



# Racial Disparities in Cesarean Section Rates Between Non-Hispanic Black and Non-Hispanic White Populations in the United States

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**Abstract** This study uses national natality data from the National Vital Statistics System, provided by the National Center for Health Statistics, covering the years 2011 to 2018 ( $N=23,810,031$ ) to investigate racial disparities in cesarean section (C-section) rates between non-Hispanic Black and non-Hispanic White mothers in the United States. This analysis offers a comprehensive perspective on the factors contributing to C-section disparities by considering mothers' demographic characteristics, health conditions, and infant health status. Using multivariable logistic regression, the findings reveal consistently higher C-section rates for non-Hispanic Black mothers compared to non-Hispanic White mothers, with the gap widening over time. Even after adjusting for sociodemographic and health-related factors, non-Hispanic Black mothers remained more likely to undergo C-sections. Using Blinder-Oaxaca decomposition methods, key factors contributing to this C-section rates disparity include maternal age, the source of delivery payment, and fetal presentation. This study highlights the pressing need for further investigation into healthcare system factors and racial inequities driving these disparities, alongside the growing urgency for policy and practical interventions to reduce unnecessary C-sections.

**Keywords** Health disparity; Cesarean section rate; Maternal and infant health

**JEL Classification** I14 • I18

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## Introduction

From 1997 to 2011, the United States (U.S.) witnessed a sharp rise in the rates of cesarean sections (C-sections), climbing from 21 to 33% (Ananth et al., 2016). The surge in C-section rates is concerning for several reasons. From a public health perspective, unnecessary C-sections pose potential risks to the health of both mothers and infants (Belizan et al., 2007; Sandall et al., 2018; Wells et al., 2019). From an economics perspective, this trend places a substantial burden on both the healthcare system and the mothers themselves, amplifying the costs associated with surgical births and their impact on public health funding and personal finances (Puro et al., 2022; Witt et al., 2015). In response to these concerns, a broad array of policies has been implemented to lower the escalating rates of C-sections in the U.S. (Blanchette, 2011; Clark et al., 2018). Although there was a marginal decrease from the peak rate in 2011, disparities in C-section prevalence continue to exist among different racial and ethnic groups (Hanson et al., 2022; Okwandu et al., 2022).

This paper documents a notable disparity that emerged in C-section rates between non-Hispanic Black and non-Hispanic White mothers by using the infant natality data published by the National Vital Statistics System (National Center for Health Statistics, 2011–2018). From 2011 to 2018, there was a decrease in C-section rates by 0.94% among non-Hispanic White mothers. Conversely, C-section rates for non-Hispanic Black mothers saw an increase of 0.86%, widening the existing disparity between the two groups.

Addressing the disparity in C-section rates between racial groups is a critical focus of U.S. public health and health policy efforts (Betran et al., 2018; Wiklund et al., 2018). Economists have long studied resource allocation, including its impact on healthcare disparities (Corredor-Waldron et al., 2024). Research shows that non-Hispanic Black women experience higher rates of C-sections, while some women who need cesarean deliveries face barriers to accessing them (Robinson et al., 2024). This misallocation highlights important disparities in C-section rates, underscoring the need for attention from medical professionals, policymakers, and economists alike. Understanding the reasons for these disparities is essential in tackling racial inequalities in healthcare. Recent studies have found a correlation between higher maternal education and increased rates of C-sections (Lurie et al., 2014). Known factors affecting C-section rates include multiple births, incorrect fetal positioning, and maternal health conditions such as obesity and hypertension (Lurie et al., 2014; Okwandu et al., 2022). However, the growing disparities in C-section rates present a complex issue. Despite current research, the precise causes of racial disparities in these rates remain unclear.

This study investigates the relationship between various factors and C-section rates, aiming to uncover the main drivers of the disparities between non-Hispanic Black and non-Hispanic White mothers. The analysis has three parts. First, this study documents C-section rates among non-Hispanic Black mothers and non-Hispanic White mothers. Then, logistic regression is used to control for health and demographic factors. The results show a substantial racial gap in C-section rates, with non-Hispanic Black women having higher rates than non-Hispanic White

women. Subsequently, the study employed the Blinder-Oaxaca (B-O) decomposition method to assess how sociodemographic and health factors contributed to the C-section disparity. Maternal age, payment source for delivery, and fetal presentation were important factors that drive C-section rate disparity. This research is notable for using a national dataset that encompasses nearly all births in the U.S. and for being the first to apply the B-O decomposition method in explaining trends in these disparities.

