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## Race/ethnicity and spatiotemporal trends in SARS-CoV-2 prevalence on obstetrical units in New York.

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## Racial and ethnic disparity and spatiotemporal trends in severe acute respiratory syndrome coronavirus 2 prevalence on obstetrical units in New York

**OBJECTIVE:** Coronavirus disease 2019 (COVID-19), caused by the virus known as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), affects racial and ethnic minorities and socioeconomically disadvantaged groups disproportionately.<sup>1–3</sup> It remains uncertain how the proportions of positive SARS-CoV-2 test results have changed over time among pregnant women from socially vulnerable populations after the closure of nonessential businesses and schools, and promotion of social distancing measures. We evaluated the temporal trends, regional geographic variation, and racial and ethnic disparity in SARS-CoV-2 prevalence among pregnant women presenting to obstetrical units of a large health system in New York during the COVID-19 outbreak.

**STUDY DESIGN:** This retrospective study included all pregnant women who were tested for SARS-CoV-2 (both symptomatic and asymptomatic) at 7 hospitals within a 30-mile radius from April 1, 2020, before the peak of the outbreak in New York State,<sup>4</sup> to June 9, 2020. These facilities, located in New York City and Long Island, include tertiary academic medical centers as well as community hospitals. The population served is one of the most diverse worldwide; the patients reside in both urban and suburban communities and are representative of a wide socioeconomic spectrum. To reduce the occult transmission of the virus from asymptomatic or presymptomatic carriers, universal SARS-CoV-2 testing protocols were implemented in all obstetrical units at the beginning of the 10-week study period, with the exception of 2 hospitals, namely Lenox Hill Hospital (LHH) and Staten Island University Hospital (SIUH), which started universal testing in weeks 2 and 4, respectively. Polymerase chain reaction (PCR) testing was performed using nasopharyngeal swabs; patients were excluded if the results were not available or, for LHH and SIUH, if they were performed before the implementation of universal testing. Data analyzed in this study included the SARS-CoV-2 test results, race and ethnicity, delivery hospital, and week of hospital visit. The weekly temporal trends in SARS-CoV-2 prevalence were compared among obstetrical units and across racial and ethnic groups. The Cochran-Armitage trend test was used to evaluate the significance of the trends in the number of positive cases over time. Multiple logistic regression analysis was used to model the binary outcome of having a positive or negative PCR result using time (study week), race and ethnicity, hospital site, and their correlations as predictors. The Northwell Health Institutional Review Board approved this

study as a minimal-risk research study using data collected as part of routine clinical practice, and therefore waived the requirement for informed consent.

