

# Neighborhood Deprivation Increases the Risk of Post-Induction Cesarean Delivery

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## Motivation

- ❖ There is some disagreement in the OBGYN community about expectant management versus labor induction; however, **induction is very common** (1/3 pregnancies)
- ❖ **Racial disparities** among progression to labor and post-induction cesareans (Black patients have a 50% increased odds of cesarean delivery versus White patients)
- ❖ **Neighborhood deprivation** is a plausible risk factor with limited evaluation to-date

## Objective



- ❖ **To measure the association between neighborhood deprivation and cesarean delivery following labor induction among patients delivering at term ( $\geq 37$  weeks of gestation).**

## Major Findings

- ❖ This study demonstrates an association between neighborhood deprivation and post-induction cesarean delivery after adjustment for individual-level factors
- ❖ Patients living in the highest level of neighborhood deprivation were at a **29% increased risk of post-induction cesarean delivery** (aOR = 1.29, 95% CI 1.05-1.57) compared with the lowest level of neighborhood deprivation

## Methods

### PRIMARY OUTCOME

- ❖ Post-induction cesarean delivery for any indication

### PRIMARY EXPOSURE

- ❖ Neighborhood deprivation score (U. Wisconsin)
- ❖ 1-100 (low to high)
- ❖ 17 education, employment, housing quality, poverty measures from census and ACS

- ❖ Retrospective cohort study of 8,672 patients  $\geq 37$  weeks of gestation, with a live-singleton gestation, who underwent labor induction from 2010-2017 at Penn Medicine (HUP and Pennsy)

- ❖ Excluded patients with prior cesarean and those with missing or insufficient address information for geocoding

- ❖ **Generalized linear mixed model** to calculate the odds of post-induction cesarean delivery among patients in four equally-spaced levels of neighborhood deprivation

- ❖ Also, modeled deprivation as a non-linear spline term
- ❖ Conducted sensitivity analysis with residential mobility

## Results

### COHORT DEMOGRAPHICS

- ❖ **8,672 total inductions** after inclusion and exclusion criteria
- ❖ **2,027 cesarean deliveries (23%)** & **6,645 vaginal deliveries (77%)**
- ❖ Majority single (64%)
- ❖ Majority Black or African American patients (58%)
- ❖ 5% with diabetes, 22% obese, 18% with pregnancy-related hypertension

- ❖ The adjusted odds of post-induction cesarean delivery were all elevated compared to the lowest level of neighborhood deprivation:
- ❖ **29%** increase in the highest group
- ❖ **28%** increase in the high group
- ❖ **20%** increase in the moderate group

- ❖ The random effect for neighborhood clustering was not significant ( $p=0.64$ )

- ❖ Our spline analysis (**Figure 2**) shows a mostly linear relationship between deprivation and post-induction cesarean, not dependent on how we binned deprivation into four categories.

- ❖ By rerunning the multivariable model (**Table 2**) and including residential mobility in the sub-population we had this data for, we saw the three aORs increase (2.12, 2.24, and 1.20)

