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Neighborhood Socioeconomic Disadvantage and Abnormal Birthweight

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Abstract

Objective: To examine whether exposure to community or neighborhood socioeconomic disadvantage as measured by the Area Deprivation Index (ADI) is associated with risk of abnormal birthweight at birth among nulliparous individuals with singleton gestations.

Methods: This was a secondary analysis from the prospective cohort Nulliparous Pregnancy Outcomes Study: Monitoring Mothers-To-Be. Participant addresses at cohort enrollment between 6 and 13 weeks were geocoded at the Census tract level and linked to the 2015 ADI. The ADI, which incorporates the domains of income, education, employment, and housing quality into a composite national ranking of neighborhood socioeconomic disadvantage, was categorized by quartiles (quartile 1, least disadvantaged, reference; quartile 4, most disadvantaged). Outcomes

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were large-for-gestational age (LGA, birthweight ≥90th percentile) and small-for-gestational age (SGA, birthweight <10th percentile) in comparison with appropriate-for-gestational age (AGA, birthweight 10th to 90th percentile) as determined using the 2017 U.S. natality reference data, standardized for fetal sex. Multinomial logistic regression models adjusted for potential confounding variables.

Results: Of 8,983 assessed deliveries in the analytic population, 12.7% (n=1,143) were SGA, 8.2% (n=738) were LGA, and 79.1% (n=7,102) were AGA. Pregnant individuals living in the highest ADI quartile (quartile 4: 17.8%) had an increased odds of delivering a SGA infant compared with those in the lowest referent quartile (quartile 1: 12.4%) (adjusted odds ratio, aOR: 1.32; 95% CI: 1.09–1.55). Pregnant individuals living in higher ADI quartiles (quartile 2: 10.3%, quartile 3: 10.7%, and quartile 4: 9.2%) had an increased odds of delivering a LGA infant compared with those in the lowest referent quartile (quartile 1: 8.2%) (aOR: quartile 2: 1.40; 95% CI: 1.19–1.61; quartile 3: 1.35; 95% CI: 1.09–1.61; and quartile 4: 1.47; 95% CI: 1.20–1.74).

Conclusions: Nulliparous pregnant individuals living in United States neighborhoods with higher area deprivation were more likely to have abnormal birthweight at both extremes.

Keywords

large-for-gestational age; small-for-gestational age; macrosomia; neighborhood disadvantage; social determinants of health; pregnancy; area deprivation index; birthweight

INTRODUCTION

Abnormal birthweight includes small for gestational age (SGA) at birth defined as a birthweight below the 10th percentile for gestational age, and large for gestational age (LGA) at birth defined as greater than or equal to the 90th percentile for gestational age.[1–4] Abnormal birthweight commonly occurs in the setting of maternal comorbidities, including pregestational diabetes,[5] obesity,[6] and substance use disoders,[7] as well as with adverse pregnancy outcomes, including hypertensive disorders of pregnancy and gestational diabetes.[8,9] Abnormal birthweight is associated with long-term adverse cardiovascular and metabolic health outcomes in the postpartum individual and child.[10–12] Infants born LGA are more likely to experience childhood obesity, and those born SGA are more likely to die during childhood.[13]

Greater exposure to adverse social determinants of health, including lower income, less education, unemployment, structural racism, and poor housing, measured at the individual level, is associated with abnormal birthweight.[14,15,16,17,18] Adverse individual social determinants of health that influence birthweight include maternal overnutrition and undernutrition,[19] exposure to social stress,[20] and contact with toxic chemicals.[21] However, less is understood about the role of community-level social determinants of health on birthweight.

Understanding the relative influence of community-level social determinants of health on abnormal birthweight is important for developing broader structural interventions and public policy changes.[22,23] Data primarily from European settings have suggested that neighborhood deprivation is associated with SGA.[24] However, a community-level metric of adverse social determinants of health has yet to be widely evaluated in association with abnormal birthweight in the U.S. The Area Deprivation Index (ADI) is such a measure. The ADI reflects a geographic area's level of socioeconomic deprivation and was created to quantify how multiple community-level measures of adverse social determinants of heath affect health outcomes within U.S. neighborhoods.[25,26]

The objective of the current analysis was to examine the association between community or neighborhood socioeconomic disadvantage as measured by the ADI and the likelihood of abnormal birthweight, including SGA and LGA, among nulliparous pregnant individuals. We hypothesized that increasing neighborhood socioeconomic disadvantage would be associated with an increased likelihood of both extremes of abnormal birthweight.

