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Neighborhood Socioeconomic Status Predicts Health After Hospitalization for Acute Coronary Syndromes: findings from TRACE-CORE (Transitions, Risks, and Actions in Coronary Events – Center for Outcomes Research and Education)

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Abstract

Objective—To explore the influence of contextual factors on health-related quality of life (HRQoL), which is sometimes used as an indicator of quality of care, we examined the association of neighborhood socioeconomic status (NSES) and trajectories of HRQoL after hospitalization for acute coronary syndromes (ACS).

Methods—We studied 1,481 patients hospitalized with ACS in Massachusetts and Georgia querying HRQoL via the mental and physical components of the SF-36 (MCS and PCS) and the physical limitations and angina-related HRQoL subscales of the Seattle Angina Questionnaire (SAQ) during hospitalization and at 1-, 3-, and 6-months post-discharge. We categorized participants by tertiles of the Neighborhood Deprivation Index (a residence-census tract-based measure) to examine the association of NSES with trajectories of HRQoL after adjusting for individual SES and clinical characteristics.

Results—Participants had mean age 61.3 (SD: 11.4) years; 33% were female; 76%, non-Hispanic white; 11.2% had household income below the federal poverty level. During 6 months post-discharge, living in lower NSES neighborhoods was associated with lower mean PCS scores (1.5 points for intermediate NSES; 1.8 for low) and SAQ scores (2.4 and 4.2 points) versus living in high NSES neighborhoods. Neighborhood SES was more consequential for patients with lower individual SES. Individuals living below the federal poverty level had lower average MCS and SAQ physical scores (3.7 and 7.7 points, respectively) than those above.

Conclusions—Neighborhood deprivation was associated with worse health status. Using HRQoL to assess quality of care without accounting for individual and neighborhood SES may unfairly penalize safety net hospitals.

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Keywords

socio-economic status; health-related quality of life; cardiovascular disease; and quality of care

Introduction

Every year, about 1.2 million adults in the United States are hospitalized with acute coronary syndrome (ACS). (1) While most patients are discharged alive, almost 30% have diminished quality of life for 6 months post-ACS discharge.(2) Thus, the American Heart Association (AHA) has called for additional research on determinants of functional status and health-related quality of life (HRQoL) among adults with cardiovascular disease.(3)

It is known that individuals with low socioeconomic status (SES) have worse HRQoL than the general population (4, 5), especially those with cardiovascular disease (6–8). The few studies that have examined neighborhood socioeconomic status (NSES) and HRQoL have mostly focused on the general population (9–11); none have studied HRQoL following hospitalization for an ACS. Yet neighborhood SES is a risk factor for heart disease (12) and death (13), and is associated with many factors that affect cardiovascular health, such as, the built environment, access to healthy foods (14), and smoking and physical activity (15, 16). Thus, neighborhood SES deserves study as a contributor to health following hospitalization for ACS.

Additionally, most hospitals' patients are geographically concentrated, with safety net hospitals treating a disproportionate share of people from poor neighborhoods. Given that post-discharge patient health may become a hospital quality metric (17, 18), if NSES predicts variations in quality of life after an ACS (19), this would have important implications for a health outcome quality metric. Yet, we could not find any study of the relationship between neighborhood SES and health status in cardiovascular disease.

While there are many plausible explanations for why living in a better-resourced neighborhood is typically associated with better health, the relationships between quality of life and individual and neighborhood SES remain unclear. Therefore, we conducted this study to examine the independent effect of NSES on health status post ACS hospitalization. We hypothesized that low neighborhood SES would predict poor health-status trajectories even after accounting for patient co-morbidities and individual SES, and that the effect of low NSES would be worse for low-SES ACS patients than for those with more individual resources.

Methods

Study Sample and Design

We used data from TRACE-CORE, a prospective longitudinal cohort study of adults who survived hospitalization with acute coronary syndrome. Patients were recruited from April 2011 to May 2013 from 6 community and teaching hospitals in central Massachusetts and Georgia. Further details regarding study design and recruitment and retention of TRACE-CORE participants are available.(20, 21)

TRACE-CORE participants were interviewed at discharge either during the index hospitalization for ACS or via telephone 72 hours after discharge. Patients were then followed via structured computer-assisted telephone interviews at 1, 3, and 6 months post-discharge. Trained study personnel abstracted clinical characteristics from medical records. This study was approved by the University of Massachusetts Medical School Institutional Review Board.

