0.86**)	1492	**0.84**	(**0.74, 0.94**)	1381
% Below Poverty						
15.0–49.6	1		1502	1		1382
9.8–14.9	1.01	(0.69, 1.46)		1.22	(0.82, 1.83)	
4.9–9.7	0.92	(0.60, 1.40)		1.10	(0.72, 1.71)	
0.2–4.8	**0.41**	(**0.26, 0.66**)		**0.60**	(**0.36, 0.96**)	
% Below Poverty per 10% Decrease	**0.72**	(**0.57, 0.90**)	1504	0.87	(0.68, 1.12)	1388
Singh SES Index						
124.3 – 197.8	1		1499	1		1391
112.4 −124.3	1.20	(0.82, 1.74)		1.40	(0.96, 2.04)	
94.6 – 112.3	0.85	(0.57, 1.26)		1.05	(0.70, 1.55)	
55.6 – 94.5	**0.39**	(**0.24, 0.64**)		**0.56**	(**0.33, 0.93**)	
Singh Index per 10-point Decrease	**0.83**	(**0.76, 0.91**)	**1497**	**0.89**	(**0.83, 0.96**)	**1395**

Bold indicates significance at the 0.05 level.

[a] Adjusted for individual-level gender, age, race, education, employment, and home ownership status. Analyses adjusting for individual-level gender, age, race, education, employment, home ownership status, and income. (*n*=1693 due to missing income) not shown.

[b] Low Deviance Information Criteria (DIC) indicates best Model Fit.