METHODS

This is a secondary analysis of the Nulliparous Pregnancy Outcomes Study: Monitoring Mothers-to-Be, a prospective cohort that was designed to evaluate maternal and environmental contributors to adverse pregnancy outcomes (ClinicalTrials.gov identifier NCT01322529).[27] This study was conducted at eight U.S. medical centers (Case Western Reserve University, Columbia University, Indiana University, University of Pittsburgh, Northwestern University, University of California at Irvine, University of Pennsylvania, and the University of Utah) from October 2010 to September 2013. Data were centrally managed by the Data Coordinating and Analysis Center at RTI International. Each site's institutional review board approved the study before initiation and all participants gave written informed consent for participation.

Enrollment criteria included pregnant individuals <14 weeks' gestation, no prior delivery at 20 weeks' gestation or later, a viable singleton pregnancy with estimated gestational age from 6 weeks 0 days to 13 weeks 6 days, and intention to deliver at a participating site hospital. Ineligible individuals included those who had an age <13 years, history of three or more pregnancy losses, donor oocyte pregnancy, planned pregnancy termination, fetal malformations likely to be lethal, fetal aneuploidy known at enrollment, previous enrollment in the study, and inability to provide informed consent. For this analysis, individuals without address data were excluded.

As previously described,[27] enrolled individuals completed three study visits during pregnancy and one at delivery. For the current analysis, each participant's primary home address was obtained via structured interview at the first visit (completed 6 to 13 weeks' gestation), which was then used to calculate the ADI. A current address of record is an accurate indicator of patient exposure to neighborhood deprivation when evaluating healthcare disparities through a three year timeframe.[28] Baseline socio-demographic characteristics inclusive of individual-level social determinants of health included age, insurance status, self-reported race and ethnicity assessed as a social determinant of health, education completed, tobacco use, and household income (reported relative to the US poverty level for household size). Clinical comorbidities included pre-pregnancy body mass index (BMI), pregestational diabetes, and chronic hypertension. Birthweight was obtained at delivery via medical record abstraction.

The ADI reflected a geographic area's (i.e., the Census Block Group) level of socioeconomic deprivation and generated a composite score that was converted to a rank based on a locale's national percentile from 0 to 100.[25] The Census Block Group was the geographic unit of construction, as the Census Block Group was considered the closest approximation to a "neighborhood." A Block Group with a ranking of 1 indicated the lowest level of "disadvantage" within the U.S. and an ADI with a ranking of 100 indicated the highest level of "disadvantage." This validated composite area-based indicator composed of 17 U.S. Census indicators spanned 4 theoretical domains of income, education, employment, and housing quality.[29,30] The ADI is available online at https://www.neighborhoodatlas.medicine.wisc.edu/.

The ADI was first released in 2015 and has since been updated once every 5 years with new U.S. Census data. The 2015 version was used for the current analysis as this was most proximate to the period of data collection. Use of a more recent deprivation index has been shown to be a valid measure of neighborhood deprivation using older data.[30] The ADI was analyzed in quartiles within the current cohort from the lowest ADI or least deprivation (quartile 1 [Q1], reference) to the highest ADI or most deprivation (quartile 4 [Q4]), consistent with prior analyses assessing a community-level metric of social determinants of health.[31,32]

The primary outcome was abnormal birthweight determined as standardized measures at both extremes, (i.e., LGA and SGA). Gestational age at delivery was determined based on the best obstetric estimate.[2] We defined LGA as a birthweight in grams ≥90th percentile and SGA as a birth weight in grams <10th percentile using an updated infant sex-specific 2017 U.S. natality reference.[1] Compared to other reference charts, this reference chart includes the most recent sociodemographic composition in the U.S. and addresses concerns regarding the validity of prior last menstrual period-based references for gestational age determination at birth by using an obstetric estimate-based reference.[1]