Health-Related Quality of Life (HRQoL)

Study outcomes included generic health-related quality of life (HRQoL), disease-specific HRQoL, and a disease-specific measure of physical limitations. We used the SF-36 (22) as our generic measure of HRQoL and the Seattle Angina Questionnaire (SAQ) (23) a disease-specific measure. The SF-36 contains two subscales, Mental Component Subscale (MCS) and Physical Components Subscale (PCS), each with a range of 0–100, with higher scores indicating better HRQoL. Each subscale is calibrated to a population mean of 50 and standard deviation of 10, with higher scores representing better health. The SF-36 has strong psychometric properties (24) and has been validated in patients with cardiovascular disease. (25) The SAQ is designed to capture disease-specific HRQoL, including physical limitations. The SAQ has strong psychometric properties (26) and has been validated for use with patients with coronary artery disease, including those undergoing coronary angiography (27) and with chronic stable angina. (26)

Neighborhood Socioeconomic Status (SES)

We used the neighborhood deprivation index (NDI) (28) based on American Community Survey's 2010 census data to measure neighborhood SES. The NDI includes 5 domains: neighborhood poverty rate, occupational characteristics, housing tenure, employment, and educational distribution (28). The NDI is calculated from these factors, based on a principal components analysis. It has a mean of 0 and a standard deviation of 1; higher scores indicate greater deprivation (i.e. lower NSES) (28). For analysis, we categorized neighborhood deprivation in tertiles: high (NDI score -1.51 to -0.59), intermediate (NDI score -0.59 to 0.30) and low neighborhood SES (NDI score 0.30 to 3.75).

Assigning an NDI score to an individual started with geocoding their self-reported address at discharge to a 2010 census tract. Geocoding involved two steps. First we used the Google maps application programming interfaces through the R package “geocode” to determine longitude and latitude (29). This program also specifies the accuracy with which it was able to match an address to a set of geographic coordinates (29). Addresses that could only be matched by zipcode are classified as approximate matches, so we excluded these from our study. Then, we used Quantum Geographic Information Systems (QGIS) (30) to match geographic coordinates for each patient's address to a census tract. Census tracts were defined using 2010 shapefiles from the US census. (31) Information needed to calculate the NDI for each census tract was downloaded and matched to TRACE-CORE participants.

Potential Confounders

Potential patient-level confounders included: demographics (including individual-level socioeconomic status), co-morbidities, and in-hospital factors. Demographic covariates were

age, sex, race/ethnicity, marital status, and living alone. All demographic characteristics were self-reported at baseline, except age which was abstracted from the medical record. Individual-level SES variables included: educational attainment, household income relative to the federal poverty level, usual source of care, and health insurance status. Patients self-reported their highest level of educational attainment, household size and categories of household income (<\$10,000, \$10,000–19,999, \$20,000–34,999, \$35,000–49,000, \$50,000–\$74,999, \$75,000–99,999, \$100,000–149,999 or \$150,000 or more). Based on reported household income and size we calculated the income to poverty ratio (IPR), a measure of the extent to which individuals are above the federal poverty level set by the Department of Health and Human Services (32). For example, an IPR score of 1 means that the patient's household income is at 100% of the federal poverty level; and a score of 3, that it is at 300% of FPL.

Patients were asked at one month following discharge, "Is there a place that you usually go to when you are sick or need advice about your health?". We coded those reporting no place to go for healthcare as having no usual source of care. Insurance status was captured from medical record abstraction at discharge as: employer or individual paid insurance, Medicare, Medicaid, or none. Medical record review provided information regarding co-morbidities present before the index hospitalization including lung disease, anemia, high blood pressure, peripheral vascular disease, arthritis, history of heart disease, diabetes, stroke or transient ischemic attack, and heart failure. Information regarding in-hospital exposures included in-hospital procedures, in-hospital complications, type of ACS, length of stay (LOS), and the Global Registry of Acute Coronary Events risk score (33). In-hospital procedures included Coronary Artery Bypass Graft (CABG) and Percutaneous Coronary Intervention (PCI). In-hospital complications included developing a major medical condition during the index hospitalization (e.g., acute kidney injury, atrial fibrillation or atrial flutter, heart failure). We categorized ACS type during the index admission as: non-ST elevated myocardial infarction (NSTEMI), ST-elevated myocardial infarction (STEMI) or unstable angina (UA) according to ACC/AHA criteria (34). Cases in which ACS type was not clear were adjudicated by a physician panel. Length of stay was abstracted from the medical record.