## Methods

### Study Population

This study analyzed birth record data from the National Vital Statistics System (National Center for Health Statistics, 2011–2018), covering the years 2011–2018. At an individual level, the data were sourced from birth certificates recorded in vital statistics offices across all states and the District of Columbia. The focus was on births to non-Hispanic Black mothers and non-Hispanic White mothers, specifically selecting records with complete information for all covariates. The timeframe of 2011–2018 was chosen due to data availability, as some key covariates needed for the study were not available in other years.

### Measures

In this study, the primary outcome of interest was whether a birth was delivered via C-section. This outcome was measured by a binary variable where “1” indicated a birth by primary or repeat cesarean, and “0” indicated all other types of deliveries. Notably, a vaginal birth following a previous C-section was not classified as a cesarean delivery. The racial categories non-Hispanic Black and non-Hispanic White were determined based on mothers reporting a single race.

The study considered several covariates. The first group of covariates comprised sociodemographic factors such as the mother’s age, education, marital status, and payment source for the delivery. Age was taken from the mother’s reported birth date or the birth certificate. Educational levels were categorized into: less than high school, high school or equivalent, some college without a degree, associate degree, and bachelor’s degree or higher. Marital status was reported by the mother as either married or not married. Payment sources for delivery included Medicaid, private insurance, self-pay, or other.

The second group of covariates was the health characteristics of the mother, which encompassed pre-pregnancy body mass index (BMI) divided into four categories by the Centers for Disease Control’s guidelines, timing of prenatal care initiation (numerically coded from one to 12), smoking status before and during pregnancy, gestational diabetes and hypertension, and any infections such as gonorrhea, chlamydia, syphilis, and hepatitis B or C during pregnancy. These were captured as binary “Yes” or “No” variables.

The third covariate group was infant health characteristics which included gestational age in weeks, birthweight in grams, number of births (e.g., single, twin), fetal position at delivery (e.g., cephalic, breech<sup>1</sup>), total birth order, and whether the baby has macrosomia (defined as a birthweight over 4000 grams, coded as a binary variable).

## Statistical analysis

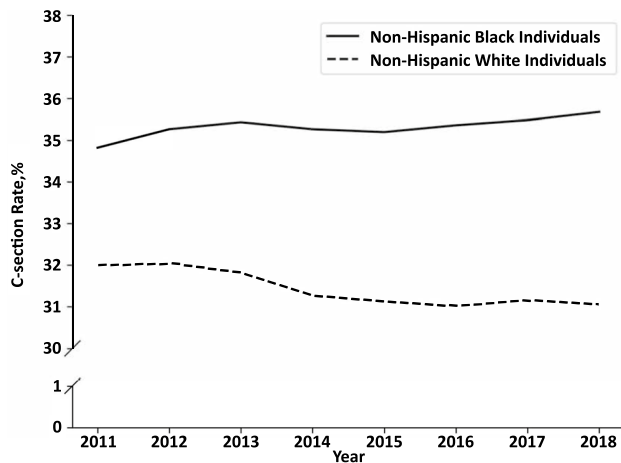
First, the study charted the trends in C-section rates for Black and White individuals from 2011 to 2018. A t-test was conducted to determine the significance of the differences in C-section rates between Black and White mothers, with the results presented alongside 95% confidence intervals (CI). Logistic regressions were then performed annually, accounting for the covariates previously mentioned, to calculate the odds ratio of C-sections in White mothers relative to Black mothers. This method controlled for potential shifts in demographic characteristics, health conditions, and infant health over time. Finally, the B-O decomposition method was applied to assess whether sociodemographic and health factors account for the C-section disparities between Black and White individuals. This method, commonly used to explore discrimination and inequality in health outcomes between two groups, was employed for each year from 2011–2018, enabling a year-by-year analysis of how each factor's influence evolved. The B-O decomposition separated the differential in C-section rates into a portion explained by observable characteristics like education or age, and a residual part that accounts for unexplained factors, potentially including racial discrimination or hospital quality disparities. All statistical analyses were executed using STATA software, version 17.0.

## Results

### Documenting Trends in Cesarean Section

Figure 1 displays the trends in C-section rates for non-Hispanic Black and non-Hispanic White women. It reveals that C-section rates for non-Hispanic Black individuals were consistently higher than those for non-Hispanic White individuals. From 2011 to 2018, the C-section rates for non-Hispanic Black mothers rose from 34.82% to 35.68%, while the rates for non-Hispanic White mothers showed a slight decline from 31.98% to 31.04%. Figure 2 illustrates the disparity in C-section rates between non-Hispanic Black and non-Hispanic White women, calculated by subtracting the C-section rates of White birthing parents from those of Black birthing parents. The gap widened over time, increasing from 2.84% (95% CI: 2.69%–2.99%) to 4.63% (95% CI: 4.49%–4.77%).