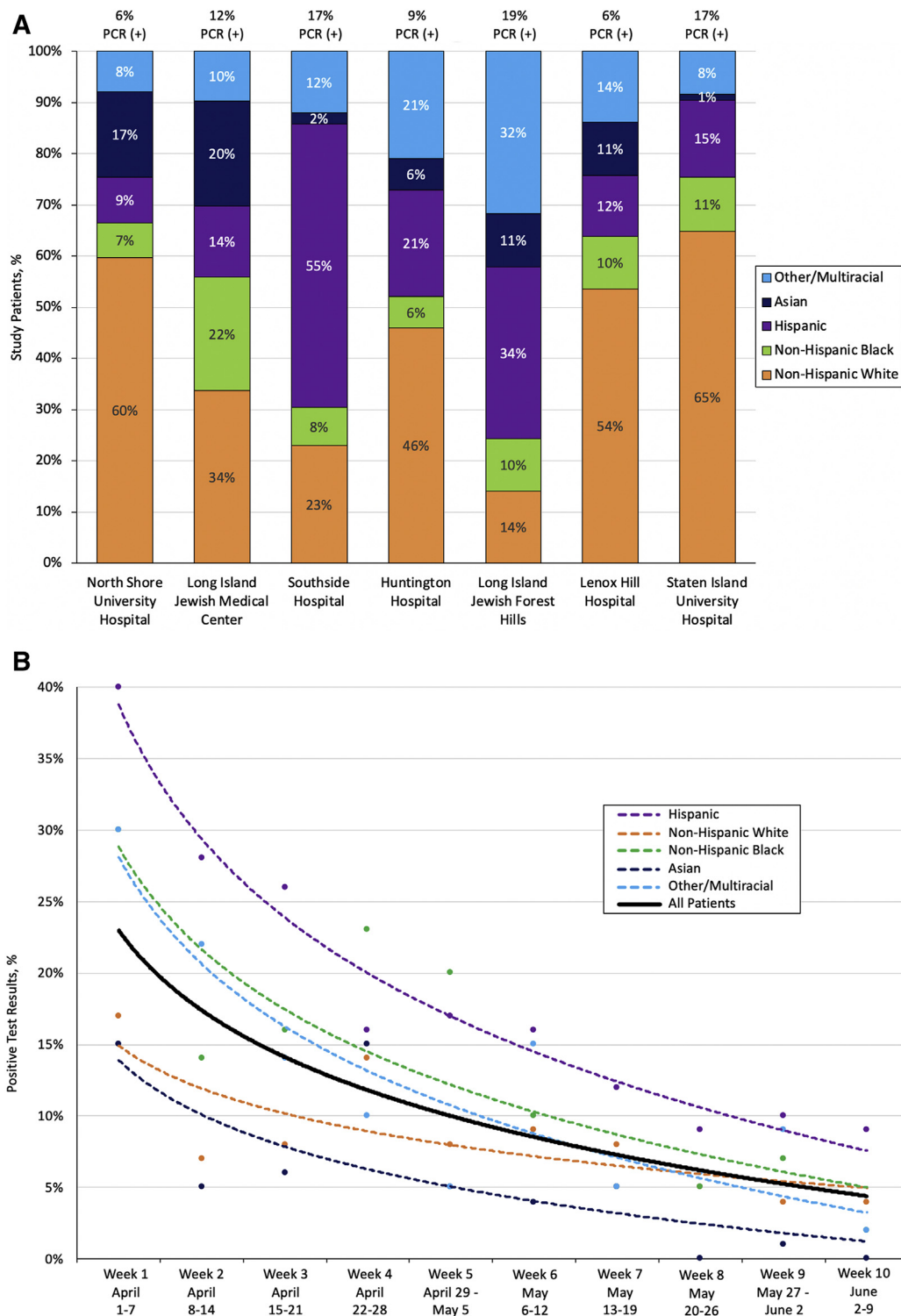
**RESULTS:** Of the 4811 pregnant women presenting to the 7 hospital sites after implementation of universal SARS-CoV-2 testing, PCR test results were obtained for 4674 patients—500 (11%) were positive. The test results were not available for 3% (n=137) of the patients, either because the test was not performed or because it was performed offsite and the result was not retrievable via our electronic medical record systems. The overall prevalence of the virus across the health system's obstetrical units declined from 25% in the 1st week to 4% in the 10th week; the trend of a decrease in the number of positive PCR tests over time was statistically significant ( $P<.0001$ ).

Differences in the number of positive SARS-CoV-2 tests were observed between racial and ethnic groups ( $P<.0001$ ). Hispanic women constituted 18% (n=836) of the study population but accounted for 31% of all the positive tests, with a test positivity rate of 18% (n=153); this was the most affected ethnic group in the study. Non-Hispanic black women, who constituted 12% (n=567) of the study population, had a test positivity rate of 14% (n=77) and accounted for 15% of all the positive tests. Non-Hispanic white women, the largest racial or ethnic group, constituted 44% (n=2065) of the patients, had a test positivity rate of 8% (n=167), and accounted for 33% of all the positive tests. Asian women comprised 13% (n=589) of the population and were the least affected group, with a test positivity rate of 5% (n=32); they accounted for 6% of all the positive tests. Women in the other or multiracial group comprised 13% (n=617) of the population, had a test positivity rate of 12% (n=71), and accounted for 14% of all the positive tests. The proportion of women in each racial or ethnic group varied by hospital site (Figure, A). Each racial or ethnic group had a significant decrease in the number of positive PCR tests over time ( $P<.0001$ ), and logistic regression analysis showed that the rates of decline were similar among groups (Figure, B).