Statistical Analysis

We first examined distributions, means and standard deviations for all variables, and then bivariate relationships of demographic, individual socioeconomic factors, and medical factors with neighborhood SES categories with quality of life, separately for each outcome (MCS, PCS, SAQ HRQoL, and SAQ physical limitations), after accounting for potential confounder using hierarchical linear models. The models included random intercepts to address clustering of observations within patients (repeated measures) and patients within census tracts. Due to our primary focus on relationships among health trajectories, and individual and neighborhood SES, we chose *a priori* to study, in models to predict health over time, interactions between NSES and individual-level SES and between NSES and time using likelihood ratio tests of statistical significance. All models included age, sex, race/ethnicity and the household-specific income-to-poverty ratio (IPR). We added other covariates when their inclusion changed the estimate for the coefficient for NSES by at least 10%.

We used multiple imputation with predictive mean matching and chained equations to create 20 imputed datasets (35). Estimates were combined using Rubin's rules (36). Analyses were performed using Stata 13 (StataCorp, College Station, TX).

Results

Sample Characteristics

Among 2187 TRACE-CORE participants, we excluded those who died during the 6-month follow-up period (n=55), those with missing baseline MCS SF-36 scores (n=2), those missing subtype of ACS (n=51), and patients who were readmitted during the 6 months following discharge (n=477). An additional 108 patients (6.5%) were excluded from the analysis because they could not be matched to a census tract; of these, 89% were unmatched because their home address was given as a post office box. Thus, we studied 1481 TRACE-CORE participants. Many values of the health status measures were missing, mostly due to loss to follow-up; 1002 patients had these data at 1 month, 916 at 3 months and 890 at 6 months.

Patients were on average 61.0 (SD 11.4) years old (Table 1). Approximately 67% were male, and 76% were non-Hispanic white. About half of participants had a high school degree or less education, and 40.1% had a household income of less than \$35,000 per year. Eleven percent (11.2%) of patients were living under the federal poverty level. The majority of patients were admitted for an NSTEMI, roughly a third were admitted for unstable angina, and 16% were admitted for a STEMI (Table 2). About two thirds of patients stayed less than 4 days for their initial hospitalization of ACS, and 68% had undergone a percutaneous coronary intervention (PCI) during their initial hospitalization.

Neighborhood Characteristics

TRACE-CORE participants came from 508 census tracts (a median of 2 patients per tract (IQR 1–4)). Almost all census tracts were in Massachusetts (53.1%) or Georgia (41.6%). For all components of the NDI except for median house value, neighborhoods in the lowest neighborhood SES tertile had the lowest NDI scores on each component (Table 3). Neighborhoods (not TRACE-CORE participants) with low SES had an average of 23% of individuals with less than a high school degree, 29% under the federal poverty level, and 25% on supplemental nutrition assistance.

Patient Characteristics Associated with Living in Neighborhoods with Low SES

Patients in neighborhoods with the lowest NSES were younger, more likely to be female, to live alone and be Hispanic or non-white (Table 1). Patients living in lower NSES neighborhoods were also more likely to have lower individual SES including having less than a high school degree, a lower IPR, and more likely to be on Medicaid or Medicare (Table 1). Participants living in lower NSES neighborhoods were more likely to have a history of diabetes, several cardiovascular conditions (high blood pressure, history of heart disease and heart failure) and drug abuse (Table 2). During their initial hospitalization, participants in lower NSES neighborhoods were less likely to have had a STEMI and more likely to have no procedures (PCI or CABG) during their initial hospitalization (Table 2).

Patient Health Status Over Time

Overall, all components of patient health status (MCS, PCS, SAQ HRQoL, and SAQ Physical Limitations) improved over the 6 months following hospital discharge. The majority of the improvement in patient health status score occurred within 1 month of discharge. Individuals living in high SES neighborhoods had higher average patient health status scores (Figure 1) at discharge that did not attenuate during follow-up.