<sup>1</sup> Cephalic presentation: A position where the fetus is poised to exit the birth canal head first. It is considered the most common and favorable position for vaginal birth. Breech presentation: A fetal position where the buttocks or feet are positioned to be delivered first, which can increase the complexity of delivery and often leads to a recommendation for cesarean delivery.



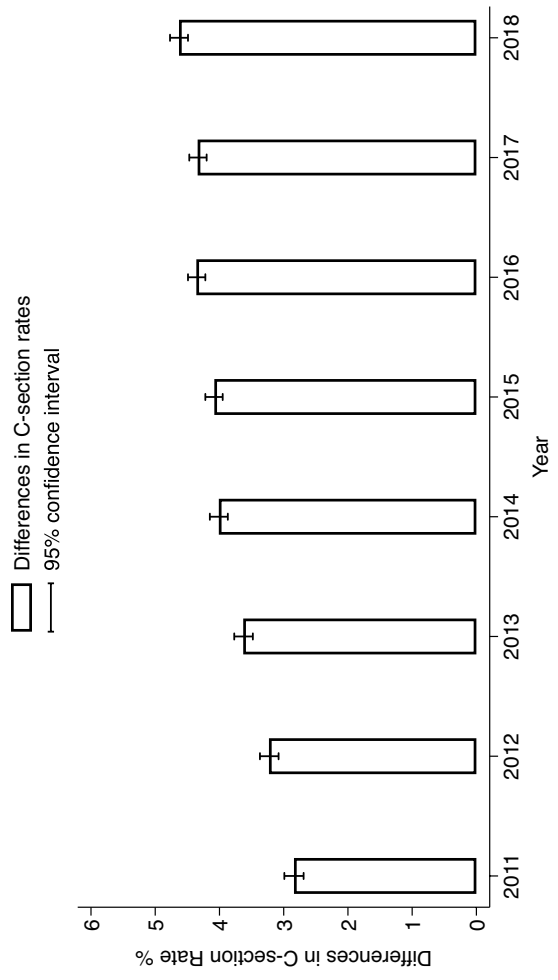
**Fig. 1** C-section Rate Trends of Black and White Individuals, 2011–2018. Data source: Authors' calculations based on data from the National Vital Statistics System (NCHS, 2011–2018)

## Study Population Characteristics

Table 1, Table 2 and Table 3 outline the characteristics of the study population, distinguishing between non-Hispanic Black and non-Hispanic White mothers. Table 1 shows that births were more common among non-Hispanic Black mothers who were younger, had less college education, were unmarried, and whose deliveries were Medicaid-funded, compared to non-Hispanic White mothers. Between 2011 and 2018, there was a slight uptick in average age and marriage rates for both non-Hispanic Black and White mothers. The percentage of non-Hispanic White mothers with a bachelor's degree saw a substantial increase (from 37.7% to 44.2%), while the increase for non-Hispanic Black mothers was more modest (from 19.8% to 25.4%).

Table 2 reports that births to non-Hispanic Black mothers typically involved a lower average birth weight, shorter gestational periods, a higher incidence of multiple births, and a lower frequency of fetal macrosomia (birth weight above 4000 grams) compared to those of non-Hispanic White mothers. Over the study period, the average gestational age and birth weight for non-Hispanic Black mothers decreased slightly. The occurrence of breech position births decreased among both Non-Hispanic Black and White mothers.

Table 3 shows that non-Hispanic Black mothers reported higher rates of obesity, gestational hypertension, and infections, as well as higher rates of non-smoking during pregnancy, compared to non-Hispanic White mothers. In addition, they had lower rates of prenatal care beginning in the first trimester. Throughout the study period, the instances of obesity, gestational diabetes, and hypertension saw an increase in both groups. In contrast, the rate of infections during pregnancy rose among non-Hispanic White mothers but declined among non-Hispanic Black mothers.



