

Evaluating Social Determinants of Obstetric Outcomes at the Intersection of Birth Databases and "Big Data"

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Objective: To characterize the influence of community characteristics on obstetric outcome disparities in a large, modern obstetric cohort. While emerging evidence suggests that racial, socioeconomic status (SES), and environmental health disparities likely contribute to obstetric outcome disparities, correlates between patient-level obstetric outcome data and community socioeconomic databases have yet to be fully explored.

Study Design: Retrospective, ecological cohort study of a 9-county birth database from 2004-2017 merged with publically available community resource data. Patient level data from the birth database used to allocate to zip code cohorts. Cohorts were associated with income, poverty, and educational attainment data from the U.S. Census Bureau. This fused database was analyzed for the primary outcome of preterm birth (PTB) and the secondary outcomes of additional obstetric and medical complications of pregnancy descriptively, with ANOVA, and with multi-variable regression addressing potential confounders.

Results: A total of 199,088 pregnancies were allocated to 120 zip code cohorts. The primary outcome of PTB as well as secondary outcomes concentrated in a non-random fashion (Figure 1). Zip code groups binned by similar SES demonstrated non-random variance with PTB that was statistically significant for extremely PTB (Figure 2). On multivariable regression, differences between zip codes were significantly associated with maternal and paternal race but demonstrated stability over time. In particular, when controlling for within zip code variability, families of color and lesser educated mothers were more likely to experience PTB.

Conclusion: In an era of worsening obstetric outcomes in the United States, modern data fusion approaches merging obstetric with community datasets have the potential to draw attention to critical socio-economic factors driving disparate health outcomes. These data reveal community SES correlates with rates of extreme PTB. Policies supporting economic vibrancy across our communities may act to facilitate improved obstetric outcomes for our patients and their families.

Figure 1: Extreme Outliers in Obstetric Comorbidities and Outcomes >3 Median Absolute Deviations from the Median Across Zip Code Regions

Zip Code Cohorts	Zipcode Demographics (US Census Bureau)			Outcomes			Comorbidities			
	Median Gross Income	HS Educational Attainment	Below Poverty Level	Any PTB	PTB <28w	NICU Admit	Pregnancy Weight Gain	Severe Maternal Depression	Chronic HTN	Substance Use
1	\$50,050	90.40%	16.90%	15.48%	2.49%	17.26%	28.95lb	1.78%	4.45%	4.80%
2	\$45,946	91.30%	13.20%	15.85%	3.40%	12.45%	26.78lb	2.26%	3.40%	7.92%
3	\$16,764	80.30%	41.00%	8.80%	1.39%	12.04%	29.33lb	3.70%	3.24%	29.63%
4	\$21,047	69.80%	48.20%	12.38%	1.36%	15.05%	26.19lb	6.26%	3.42%	19.54%
5	\$41,158	80.30%	19.90%	9.80%	1.07%	10.38%	28.19lb	3.17%	2.91%	13.00%
6	\$42,589	93.60%	23.00%	8.99%	1.15%	10.74%	31.02lb	3.32%	1.99%	9.29%
7	\$20,761	76.30%	48.10%	12.26%	1.69%	12.63%	25.46lb	5.05%	4.72%	21.30%
8	\$42,012	85.20%	23.10%	10.97%	1.18%	12.37%	27.94lb	3.32%	3.39%	12.29%
9	\$25,772	74.90%	41.60%	12.98%	1.79%	13.24%	26.45lb	4.80%	4.51%	21.07%
10	\$31,169	79.00%	28.20%	11.30%	1.30%	12.04%	26.39lb	4.08%	4.25%	15.75%
11	\$38,135	84.70%	22.70%	10.77%	0.94%	12.01%	28.59lb	2.75%	0.32%	10.25%
12	\$37,383	84.90%	27.60%	12.03%	1.69%	12.45%	27.38lb	3.88%	5.35%	15.44%
13	\$26,104	70.30%	40.90%	11.61%	1.40%	14.02%	26.61lb	4.86%	3.66%	16.73%
14	\$49,615	85.60%	13.60%	11.38%	0.58%	7.93%	26.52lb	2.02%	1.73%	2.31%
15	\$51,564	95.40%	25.90%	28.57%	4.20%	30.81%	29.36lb	0.84%	2.80%	2.52%
16	\$41,010	88.60%	19.80%	24.43%	2.26%	28.05%	29.83lb	0.45%	5.88%	2.71%
17	\$50,679	93.00%	15.80%	14.88%	1.86%	15.35%	29.69lb	1.40%	2.79%	2.79%
Regional Pop.	\$ 53029 ±	91.10% ±	12.25% ±	8.85% ±	0.57% ±	8.97% ±	29.68lb ±	1.65% ±	2.08% ±	3.02% ±
Median±MAD	\$7764	3.3%	4.35%	0.92%	0.23%	1.62%	0.94lb	0.60%	0.63%	1.21%

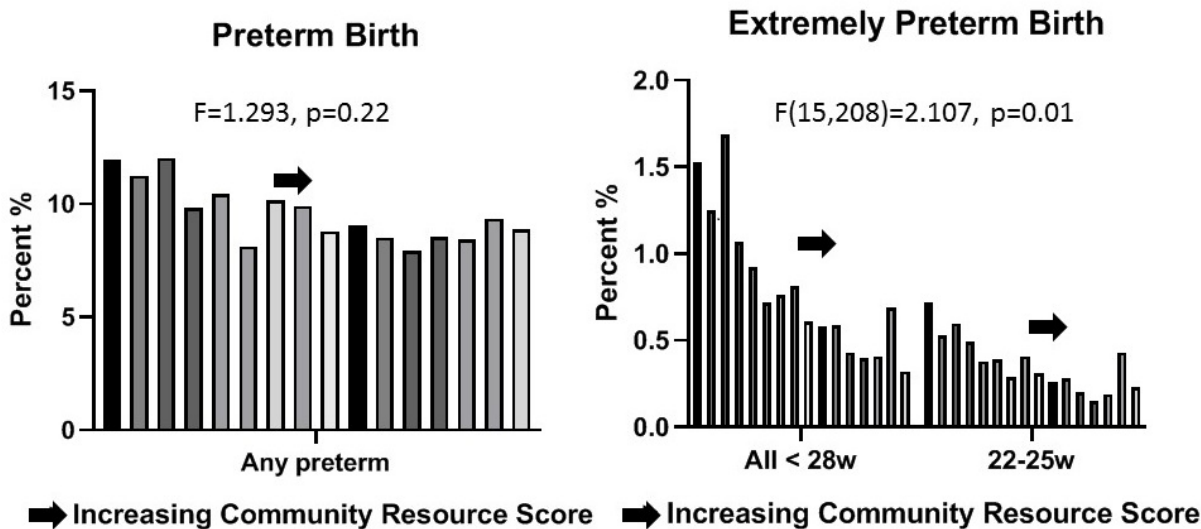
All other zip codes without two or more findings >3 MAD from the Median (n=103 zip codes)

Yellow = ± 1 MAD

Orange = ± 2 MAD

Red = ± 3 MAD

Figure 2: Preterm Birth in Zip Codes Grouped by Socioeconomic and Educational Attainment Metrics



“Community Resource Score” calculated by number of MAD above or below the median for regional gross income, individuals living below the poverty level, and educational attainment.