Interactions

The interaction between NSES and individual SES was significant for both MCS ($p<0.001$) and SAQ Physical Limitations ($p=0.03$), but not for SAQ HRQoL ($p=0.08$) or PCS ($p=0.85$) (Supplemental figure 1). The interactions all indicate larger HRQoL NSES-associated deficits for poorer patients living in poor neighborhoods than for patients with higher individual SES. There were no statistical interactions present between NSES and time for any components of patient health status (MCS $p=0.74$, PCS $p=0.58$, SAQ physical limitations $p=0.38$, SAQ HRQoL $p=0.26$).

Association between Neighborhood SES and Patient Health Status

Figure 2 illustrates the models of Supplemental table 1. Figure 2 shows predicted patient health status over time for several exemplary values of Income to Poverty Ratio or IPR and NSES. For IPR we consider being either in a household at the federal poverty level (IPR=1) or at 300% of the FPL (IPR=3). For NSES, we considered those living in neighborhoods with high vs. low SES tertiles. In all models, the association of HRQoL with NSES was weaker (a smaller coefficient) than the association with individual SES in multivariate models (Supplemental table 1 and Figure 2).

Discussion

We examined the association between NSES and patient health in the 6 months following hospitalization for an ACS, finding that patients who lived in *neighborhoods* with lower NSES had significantly worse patient health status at discharge, even after adjusting for individual SES and a rich array of clinical characteristics. The discrepancy was maintained throughout the 6-month follow-up, with residing in a poorer neighborhood being associated with worse patient health. Both individual and neighborhood SES mattered for health, with individual SES mattering more than NSES. Moreover, for two of our health status measures, MCS and SAQ physical limitations, combined individual and neighborhood poverty was worse than adding their individual effects would suggest.

Associations between NSES and health were strong and consistent, with low NSES neighborhoods associated with reductions in health. The effect on MCS was almost as large as the minimally important clinical difference amongst those with no income, e.g., a 5-point deficit in MCS (37). However, the magnitude of the association with other health outcomes was more modest. For example, the mean PCS score for individuals living in neighborhoods in the lowest NSES tertile was 1.8 lower than the mean for those living in the highest NSES tertile. Although a difference of this size may not be clinically important for an individual, it could matter at the population level.

The literature regarding NSES and HRQoL in the general adult population has found small effects for neighborhood deprivation (11, 38). For example, one study estimated reductions of 0.5 and 0.3 points for PCS and MCS scores, respectively, for each standard-deviation-sized increase in the neighborhood deprivation index, after controlling for several individual-level SES measures (38). This parallels our finding that patients living in the tertile with low NSES neighborhoods, whose mean neighborhood deprivation index was 2.5 SD lower than those in the high NSES tertile, averaged 1.8 points lower on the PCS. We confirmed other previous findings as well, in that individual SES was more consequential for HRQoL than NSES (10) and that the NSES effect held steady over time (11).

Our finding that individual SES is associated with poorer HRQoL in cardiovascular disease is also consistent with prior work (6–8). Despite the vast literature on individual SES and HRQoL we found only four studies that examined the interaction between individual SES and NSES: three did not find a statistically significant relationship (39–41) and one did (10). However, all of these studies were conducted in the general population. It is plausible that the combination of low individual and low neighborhood SES is particularly problematic for HRQoL following hospitalization, when patients are likely to need substantial social and material support.

Our study found statistically significant interactions between NSES and individual SES for MCS and SAQ physical limitations. This is also similar to the literature on the general population, where some studies have found significant effects of neighborhood SES on MCS but not PCS or vice versa (9, 39).

NSES could affect HRQoL after an ACS through several mechanisms. Individuals who live in lower SES neighborhoods may be more likely to engage in lifestyle behaviors that inhibit recovery after acute coronary syndrome. This is plausible, since poorer neighborhoods are associated with more cardiovascular risk factors, such as higher rates of obesity and weight gain in women (42–44), lower levels of physical activity and higher prevalence of smoking (45). NSES may also be related to other neighborhood-level risk factors such as a more adverse built environment with, e.g., fewer parks, or grocery stores with fruits and vegetables(46); and an elevated level of daily stress that may contribute to allostatic load or bodily “wear and tear” (47).

Neighborhood could also influence patient health after ACS through access to health care. For example, low NSES neighborhoods often have too few primary care doctors or clinics, or limited public transportation for getting to clinics. This could contribute to poorer outcomes either through later presentation to the hospital for an ACS or less access to preventive and follow-up services.