**Fig. 2** White-Black Individual C-section Rate Differences, 2011–2018. Data source: Authors’ calculations based on data from the National Vital Statistics System (NCHS 2011–2018)

**Table 1** Mothers' demographic characteristics stratified by non-Hispanic Black and non-Hispanic White mothers: 2011–2018

Mothers' Demographic Characteristics	Total (N) Births	C-section rate (%)	Age, years	Bachelor's degree or higher (%)	Married (%)	Medicaid (%)
2011						
White	2,361,779	31.982	27.958	37.719	64.461	40.339
Black	453,551	34.819	26.137	19.831	28.241	66.108
2012						
White	2,404,499	32.036	28.081	38.653	64.337	39.79
Black	470,906	35.264	26.342	20.452	28.511	66.28
2013						
White	2,437,889	31.805	28.246	39.594	64.473	39.752
Black	491,637	35.43	26.563	21.448	28.848	66.828
2014						
White	2,660,065	31.254	28.355	40.022	64.438	39.907
Black	533,317	35.264	26.786	22.206	29.389	67.429
2015						
White	2,732,950	31.113	28.545	40.81	64.454	39.154
Black	555,269	35.195	27.051	23.113	29.85	66.401
2016						
White	2,759,219	31.002	28.767	42.197	65.075	38.38
Black	90,639	35.357	27.394	24.205	31.296	64.871
2017						
White	2,366,397	31.145	28.837	43.782	65.885	37.529
Black	574,334	35.48	27.556	24.462	31.45	65.689
2018						
White	2,360,340	31.046	28.973	44.224	65.864	37.137
Black	557,240	35.676	27.744	25.396	30.924	65.229

Data source: Authors' calculations based on data from the National Vital Statistics System (NCHS, 2011–2018)

## Logistic Regression Results

Figure 3 shows that the odds ratio of C-sections in non-Hispanic Black mothers compared with non-Hispanic White mothers increased from 1.150 (95% CI: 1.142—1.159) to 1.209 (95% CI: 1.2—1.217) from 2011 to 2018. Covariates associated with higher odds of C-section include older age, less education, having the delivery paid for by Medicaid, having a first birth, having multiple births, smoking during pregnancy, chronic and gestational diabetes and hypertension, and infection during pregnancy.

**Table 2** Infant health characteristics stratified by non-Hispanic Black and non-Hispanic White mothers: 2011–2018

Infant Health Characteristics	Gesta- tional age, weeks	Birthweight, grams	Multiple birth (%)	First birth (%)	Breech position (%)	Fetal Macrosomia (%)
2011						
White	38.741	3317.102	3.308	39.996	5.867	8.792
Black	38.229	3095.445	3.651	38.958	5.869	4.512
2012						
White	38.767	3322.499	3.313	39.85	5.851	8.997
Black	38.258	3103.557	3.630	38.401	5.608	4.687
2013						
White	38.773	3323.346	3.329	39.452	5.901	9.065
Black	38.253	3103.865	3.769	37.692	5.955	4.701
2014						
White	38.768	3322.567	3.344	39.007	5.649	9.09
Black	38.246	3100.718	3.906	37.018	5.833	4.695
2015						
White	38.763	3321.099	3.324	38.453	5.427	9.052
Black	38.242	3098.359	3.881	36.737	5.071	4.646
2016						
White	38.759	3319.562	3.310	38.14	5.247	9.043
Black	38.238	3100.11	3.910	36.106	4.802	4.709
2017						
White	38.723	3314.157	3.356	38.052	4.935	8.885
Black	38.188	3093.205	3.982	35.511	4.505	4.63
2018						
White	38.702	3313.949	3.225	37.991	4.893	8.815
Black	38.154	3087.123	4.064	35.755	4.4	4.536

Data source: Authors' calculations based on data from the National Vital Statistics System (NCHS, 2011–2018)

## Blinder-Oaxaca Decomposition Results

Figure 4, Fig. 5 and Fig. 6 display the Blinder-Oaxaca decomposition results, illustrating the impact of each covariate on the C-section rate disparity between non-Hispanic Black and non-Hispanic White mothers. Of all the characteristics analyzed, sociodemographic factors emerged as the most important contributors to this disparity. Age was identified as the most substantial negative contributor, but its impact diminished over time, declining from a 66% contribution in 2011 to −30% in 2018. Hypertension was the leading health-related factor, accounting for approximately 6% to 8% of the disparity. The most prominent birth-related contributor was fetal malpresentation, influencing the gap by 13% to 22%.