We descriptively compared the frequency of individual social determinants of health and clinical characteristics across the exposure (ADI quartiles) and outcome (AGA [reference], SGA, LGA) using chi-square tests for categorical variables and Wilcoxon rank sum tests for continuous variables. Because we compared infants born SGA and LGA to those born AGA as the referent, we employed a multinomial logistic regression model to model a non-binary outcome.[33] Unadjusted and adjusted odds ratios (OR, aOR) with 95% confidence intervals (95% CI) were calculated. We selected covariates for inclusion in the multivariate model based on a review of the literature and examination of a directed acyclic graph (DAG) (Appendix 1, available online at http://links.lww.com/xxx).[34] We adjusted for age (<25, 25–30, >30–35, and >35 years) and individual social determinants of health, including Medicaid insurance status (yes/no), educational attainment (high school or less, some college, college graduate, graduate degree), and household income and size relative to the U.S. poverty level (<130%, 130 to 350%, and >350%). We did not adjust for chronic hypertension, pregestational diabetes, and body mass index because these clinical variables were considered to be on the causal pathway between the exposure and outcome.[35]

Because the relative influence of a community-level metric such as the ADI on birthweight may vary by individual social determinants of health, we separately assessed for effect modification in the adjusted model with interaction terms between the primary exposure, the ADI, and two individual-level social determinants of health—insurance status and race and ethnicity through which processes consequent to structural racism, such as residential segregation and discrimination, may operate. Imputation for missing data was performed using Multiple Imputation by Chained Equations or MICE (n=30 imputations) and estimates were combined using Rubin's rule. All statistical analyses were performed using STATA (StataCorp, LLC, version 16.1, College Station, TX) and R statistical software version 4.2.0 (R Foundation for Statistical Computing).

RESULTS

Among 10,038 enrolled nulliparous pregnant individuals, 480 (4.4%) did not have addresses available and 605 (6.0%) did not have birthweight available. The final analytic sample included 8,983 (89.4%) individuals (Appendix 2, available online at http://links.lww.com/xxx). Participant age, chronic comorbidities such as higher BMI, pregestational diabetes, and chronic hypertension, and individual adverse social determinants of health such as minoritized race and ethnicity, Medicaid insurance, and lower educational attainment, and ADI quartiles (for those in whom only the outcome was missing) varied between those who were included versus excluded from the current analysis ($p<0.01$ for all) (Appendix 3, available online at http://links.lww.com/xxx).

The median ADI score was 39.0 (interquartile range [IQR]: 0, 100), and by quartile was 13.0 (IQR: 0, 24.0) for Q1, 35.5 (IQR: 25.0, 50.0) for Q2, 61.0 (IQR: 51.0, 74.0) for Q3, and 92.0 (IQR: 75.0, 100.0) for Q4. Participant age, tobacco use, and living with clinical comorbidities, including living with a higher BMI, pregestational diabetes, and chronic hypertension, varied by ADI quartile ($p<0.001$ for all) (Table 1). Individual adverse social determinants of health, including minoritized race and ethnicity, Medicaid insurance, lower educational attainment, and a lower household income, also varied by ADI quartile ($p<0.001$ for all).

The overall frequency of LGA was 8.2% (n=738), SGA was 12.7% (n=1,143), and AGA was 79.1% (n=7,102). The frequency of SGA significantly varied by quartile of neighborhood deprivation (Q1: 12.4%, Q2: 12.5%, Q3: 14.2%, and Q4: 17.8%; overall $p<0.001$), as did the frequency of LGA (Q1: 8.2%, Q2: 10.3%, Q3: 10.7%, and Q4: 9.2%; overall $p<0.01$) (Appendix 4, available online at http://links.lww.com/xxx). Individuals with an SGA infant were generally more likely to experience adverse individual-level social determinants of health ($p<0.05$ for all), but the opposite was the case for LGA (Appendix 5, available online at http://links.lww.com/xxx). Individuals with an LGA infant were more likely to be living with a higher BMI, pregestational diabetes, and chronic hypertension ($p<0.05$ for all).