The American Heart Association has proposed patient health status as a quality metric (48), and both the Veterans Affairs Administration and the Centers of Medicare and Medicaid Services are exploring using patient health status measures as quality indicators after elective PCI (18). To create a “level the playing field” quality measures must be risk-adjusted among providers who serve very different patients (48). However, providers have expressed concern about how well these measures can discriminate between providers and

institutions with high and low quality of care (49). Our study adds to these concerns, since hospitals that serve patients from low NSES neighborhoods may be unfairly judged. Regardless of that, healthcare providers and hospitals can try to anticipate the needs of ACS patients as they are discharged home to high-risk neighborhoods. Actions could include: more intense discharge planning, post-discharge follow-up by community health workers and others, and discussions of neighborhood resources, barriers to self-care and access to follow-up medical care. Policy makers should keep the relationship between NSES and patient health status in mind as they consider using quality metrics based on measures of patient health.

This study has several limitations. First, participants with post office boxes listed for their home addresses were excluded from the analysis since we were unable to match these participants to a census tract. However, the number of individuals was small (~6%) and matched and unmatched participants were similar in their patient health status scores (MCS $p=0.980$, PCS $p=0.204$, SAQ HRQoL $p=0.628$, SAQ physical limitations $p=0.06$). Second, since our patients came from just 6 hospitals in the eastern US, these findings might not generalize to other areas. Moreover, most of the hospitals were teaching hospitals which may affect generalizability to non-teaching hospitals. When we included teaching status in our models, the association between NSES and patient health status was unchanged. Third, much data were missing, both due to loss to follow-up and about 20% of participants not reporting individual-level income data. However, a complete analysis and one using multiply-imputed data provided substantively similar findings. Fourth, while patients could have moved during the follow-up period, this was probably quite uncommon, since the follow-up period was only 6 months and only 4.7% of participant's zipcodes changed during that time. Fifth, we did not study any "environmentally-oriented" neighborhood characteristics, such as pollution or segregation. Sixth, our findings only apply to ACS patients who were discharged but not readmitted, since we excluded patients who were readmitted within 6 months. We initially decided to exclude those who were readmitted as it is unknown how readmissions will be handled should patient health status become a quality metric. However, this most likely did not affect our results as neighborhood SES was not associated with readmission. Thus, it seems unlikely that our findings would be affected. Sixth, because we do not have a pre-ACS measure of patient health status, it isn't possible for us to know whether individuals who live in lower NSES neighborhoods always have worse patient health status or if this happens only after an ACS. However, regardless of whether this effect is only after ACS or not, hospitals with patients from lower NSES neighborhoods would be penalized if patient health status becomes a quality metric. In compensation for these limitations, these rich longitudinal data from patient interviews and medical and administrative records allowed us to explore important relationships among personal and contextual patient factors and patient health following hospitalization for an ACS.

In summary, we found that patients living in neighborhoods with lower NSES had worse health following discharge for an ACS, even after adjusting for individual SES and clinical characteristics. This difference was present at discharge and sustained during 6 months of follow-up. For the mental health-related quality of life and physical limitations due to

angina, the deleterious effect of NSES on patient health status was significantly worse for patients with lower individual-level SES.

We draw two lessons from these findings: 1) caution should be used when interpreting post-discharge health status as a measure of healthcare quality, and 2) research is needed to identify interventions at the provider, hospital, neighborhood and municipal levels to address the disparities associated with both individual and community-level socioeconomic stress.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Patient health status by tertiles of neighborhood socioeconomic status (SES)* among 1,481 adults hospitalized with Acute Coronary Syndrome, TRACE-CORE, 2011–2013

*Neighborhood SES, was measured using the neighborhood deprivation indices (NDI), as proposed by Messer et. al.(1) It has a mean of 0 and a standard deviation of 1; with higher scores indicating greater deprivation or worse neighborhood socioeconomic status.(1)

†Long dash lines represent the average patient health status among those living in the tertile of neighborhoods with the lowest neighborhood socioeconomic status, the short dash represents those in average neighborhoods, and the solid line represents those living in neighborhoods with the highest neighborhood socioeconomic status.

Figure 2.