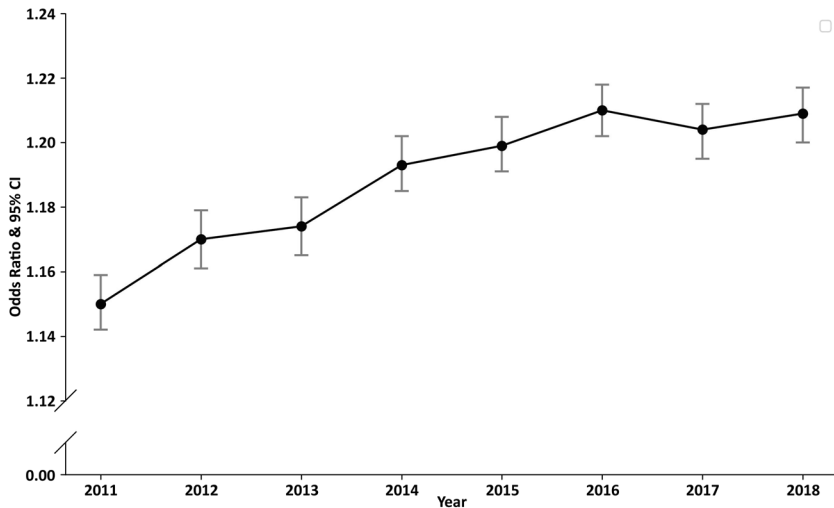
**Table 3** Mothers' health characteristics stratified by non-Hispanic Black and non-Hispanic White mothers: 2011–2018

Mothers' Health Characteristics	Obese (%)	Prenatal care starts in first trimester (%)	Nonsmoker (%)	Gestational diabetes (%)	Gestational hypertension (%)	Infection during pregnancy (%)
2011						
White	22.755	77.206	82.150	4.786	4.478	1.638
Black	32.028	66.501	79.900	4.216	5.555	6.084
2012						
White	23.039	77.377	83.738	5.053	4.7	1.746
Black	32.681	66.508	84.537	4.452	5.729	5.977
2013						
White	23.51	77.542	84.276	5.147	4.897	1.803
Black	33.625	66.542	85.419	4.53	5.946	5.804
2014						
White	24.015	80.153	87.212	5.312	5.197	1.936
Black	34.33	68.859	89.565	4.633	6.226	5.634
2015						
White	24.776	80.479	88.320	5.519	5.631	2.003
Black	35.078	69.41	90.417	4.789	7.007	5.369
2016						
White	25.483	80.785	89.138	5.702	5.974	2.038
Black	35.69	69.703	91.453	5.067	7.218	5.256
2017						
White	26.3	80.475	88.576	6.118	6.718	2.278
Black	36.38	69.595	91.886	5.293	7.654	5.482
2018						
White	27.323	80.436	89.058	6.431	7.437	2.335
Black	37.72	70.037	91.336	5.454	8.51	5.55

Data source: Authors' calculations based on data from the National Vital Statistics System (NCHS, 2011–2018)

## Discussion

The study indicates that sociodemographic factors are pivotal in widening the C-section rate gap between non-Hispanic Black and White mothers. An increase in the age of the birthing parent was notably linked to this disparity. Moreover, the method of payment for delivery, particularly Medicaid, emerged as a substantial factor. Non-Hispanic Black mothers were 20% more likely to use Medicaid for delivery payments compared to non-Hispanic White women. Logistic regression analysis revealed a positive correlation between Medicaid coverage and the likelihood of a C-section. Since Medicaid users typically have lower income levels, the

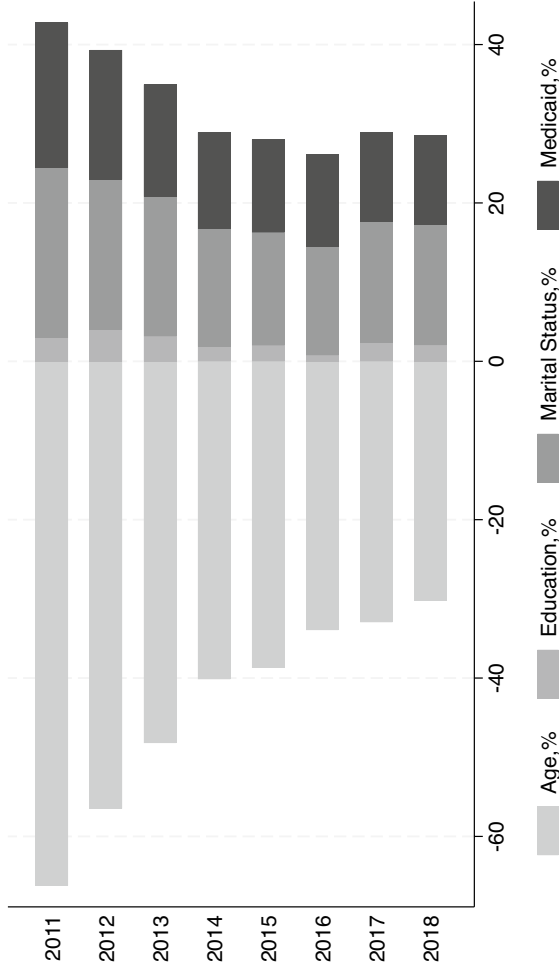


**Fig. 3** Trends in Odds Ratio of C-sections in Non-Hispanic White Mothers Compared with non-Hispanic Black Mothers, 2011–2018. Data source: Authors' calculations based on data from the National Vital Statistics System of NCHS for the years 2011–2018