Considerable heterogeneity in SARS-CoV-2 prevalence was observed across hospitals in the region ( $P<.0001$ ; Table). Overall, test positivity ranged from 6% to 19% across obstetrical units, and the peak prevalence at each site varied from 13% to 41%. A significant decrease in the number of positive tests weekly was observed at all sites, but the rate of decline was significantly higher at some sites compared with others. A correlation between the site and race or ethnicity was not detected.

## FIGURE

## Racial and ethnic disparity and spatiotemporal variation in SARS-CoV-2 prevalence



**A**, Race/ethnicity of pregnant women presenting to obstetrical units within Northwell Health from April 1 to June 9, 2020, stratified by hospital site. **B**, Temporal changes in the prevalence of SARS-CoV-2 among pregnant women presenting to obstetrical units within Northwell Health from April 1 to June 10, 2020, stratified by race/ethnicity. No significant difference in the rate of decline was observed among groups.

PCR, polymerase chain reaction; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

Blitz. Spatiotemporal trends in SARS-CoV-2. *AJOG MFM* 2020.

TABLE

Temporal changes in the SARS-CoV-2 test results on presentation to obstetrical units of Northwell Health from April 1 to June 9, 2020, stratified by hospital site

Characteristics	SARS-CoV-2 PCR results by week, n (%)										Total
	Week 1 April 1–7	Week 2 April 8–14	Week 3 April 15–21	Week 4 April 22–28	Week 5 April 29– May 5	Week 6 May 6–12	Week 7 May 13–19	Week 8 May 20–26	Week 9 May 27– June 2	Week 10 June 3–9	
All hospitals											
Total	407	430	430	502	481	475	494	470	510	475	4674
Positive	103 (25)	57 (13)	57 (13)	76 (15)	50 (10)	51 (11)	37 (7)	23 (5)	28 (5)	18 (4)	500 (11)
Negative	304 (75)	373 (87)	373 (87)	426 (85)	431 (90)	424 (89)	457 (93)	447 (95)	482 (95)	457 (96)	4174 (89)
North Shore University Hospital, Manhasset, NY											
Total	119	116	112	116	115	96	115	119	140	105	1153
Positive	15 (13)	11 (9)	13 (12)	10 (9)	7 (6)	1 (1)	6 (5)	1 (1)	5 (4)	2 (2)	71 (6)
Negative	104 (87)	105 (91)	99 (88)	106 (91)	108 (94)	95 (99)	109 (95)	118 (99)	135 (96)	103 (98)	1082 (94)
Long Island Jewish Medical Center, New Hyde Park, NY											
Total	176	139	125	128	128	157	139	143	143	121	1399
Positive	51 (29)	19 (14)	18 (14)	23 (18)	13 (10)	15 (10)	10 (7)	7 (5)	4 (3)	4 (3)	164 (12)
Negative	125 (71)	120 (86)	107 (86)	105 (82)	115 (90)	142 (90)	129 (93)	136 (95)	139 (97)	117 (97)	1235 (88)
Southside Hospital, Bay Shore, NY											
Total	49	48	40	38	41	33	48	37	42	43	418
Positive	20 (41)	14 (29)	5 (13)	2 (5)	7 (17)	6 (18)	8 (17)	3 (8)	2 (5)	2 (5)	69 (17)
Negative	29 (59)	34 (71)	35 (87)	36 (95)	34 (83)	27 (82)	40 (83)	34 (92)	40 (95)	41 (95)	349 (83)
Huntington Hospital, Huntington, NY											
Total	38	20	37	31	34	27	32	20	19	39	297
Positive	8 (21)	2 (10)	7 (19)	4 (13)	1 (3)	2 (7)	0 (0)	0 (0)	1 (5)	1 (3)	26 (9)
Negative	30 (89)	18 (90)	30 (81)	27 (87)	33 (97)	25 (93)	32 (100)	20 (100)	18 (95)	38 (97)	271 (91)

Blitz. Spatiotemporal trends in SARS-CoV-2. AJOG MFM 2020.