Predicted patient health status over time for those in the lowest and highest tertiles of neighborhood socioeconomic status (SES)* and those below the federal poverty level and those at least 300% of the federal poverty level among 1,481 adults hospitalized with Acute Coronary Syndrome, TRACE-CORE, 2011–2013

*Neighborhood SES, was measured using the neighborhood deprivation indices (NDI), as proposed by Messer et. al.(1) It has a mean of 0 and a standard deviation of 1; with higher scores indicating greater deprivation or worse neighborhood socioeconomic status.(1)

†Short dashed lines represent the predicted patient health status among those living in the tertile of neighborhoods with the lowest neighborhood socioeconomic status and whose individual-level income is under the federal poverty level. Long dashed lines represent the predicted patient health status among those living in the tertile of neighborhoods with the lowest neighborhood socioeconomic status and whose individual-level income is at least 300% of the federal poverty level. Medium dashed lines represent the predicted patient health status among those who living in the tertile of neighborhoods with the highest neighborhood socioeconomic status and whose individual-level income is under the federal poverty level. Solid lines represent the predicted patient health status among those living in the tertile of neighborhoods with the highest neighborhood socioeconomic status and whose individual-level income is at least 300% of the federal poverty level.

Socio-demographic and individual-level socioeconomic characteristics associated with neighborhood socioeconomic status* tertile among 1,481 adults hospitalized with Acute Coronary Syndrome, TRACE-CORE, 2011–2013

Table 1

	Neighborhood SES				P-value
	Full Sample (n=1481)	High (n=498)	Intermediate (n=490)	Low (n=493)	
Socio-demographic					
Average Age (SD)	61.0 (11.4)	61.9 (11.5)	60.9 (11.7)	60.2 (11.0)	0.041
Male, %	66.5	73.5	65.5	60.5	<0.001
Race/ethnicity, %					
Asian or Pacific Islander	0.9	1.8	0.4	0.4	<0.001
Black	15.3	2.4	11.4	32.1	
Native American or Alaska Native	0.9	0.6	1.0	1.0	
White	77.3	89.4	81.2	61.1	
More than one race	4.2	4.2	5.1	3.3	
Hispanic, %	3.2	2.8	2.3	4.0	<0.001
Lives Alone, %	22.0	18.9	19.0	28.0	0.001
Marital status, %					
Single	11.4	8.2	12.0	13.8	<0.001
Married	58.7	67.9	60.0	48.1	
Separated/divorced	18.8	13.3	17.1	26.0	
Widowed	11.2	10.6	10.8	12.0	
Socioeconomic Status					
Education, %					
Less than high-school	17.8	7.9	16.5	29.0	<0.001
High-school	30.0	24.4	32.5	32.1	
Some college, trade school	27.6	28.0	30.0	24.8	
College graduate	25.1	39.8	21.0	14.2	
Household Income, %					
<\$4,999\$	40.1	26.1	37.2	57.8	<0.001
35,000–74,999\$	31.3	28.5	38.0	27.2	
>75,000	28.6	45.5	24.8	15.0	

	Neighborhood SES				P-value
	Full Sample (n=1481)	High (n=498)	Intermediate (n=490)	Low (n=493)	
Income to Poverty Ratio, %	2.5	2.6	2.3	2.0	<0.001
Less than 1	11.2	11.4	11.4	18.7	<0.001
1-2.9	19.0	15.3	22.2	19.7	
At least 3	69.8	81.1	66.3	61.7	
No usual source of care, %	13.9	12.7	10.2	19.2	0.134
Insurance status, %					
Employer or Individual	69.4	78.5	73.1	56.4	<0.0010
Medicare	16.8	12.1	13.5	24.8	
Medicaid	5.1	3.0	4.1	8.1	
None	8.9	6.4	9.4	10.8	

* Neighborhood SES, was measured using the neighborhood deprivation indices (NDI), as in Messer et. al.(28) It has a mean of 0 and a standard deviation of 1; higher scores indicate greater deprivation, that is, worse neighborhood socioeconomic status.(28)

Clinical characteristics and in-hospital management of ACS by neighborhood socioeconomic status* tertile for 1,481 adults hospitalized with Acute Coronary Syndrome, TRACE-CORE, 2011–2013

