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Objective

Our objective was to determine how SDH are associated with SARS-CoV-2 infection and the severity of COVID-19 illness in hospitalized pregnant patients in New York during the global COVID-19 pandemic.

Methods

This cross-sectional study evaluated all pregnant patients who delivered and had polymerase chain reaction (PCR) testing for SARS-CoV-2 between March 15, 2020 and June 15, 2020 at seven hospitals within Northwell Health, the largest academic health system in New York. During the study period, universal SARS-CoV-2 testing protocols were implemented at all sites. PCR testing was performed using nasopharyngeal swabs. Patients were excluded if the following variables were not available: PCR results, race, ethnicity, and/or ZIP code of residence. Clinical data were obtained from the enterprise electronic health record system. For each patient, ZIP code was used as a proxy for neighborhood. Socioeconomic characteristics were determined by linking to ZIP code data from the United States Census Bureau's American Community Survey (ACS) and the Internal Revenue Service's Statistics of Income (SOI) Division. Specific variables of interest included mean persons per household, median household income, percent unemployment, and percent with less than high school education. Medical records were manually reviewed for all subjects with positive PCR test results in order to correctly identify symptomatic patients and then classify those subjects using the National Institutes of Health (NIH) severity of illness categories. Classification was based on the highest severity of illness throughout gestation and not necessarily at the time of presentation for delivery.

Table 1. Results of multivariable logistic regression model to predict severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) polymerase chain reaction (PCR) test positivity.

Characteristic	OR	95% CI	P value
Maternal age	0.957	0.937, 0.977	<0.001
Parity	1.275	1.175, 1.385	<0.001
Race and ethnicity ^a			
Asian	ref	ref	
Hispanic	1.726	1.134, 2.677	<0.02
Non-Hispanic Black	1.768	1.144, 2.776	<0.02
Non-Hispanic White	1.439	0.976, 2.175	0.08
Other/multiracial	1.732	1.085, 2.789	<0.03
Diabetes	2.154	0.981, 4.345	<0.05
Private vs. public health insurance	0.720	0.566, 0.917	<0.009
Preferred language Spanish vs. English	1.670	1.144, 2.431	<0.009
Neighborhood characteristics			
Median income ^b	0.887	0.796, 0.982	<0.03
Percent less than high school ^c	1.022	1.001, 1.042	<0.04

CI, confidence interval; OR, odds ratio; ref, referent

^a Asian is referent based on lowest PCR positivity (6%) in study population

^b Unit of median income is \$10,000; OR can be explained by every unit increase of this amount

^c Unit of percent less than high school is 1%; OR can be explained by every unit increase of this amount

Results

A total of 4,873 patients were included in the study. The PCR test positivity rate was 11% (n=544). Among this group, 359 patients (66%) were asymptomatic or presymptomatic, 115 (21%) had mild or moderate COVID-19, and 70 (13%) had severe or critical COVID-19. On multiple logistic regression modeling, pregnant patients who tested positive for SARS-CoV-2 were more likely to be younger, of higher parity, belong to minoritized racial and ethnic groups, have public health insurance, have limited English proficiency, and/or reside in low-income neighborhoods with less educational attainment. On ordinal logit regression modeling, obesity, income, and education were significantly associated with COVID-19 severity.

Conclusion

Social and physical determinants of health play a significant role in determining the risk of infection. Severity of COVID-19 illness was not associated with race or ethnicity but was associated with maternal obesity and neighborhood level characteristics such as educational attainment and household income.

Figure 1. Association between neighborhood characteristics and SARS-CoV-2 infection and severity