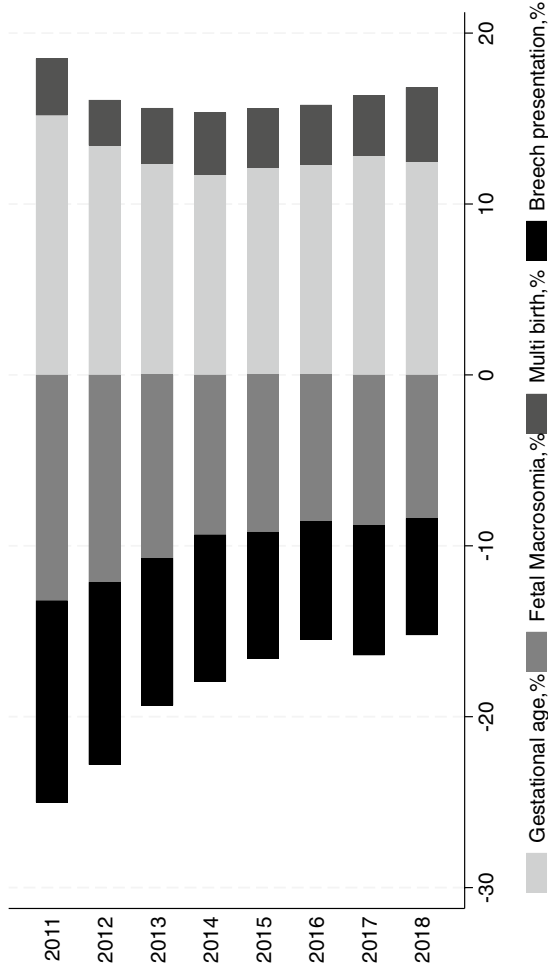
study suggests a possible link between income disparities and the C-section rate gap (Kominiński et al., 2017). However, this hypothesis warrants further investigation. Additionally, marital status moderately influenced the C-section disparities. Non-Hispanic Black mothers were less likely to be married during pregnancy. Prior research has shown that having dual-parent involvement during pregnancy enhances maternal health-seeking behaviors (Martin et al., 2007). Therefore, the absence of such support may create both financial and informational barriers that hinder non-Hispanic Black individuals from accessing comprehensive information about C-section deliveries (Lu et al., 2010).

Birth characteristics contributed moderately to C-section disparities, with factors like fetal malpresentation and multiple births closely linked to the likelihood of undergoing a C-section. Table 2 highlights substantial differences between non-Hispanic Black and White mothers in these aspects. Research suggests that non-Hispanic Black individuals are more prone to having twins or multiple births compared to other races (Lu et al., 2010). This points to a portion of the higher C-section rates among non-Hispanic Black individuals possibly stemming from genetic factors, which could make these surgeries medically necessary. Furthermore, Table 3 shows an increase in pregnancy-related hypertension for both non-Hispanic Black and White individuals, with a notable and persistent disparity between the two. This aligns with a life course perspective, underlining the importance of tackling adverse maternal health issues to narrow the gap in C-section rates.

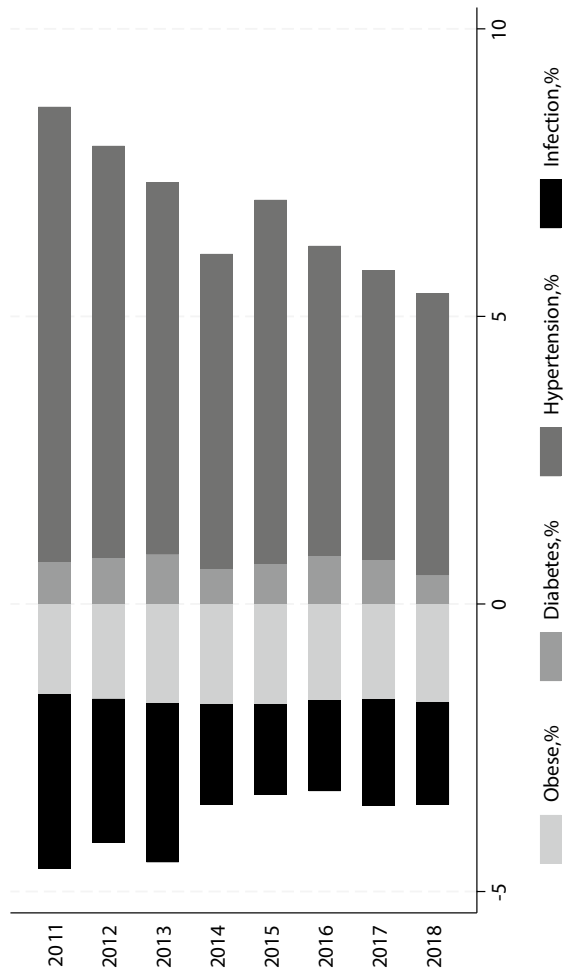
The life course perspective suggests that disparities in birthing outcomes between non-Hispanic Black and White individuals are influenced by a lifetime of experiences. This view posits that the developmental trajectory of a person's life, from childhood to pregnancy, can impact birthing outcomes (Bryant et al., 2010).