(continued)

TABLE

Temporal changes in the SARS-CoV-2 test results on presentation to obstetrical units of Northwell Health from April 1 to June 9, 2020, stratified by hospital site (continued)

Characteristics	SARS-CoV-2 PCR results by week, n (%)										Total
	Week 1 April 1–7	Week 2 April 8–14	Week 3 April 15–21	Week 4 April 22–28	Week 5 April 29– May 5	Week 6 May 6–12	Week 7 May 13–19	Week 8 May 20–26	Week 9 May 27– June 2	Week 10 June 3–9	
Long Island Jewish Forest Hills, Forest Hills, NY											
Total	25	43	38	42	44	44	38	28	39	40	381
Positive	9 (36)	6 (14)	10 (26)	10 (24)	8 (18)	9 (20)	5 (13)	2 (7)	8 (21)	4 (10)	71 (19)
Negative	16 (64)	37 (86)	28 (74)	32 (76)	36 (82)	35 (80)	33 (87)	26 (93)	31 (79)	36 (90)	310 (81)
Lenox Hill Hospital, Manhattan, NY <sup>a</sup>											
Total	-	64	78	82	74	68	70	72	79	83	670
Positive	-	5 (8)	4 (5)	11 (13)	2 (3)	11 (16)	2 (3)	2 (3)	1 (1)	1 (1)	39 (6)
Negative	-	59 (92)	74 (95)	71 (87)	72 (97)	57 (84)	68 (97)	70 (97)	78 (99)	82 (99)	631 (94)
Staten Island University Hospital, Staten Island, NY <sup>b</sup>											
Total	-	-	-	65	45	50	52	51	49	44	356
Positive	-	-	-	16 (25)	12 (27)	7 (14)	6 (12)	8 (16)	7 (14)	4 (10)	60 (17)
Negative	-	-	-	49 (75)	33 (73)	43 (86)	46 (88)	43 (84)	42 (86)	40 (90)	296 (83)

PCR, polymerase chain reaction; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

<sup>a</sup> Universal SARS-CoV-2 PCR testing protocol implemented during the second week of the study period; <sup>b</sup> Universal SARS-CoV-2 PCR testing protocol implemented during the fourth week of the study period.

Blitz. Spatiotemporal trends in SARS-CoV-2. AJOG MFM 2020.

**CONCLUSION:** Within a large health system in New York, Hispanic and non-Hispanic black pregnant women were disproportionately affected by SARS-CoV-2; despite constituting approximately one-third of the study population, they accounted for nearly half of all the cases. Although a decrease in the prevalence of the virus was observed in all racial and ethnic groups during the 10-week study period, there was no difference in the rate of decline among the groups. This may indicate that all the groups benefited from the implementation of social distancing measures despite a legitimate concern that vulnerable populations may have greater difficulty in adhering to such guidelines.

Geographic variability in positive SARS-CoV-2 cases results in high and low prevalence obstetrical units, which has implications for healthcare resource planning and community outreach, education, and prevention efforts. A statistically significant decrease in the number of positive cases over time was observed across all obstetrical units during the study period, but the rate of change was not uniform, with the rates declining more rapidly in some sites than others. An evaluation of the factors that contribute to this variation is therefore warranted.

Universal testing protocols in obstetrical units may allow for the identification of spatiotemporal trends in SARS-CoV-2 prevalence that reflect the surrounding catchment areas, providing a dynamic view of viral spread in our communities. ■

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