Table 2

Co-morbidities	Neighborhood SES				P-value
	Full Sample (n=1481)	High (n=498)	Intermediate (n=490)	Low (n=493)	
Lung disease, %	16.3	14.3	15.9	18.7	0.061
Anemia, %	4.3	5.0	4.1	3.9	0.366
High blood pressure, %	73.6	68.1	73.9	78.9	<0.001
Peripheral Vascular Disease, %	8.6	9.0	8.2	8.7	0.859
Arthritis, %	19.3	19.1	18.4	20.5	0.575
History of Heart Disease, %	46.8	39.8	47.0	53.8	<0.001
Diabetes, %	34.6	25.9	32.5	45.4	<0.001
History of Spinal Diseases, %	5.7	6.4	4.7	6.1	0.815
Stroke, %	7.9	5.2	8.6	10.8	0.001
Heart failure, %	11.8	8.0	11.6	15.8	<0.001
Cancer, %	11.6	11.5	12.0	11.4	0.967
Renal failure, %	8.9	8.0	7.8	11.0	0.107
Atrial fibrillation, %	6.4	6.2	5.7	7.1	0.574
Hyperlipidemia, %	68.1	69.5	67.1	67.6	0.513
History of Alcohol Abuse, %	4.7	3.8	5.7	4.7	0.526
History of Drug Abuse, %	4.5	2.8	3.1	7.7	<0.001
Family history of heart disease, %	53.8	54.0	53.5	53.8	0.933

In hospital factors

Type of ACS, %					
STEMI	15.9	18.3	16.9	12.4	0.028
NSTEMI	54.0	52.0	55.7	54.2	
UA	30.2	29.7	27.4	33.5	
Length of stay, %					
0–1 day	21.7	25.3	18.8	21.1	0.067
2–3 days	45.0	44.8	45.7	44.6	

Co-morbidities	Neighborhood SES				P-value
	Full Sample (n=1481)	High (n=498)	Intermediate (n=490)	Low (n=493)	
4+ days	33.2	29.9	35.5	34.3	
Any in hospital complications, %	19.8	18.3	23.1	18.1	0.936
Any in hospital procedures, %					
None	20.5	17.1	18.6	25.8	0.001
Percutaneous Coronary Intervention	67.3	69.9	67.8	64.3	
Coronary Artery Bypass Graft	12.2	13.1	13.7	9.9	
Average GRACE risk score (SD)	93.7 (27.7)	93.4 (27.8)	94.6 (28.1)	93.2 (27.1)	0.667

* Neighborhood SES, was measured using the neighborhood deprivation indices (NDI), as proposed by Messer et. al.(28) It has a mean of 0 and a standard deviation of 1; with higher scores indicating greater deprivation or worse neighborhood socioeconomic status.(28)

Table 3
 Characteristics of 50 neighborhoods included in the TRACE-CORE study by tertiles of neighborhood socioeconomic status (SES) *

	All Census Tracts (n=508)	Neighborhood SES			p-value
		High (n=160)	Intermediate (n=176)	Low (n=172)	
Average % of Individuals in Each Census Tract (SD)					
Males in managerial positions	31.8 (14.7)	46.3 (11.5)	30.3 (9.2)	19.7 (9.4)	<0.001
Households with an income < 30k	34.4 (17.6)	17.9 (6.5)	30.9 (8.4)	53.2 (13.6)	<0.001
Individuals < high school degree	13.6 (8.8)	5.8 (2.9)	12.0 (4.5)	22.5 (7.8)	<0.001
Households with > 1 person per room	1.7 (2.0)	0.77 (1.2)	1.3 (1.3)	2.9 (2.4)	<0.001
Unemployment	6.4 (3.0)	4.7 (1.7)	6.1 (2.1)	8.3 (3.7)	<0.001
Under federal poverty line	15.8 (12.8)	5.4 (3.1)	12.0 (5.3)	29.3 (12.1)	<0.001
On cash assistance welfare	2.4 (2.8)	1.3 (1.1)	1.8 (1.5)	4.1 (3.8)	<0.001
On Supplemental Security Income	5.4 (4.1)	2.3 (1.5)	4.6 (2.1)	9.0 (4.6)	<0.001
On Supplemental Nutrition Assistance Program	13.2 (11.4)	4.1 (2.6)	9.9 (4.0)	25.1 (11.4)	<0.001
Female headed households with dependents under 18	12.5 (9.3)	6.1 (3.5)	10.6 (5.2)	20.3 (10.6)	<0.001
Average Median Home Value (\$)	236,610 (137, 589)	267,200 (82,622)	169,960 (124,598)	276,355 (163,878)	0.491

* Neighborhood SES, was measured using the neighborhood deprivation indices (NDD), as proposed by Messer et. al.(1) It has a mean of 0 and a standard deviation of 1; with higher scores