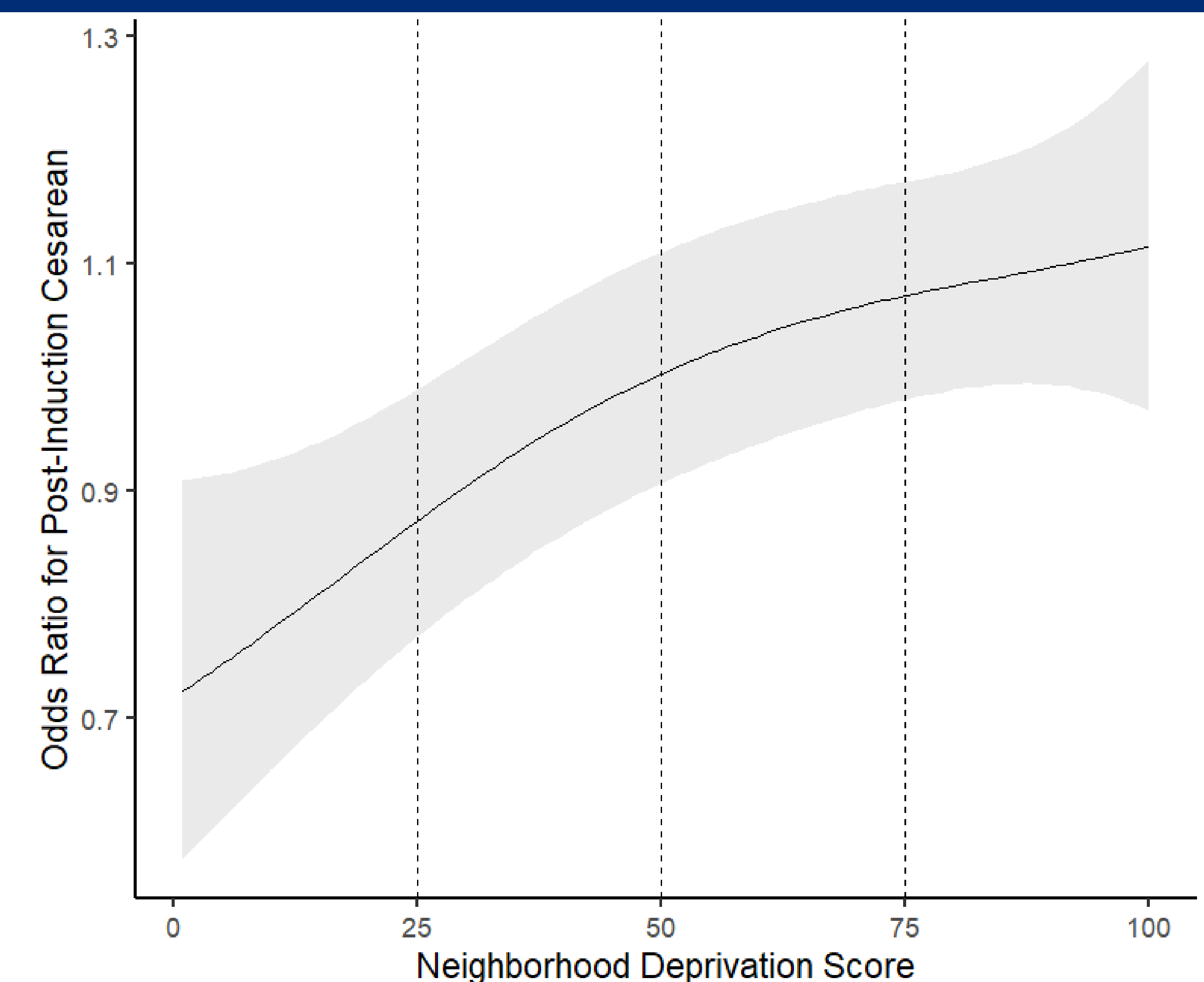


Figure 2. Association between neighborhood deprivation and odds of post-induction cesarean delivery, adjusted for parity, gestational age, race/ethnicity, patient age, obesity, pregnancy-related hypertension, diabetes, and marital status, with a random effect for neighborhood. Each point on the curve is the OR for people with that neighborhood deprivation score compared to all other patients. Vertical dashed lines represent the binning of deprivation score in the primary generalized linear mixed model analysis.

Table 2. Associations between neighborhood deprivation and cesarean delivery following labor induction

Covariate	Cesarean Rate	Crude OR	95% CI	Adjusted OR <sup>a</sup>	95% CI
<b>Neighborhood Deprivation</b>					
Highest (75-100)	22.39%	0.90	0.78-1.03	1.29	1.05-1.57
High (50-74)	24.37%	1.07	0.91-1.26	1.28	1.04-1.57
Moderate (25-49)	25.66%	0.91	0.77-1.06	1.20	1.00-1.44
Lowest (0-24)	22.60%	1.00	Reference	1.00	Reference
<b>Comorbidities</b>					
Diabetes (versus no diabetes)	27.79%	1.30	1.03-1.58	1.10	0.85-1.43
Pregnancy-related hypertensions (versus not)	30.76%	1.59	1.41-1.80	1.70	1.47-1.97
Obesity (versus not obese)	31.79%	1.76	1.58-1.97	1.95	1.70-2.23

<sup>a</sup>Additionally adjusted for maternal age (continuous), race/ethnicity, parity, gestational age, and marital status

## Discussion

- ❖ Patients living in neighborhoods with the highest deprivation scores had the highest odds of post-induction cesarean delivery

- ❖ A major **strength** of our study is the large sample size of labor inductions and a cohort from a very diverse spectrum of neighborhood deprivation levels

- ❖ Individual-level race/ethnicity serves as a proxy for socioeconomic disparities, namely racism, which is not captured in our deprivation score