**Fig. 4** Percent contribution to C-section rate disparity explained by mothers' demographic contributors. Data source: Authors' calculations based on data from the National Vital Statistics System (NCHS, 2011–2018)



**Fig. 5** Percent contribution to C-section rate disparity explained by infant health contributors. Data source: Authors' calculations based on data from the National Vital Statistics System of (NCHS, 2011–2018)



**Fig. 6** Percent contribution to C-section rate disparity explained by mothers' health contributors. Data source: Authors' calculations based on data from the National Vital Statistics System of (NCHS, 2011–2018)

Research has investigated how racial disparities in life experiences, encompassing socioeconomic status, job discrimination, and the legacy of racist housing policies, contribute to differences in obstetric experiences and outcomes (Hollenbach et al., 2022).

Hospital quality might also play a role in the disparities between non-Hispanic Black and White C-section rates. Variations in cesarean delivery rates across hospitals have been documented (Nguyen et al., 2017). Factors such as hospital policies, the culture within hospital units, and the attitudes of individual clinicians may contribute to the racial differences observed in cesarean delivery rates (Rosenstein et al., 2021).

## Limitations

The study's first limitation lies in its partial explanation of the disparities in C-section rates between non-Hispanic Black and White mothers. A large portion of the disparities remains unaccounted for. This gap may be due to factors not observed or captured in the study, such as environmental influences, variations in prenatal care quality, hospital standards, decisions made by doctors during delivery, and other unidentified indicators related to C-sections.

Secondly, while the Blinder-Oaxaca decomposition results delineate the relative impact of each characteristic on C-section disparities, they do not lend themselves well to comparative analysis over time. Future research could undertake a more comprehensive study to refine these comparisons. For instance, the costs of C-sections could be an important factor. Doctors' decisions regarding whether to perform a cesarean may be influenced by factors such as the patient's insurance type or the out-of-pocket expenses associated with delivery. By measuring the costs of C-sections more accurately, one could gain a clearer understanding of these issues (Corredor-Waldron et al., 2024).

Finally, the current findings only establish correlations between observed factors and the C-section rate disparity. To determine causality, experimental and quasi-experimental research designs would be required for more in-depth analysis.

## Declarations

**Conflict of interest** We declare no conflict of interest.

**Ethics Committee Approval** This study does not involve human participants and, thus, does not require ethics committee approval.