In multivariable analysis, living in communities with the highest area deprivation (i.e., Q4: 17.8%) was associated with an increased odds of having an SGA infant compared with those living in communities with the lowest area deprivation (Q1: 12.4%) (aOR: 1.32;

95% CI: 1.09–1.55) (Table 2). However, living in communities with ADI Q2 or Q3 was not associated with greater odds of an SGA infant. Living in communities with higher area deprivation, including Q2: 10.3%, Q3: 10.7%, and Q4: 9.2%, was associated with an increased odds of having an LGA infant compared with those living in communities with the lowest area deprivation (Q1: 8.2%) (aOR: Q2: 1.40; 95% CI: 1.19–1.61; Q3: 1.35; 95% CI: 1.09–1.61; and Q4: 1.47; 95% CI: 1.20–1.74). The above results held when the multivariable analysis was restricted to a complete data analysis (i.e.., participants without missing covariate data, n=7,335 or 81.7%).

Interaction effects between self-reported race and ethnicity and insurance status and the main exposure of ADI were not significant in the above adjusted models ($p>0.05$ for both), and hence, we did not present additional stratified analyses.

DISCUSSION

In this prospective cohort of nulliparous pregnant individuals, living in U.S. neighborhoods with higher area deprivation was associated with an increased odds of abnormal birthweight at the extremes. In particular, living in the highest quartile of area deprivation was associated with increased odds of SGA, as were higher quartiles of area deprivation with LGA.

The current study assessed the association of community-level, as opposed to individual-level, adverse social determinants of health, in pregnancy.[22,23] Studies in pregnancy have primarily identified patient-level factors, such as medical comorbidities, substance use, and individual social determinants, that are associated with low birthweight.[36–38] More recent data suggest an association between community-level measures of adverse social determinants of health, such as the ADI or the conceptually related CDC Social Vulnerability Index, and other perinatal and health outcomes in pregnancy, such as preterm birth,[39] vaccine hesitancy,[31] glycemic control,[40] and cardiovascular health.[41] Data from primarily European settings have demonstrated that living in communities with the highest neighborhood deprivation were associated with SGA.[24] Two U.S. studies have suggested a possible association between neighborhood deprivation indices with low infant birthweight.[42,43] A prior analysis using vital statistics birth record data demonstrated a slightly increased risk of SGA with a summary-level index of neighborhood deprivation.[44] The current analysis extends these findings to birthweight at both extremes, and in particular LGA, to a geographically representative cohort from across the U.S. using a multidimensional community-level measure of adverse social determinants of health. Of note, we did not observe a dose-response relationship between higher quartiles of the ADI and LGA, but rather a similar relationship across higher ADI quartiles. The ADI was assessed early in pregnancy and likely reflects the periconceptional period. For example, pre-pregnancy social determinants, such as food and nutrition insecurity, may be more important to pregnancy outcomes than those that occur later in pregnancy.[40,45]

The mechanisms by which social circumstances are translated into alterations in fetal growth and consequent birthweight remain to be fully defined.[21] It is possible that social determinants affect placental nutrient transport,[46] the intestinal microbiome,[47] the maternal neuroendocrine environment,[48] and prenatal toxicant exposure.[49] A pathway through which differences in fetal growth and consequent birthweight may manifest is through the development of clinical co-morbidities that have been documented to be related to social drivers (i.e., hypertension, diabetes), and thus we did not adjust for these factors, as that would lead to collider bias.[35]

The ADI is a metric accessible via a web-based portal and can be determined from patient residential addresses available in the electronic health record (EHR).[29] The ADI, in combination with other metrics that account for specific structural and environmental factors that influence pregnancy outcomes, such as food insecurity and walkability,[50,51] could be integrated into prenatal care in the EHR as part of universal screening for social determinants of health.[52] Although the excess adverse fetal risk associated with neighborhood deprivation may appear small, the high frequency of community-level social deprivation suggests the potential clinical and public health benefits of intervention. Such interventions may include better linkage to existing programs. For example, participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is associated with improved birth outcomes, including low birthweight.[53,54] In addition, programs addressing prenatal care access, such as statewide Medicaid and home-visiting programs for pregnant individuals with low incomes, are associated with a reduced risk of low birthweight and preterm birth.[55] How policy changes that address social determinants, such as food insecurity, walkability, and public safety, can have population-level health outcomes, including birthweight, requires further study.