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## References

- Ananth, C. V., Friedman, A. M., Keyes, K. M., Hamilton, A., & Wright, J. D. (2016). Trends in primary and repeat cesarean deliveries: A population-based cohort study in the United States, 1979–2010. *American Journal of Obstetrics and Gynecology*, 214(1), S380–S380.
- Belizan, J. M., Althabe, F., & Cafferata, M. L. (2007). Health consequences of the increasing caesarean section rates. *Epidemiology*, 18(4), 485–486.
- Betran, A. P., Temmerman, M., Kingdon, C., Mohiddin, A., Opiyo, N., Torloni, M. R., Zhang, J., Musana, O., Wanyonyi, S. Z., Gulmezoglu, A. M., & Downe, S. (2018). Interventions to reduce unnecessary caesarean sections in healthy women and babies. *Lancet*, 392(10155), 1358–1368.
- Blanchette, H. (2011). The Rising Cesarean Delivery Rate in American. *Obstetrics and Gynecology*, 118(3), 687–690.
- Bryant, A. S., Worjohol, A., Caughey, A. B., & Washington, A. E. (2010). Racial/ethnic disparities in obstetric outcomes and care: Prevalence and determinants. *American Journal of Obstetrics and Gynecology*, 202(4), 335–343.
- Clark, S. L., Garite, T. J., Hamilton, E. F., Belfort, M. A., & Hankins, G. D. (2018). “Doing something” about the cesarean delivery rate. *American Journal of Obstetrics and Gynecology*, 219(3), 267–271.
- Corredor-Waldron, A., Currie, J., & Schnell, M. Drivers of racial differences in C-sections. national bureau of economic research working paper series. <http://www.nber.org/papers/w32891>. Accessed Oct 2024
- Hanson, C., Samson, K., Anderson-Berry, A. L., Slotkowski, R. A., & Su, D. J. (2022). Racial disparities in caesarean delivery among nulliparous women that delivered at term: Cross-sectional decomposition analysis of Nebraska birth records from 2005–2014. *BMC Pregnancy and Childbirth*, 22(1), 329. <https://doi.org/10.1186/s12884-022-04666-3>
- Hollenbach, S. J., Thornburg, L. L., Glantz, J. C., & Hill, E. (2022). Associations Between Historically Redlined Districts and Racial Disparities in Current Obstetric Outcomes. *Obstetrical & Gynecological Survey*, 77(3), 141–142.
- Kominski, G. F., Nonzee, N. J., & Sorensen, A. (2017). The Affordable Care Act’s Impacts on Access to Insurance and Health Care for Low-Income Populations. *Annual Review of Public Health*, 38, 489–505. <https://doi.org/10.1146/annurev-publhealth-031816-044555>
- Lu, M. C., Kotelchuck, M., Hogan, V., Jones, L., Wright, K., & Halfon, N. (2010). Closing the Black-White Gap in Birth Outcomes: A Life-Course Approach. *Ethnicity & Disease*, 20(1), 62–76.
- Lurie, S., Raz, N., Boaz, M., Sadan, O., & Golan, A. (2014). Comparison of maternal outcomes from primary cesarean section during the second compared with first stage of labor by indication for the operation. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 182(November), 43–47.
- Martin, L. T., McNamara, M. J., Milot, A. S., Halle, T., & Hair, E. C. (2007). The effects of father involvement during pregnancy on receipt of prenatal care and maternal smoking. *Maternal and Child Health Journal*, 11(6), 595–602.
- National Center for Health Statistics, National Vital Statistics System, Natality Data, 2011–2018. <https://www.cdc.gov/nchs/nvss/births.htm>.
- Nguyen, D. B., Czuzoj-Shulman, N., Spence, A. R., & Abenhaim, H. A. (2017). Variation in cesarean delivery rates among high-risk pregnancies across hospitals in the US. *American Journal of Obstetrics and Gynecology*, 216(1), S384–S385.
- Okwandu, I. C., Anderson, M., Postlethwaite, D., Shirazi, A., & Torrente, S. (2022). Racial and Ethnic Disparities in Cesarean Delivery and Indications Among Nulliparous, Term, Singleton, Vertex Women. *Journal of Racial and Ethnic Health Disparities*, 9(4), 1161–1171.
- Puro, N., Kelly, R. J., Bodas, M., & Feyereisen, S. (2022). Estimating the differences in Cesarean section (C-section) rates between public and privately insured mothers in Florida: A decomposition approach. *PLoS ONE*, 17(4), e0266666.
- Robinson, S., Royer, H., & Silver, D. (2024). Geographic Variation in Cesarean Sections in the United States: Trends, Correlates, and Other Interesting Facts. *Journal of Japan Water Works Association*, 42(Suppl 1), S219–S259.
- Rosenstein, M. G., Chang, S. C., Sakowski, C., Markow, C., Teleki, S., Lang, L. C., Logan, J., Cape, V., & Main, E. K. (2021). Hospital Quality Improvement Interventions, Statewide Policy Initiatives, and Rates of Cesarean Delivery for Nulliparous, Term, Singleton, Vertex Births in California. *Obstetrical & Gynecological Survey*, 76(10), 593–595.

- Sandall, J., Tribe, R. M., Avery, L., Mola, G., Visser, G. H., Homer, C. S., & Temmerman, M. (2018). Short-term and long-term effects of caesarean section on the health of women and children. *Lancet*, 392(10155), 1349–1357.
- Wells, J. C., Wibaek, R., & Poullas, M. (2019). Global epidemiology of use of and disparities in caesarean sections. *Lancet*, 394(10192), 24–25.
- Wiklund, I., Malata, A. M., Cheung, N. F., & Cadee, F. (2018). Appropriate use of caesarean section globally requires a different approach. *Lancet*, 392(10155), 1288–1289.
- Witt, W. P., Wisk, L. E., Cheng, E. R., Mandell, K., Chatterjee, D., Wakeel, F., & Zarak, D. (2015). Determinants of cesarean delivery in the US: A lifecourse approach. *Maternal and Child Health Journal*, 19(1), 84–93.

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