Limitations of the current analysis include use of a participant address in early pregnancy. Even though individuals with high ADI are more likely to relocate, a current address is an accurate indicator of patient exposure to neighborhood deprivation through a three year timeframe.[28] Second, it is possible that for some individuals for whom an ADI could not be calculated lived with unstable housing or in a transient setting. It is likely these individuals would have had a higher ADI and be more likely to have an infant with an abnormal birthweight than included individuals, and their exclusion may attenuate the observed associations in the current analysis. Also, a missing ADI may reflect a geographic location for which this metric cannot be calculated, such as a post office box, a business address, or a coastal or offshore location. Third, despite careful adjustment for confounding, the odds ratio was relatively modest, and such an association is within the zone of potential bias for prospective studies.[56] Fourth, the data are now nearly a decade old, although there is no reason to believe that the underlying association between social conditions and birthweight was dependent upon or specific to that particular time. In fact, it is possible this association may have strengthened over time in the setting of rising social inequities in the U.S.[57] Finally, the study population was restricted to nulliparous individuals receiving care at primarily academic medical centers, who entered prenatal care in the first trimester, and were enrolled in a longitudinal study, all of which may limit generalizability.

A strength of this study is that ADI was assessed in early pregnancy. In addition, the ADI is a measure of community-level adverse social determinants of health that is generalizable across the U.S. It can be used to inform health delivery and policy, especially for the most disadvantaged neighborhood groups. Also, gestational dating was precise,[2] enhancing accuracy of birthweight percentiles.

In conclusion, nulliparous pregnant individuals living in U.S. neighborhoods with higher area deprivation were at an increased likelihood of abnormal birthweight at the extremes. The observed associations highlight that social conditions experienced by pregnant individuals may affect fetal growth and consequent birthweight.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Socio-demographic and clinical characteristics of assessed nulliparous pregnant individuals overall and by ADI quartile (N=8,983)[1]

		ADI quartile			
Variable	**Overall N=8,983**	**Quartile 1 (least) N=2,952**	**Quartile 2 N=2,534**	**Quartile 3 N=1,412**	**Quartile 4 (most) N=2,085**
ADI score, median (IQR)	39.0 (18.0, 71.0)	13.0 (7.0, 18.0)	35.5 (30.0, 43.0)	61.0 (56.0, 67.0)	92.0 (85.0, 97.0)
Age, years, median (IQR)	27.0 (23.0, 31.0)	30.0 (27.0, 33.0)	28.0 (24.0, 31.0)	25.0 (22.0, 30.0)	23.0 (20.0, 27.0)
Medicaid insurance (n=8,924)					
Yes	2,442 (27.4)	394 (13.4)	405 (16.0)	424 (30.2)	1,219 (59.3)
No	6,482 (72.6)	2,546 (86.6)	2,122 (84.0)	979 (69.8)	835 (40.7)
Missing	59 (0.7)	12 (0.4)	7 (0.3)	9 (0.6)	31 (1.5)
Race and ethnicity					
Hispanic	1,485 (16.5)	414 (14.0)	326 (12.9)	193 (13.7)	552 (26.5)
Non-Hispanic Asian	358 (4.0)	209 (7.1)	73 (2.9)	35 (2.5)	41 (2.0)
Non-Hispanic Black	1,174 (13.1)	108 (3.7)	148 (5.8)	207 (14.7)	711 (34.1)
Non-Hispanic White	5,517 (61.4)	2,097 (71.0)	1,886 (74.4)	893 (63.2)	641 (30.7)
None of the above	449 (5.0)	124 (4.2)	101 (4.0)	84 (5.9)	140 (6.7)
Education (n=8,976)					
High school or less	669 (7.5)	65 (2.2)	102 (4.0)	119 (8.4)	383 (18.4)
Some college	2,751 (30.6)	493 (16.7)	709 (28.0)	526 (37.3)	1,023 (49.2)
College graduate	3,437 (38.3)	1,243 (42.1)	1,148 (45.3)	535 (37.9)	511 (24.6)
Graduate degree	2,119 (23.6)	1,150 (39.0)	574 (22.7)	232 (16.4)	163 (7.8)
Missing	7 (0.01)	1(0.03)	1 (0.04)	0	5 (0.2)
Smoked status (N=8,977)					
Yes	1,558 (17.4)	359 (12.2)	369 (14.6)	291 (20.6)	539 (25.9)
No	7,419 (82.6)	2,591 (87.8)	2,165 (85.4)	1,120 (79.4)	1,543 (74.1)
Missing	6 (0.01)	2 (0.1)	0	1 (0.1)	3 (0.1)
Body mass index, kg/m^2 (n=8,819)					
Underweight	202 (2.3)	71 (2.4)	43 (1.7)	35 (2.5)	53 (2.6)
Normal weight	4,497 (51.0)	1,756 (60.3)	1,275 (51.0)	633 (45.3)	833 (41.5)
Overweight	2,182 (24.7)	684 (23.5)	665 (26.6)	325 (23.3)	508 (25.3)
Obesity	1,075 (12.2)	265 (9.1)	299 (12.0)	226 (16.2)	285 (14.2)
Severe obesity	863 (9.8)	138 (4.7)	220 (8.8)	177 (12.7)	328 (16.3)
Missing	164 (1.8)	38 (1.3)	32 (1.3)	16 (1.1)	78 (3.7)
Household income and size relative to the U.S. poverty level (n=7,367)					
<130%	1,441 (19.6)	179 (6.7)	273 (12.5)	293 (25.8)	696 (50.6)
130 to 350%	2,205 (29.9)	518 (19.4)	786 (36.0)	463 (40.7)	438 (31.9)
>350%	3,721 (50.5)	1,973 (73.9)	1,126 (51.5)	381 (33.5)	241 (17.5)
Missing	1,616 (18.0)	282 (9.6)	349 (13.8)	275 (19.5)	710 (34.1)
Diabetes in pregnancy (n=8,980)					
Pregestational diabetes	132 (1.5)	23 (0.8)	29 (1.1)	26 (1.8)	54 (2.6)
Gestational diabetes	376 (4.2)	125 (4.2)	98 (3.9)	62 (4.4)	91 (4.4)
No diabetes	8,472 (94.3)	2,801 (95.0)	2,407 (95.0)	1,324 (93.8)	1,940 (93.0)
Missing	3 (0.03)	3 (0.1)	0	0	0
Chronic hypertension (n=8,966)					
Yes	214 (2.4)	49 (1.7)	59 (2.3)	30 (2.1)	76 (3.6)
No	8,752 (97.6)	2,897 (98.3)	2,469 (97.7)	1,379 (97.9)	2,007 (96.4)
Missing	17 (0.2)	6 (0.2)	6 (0.2)	3 (0.2)	2 (0.1)

[1]Chi-square test was used to compare categorical variables and Wilcoxon rank sum test for continuous variables. $p<0.001$ for all assessed characteristics above.

Table 2.

Association between Area Deprivation Index (ADI) and abnormal fetal growth (SGA and LGA vs. AGA)

		Frequency (row percentage)		Unadjusted and adjusted analyses	
	N	Yes N (%)	No N (%)	Risk ratio (RR); 95% CI[1]	Adjusted risk ratio (ARR); 95% CI[1,2]
SGA (outcome) vs. AGA (reference)					
Area Deprivation Index					
Quartile 1 (least disadvantaged)	2,739	341 (12.4)	2,398 (87.6)	1.00	1.00
Quartile 2	2,303	287 (12.5)	2,016 (87.5)	1.00 (0.83 to 1.17)	1.07 (0.88 to 1.26)
Quartile 3	1,279	172 (14.2)	1,107 (85.8)	1.09 (0.89 to 1.29)	1.00 (0.77 to 1.23)
Quartile 4 (most disadvantaged)	1,924	343 (17.8)	1,581 (82.2)	1.53 (1.37 to 1.69)	1.32 (1.09 to 1.55)
LGA (outcome) vs. AGA (reference)					
Area Deprivation Index					
Quartile 1 (least disadvantaged)	2,611	213 (8.2)	2,398 (91.8)	1.00	1.00
Quartile 2	2,247	231 (10.3)	2,016 (89.7)	1.29 (1.09 to 1.49)	1.40 (1.19 to 1.61)
Quartile 3	1,240	133 (10.7)	1,107 (89.3)	1.35 (1.12 to 1.58)	1.35 (1.09 to 1.61)
Quartile 4 (most disadvantaged)	1,742	161 (9.2)	1,581 (91.8)	1.15 (0.94 to 1.36)	1.47 (1.20 to 1.74)

[1] Multinomial logistic regression was used for a non-binary outcome (SGA, LGA, vs. AGA)

[2] Model adjusted for age, Medicaid enrollment, educational attainment, and household income.

N=8,983