Patient Race and Location Influence Cesarean Rates for First-Time Deliveries

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Last updated 18 March 2025 • Check for updates at EpicResearch.org

Key Findings:

- Black and Asian mothers have higher rates of cesarean deliveries during their first deliveries compared to those who are Hispanic, White, Indigenous American, or Hawaiian/Pacific Islander.
- Women who live in the southern, northeastern, and urban parts of the United States (U.S.) have higher rates of cesarean deliveries compared to other regions and rural locations in the U.S.

Cesarean delivery, also known as a C-section, is a surgical procedure in which a baby is delivered through an incision in the mother's abdomen and uterus. While often necessary for maternal or fetal indications, it is associated with higher risks of maternal and neonatal complications, as well as increased healthcare costs, compared to vaginal delivery.[1,2] Over the past decade, C-section rates have risen globally, raising concerns around potential overuse and its impact on maternal and neonatal health.[3,4] However, less is known about whether certain populations are more or less likely to have a C-section for their first delivery.

To better understand the demographics and clinical characteristics associated with cesarean deliveries, we studied 2,099,282 women who had their first delivery documented between January 1, 2017, and December 31, 2024. We excluded women who were younger than 14 years or older than 50 years at the time of birth or those whose baby had a gestational age less than 22 weeks or more than 45 weeks at delivery.

We found that the rate of first-time deliveries by cesarean was highest amongst Black mothers, with 33.8% of their deliveries occurring by C-section, while Hispanic mothers had the lowest rate of C-sections for their first delivery, as seen in Figure 1. C-sections are more common in the South and Northeast regions of the US. However, those living in rural areas had lower rates of C-sections than those in more densely populated areas.

Rate of Cesarean Deliveries Among First-Time Deliveries by Demographic Factors

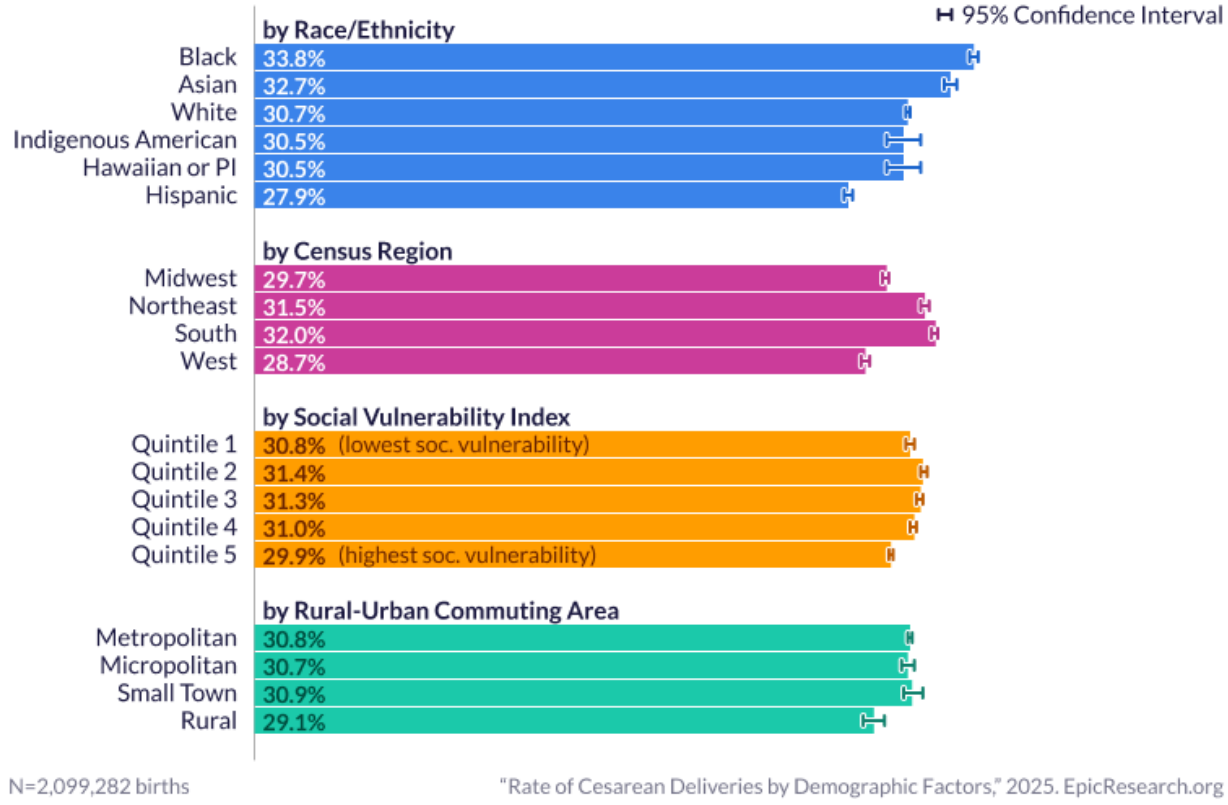

Figure 1. The rate of cesarean deliveries for first-time births stratified by the mother's demographic factors.

We found similar results in a sensitivity analysis adjusting for factors known to increase the risk of cesarean deliveries, such as conditions of the placenta or umbilical cord, position of the baby, or medical diagnoses the mother may have.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 295 million patient records from 1,600 hospitals and more than 37,000 clinics from all 50 states, Lebanon, and Saudi Arabia. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.

References

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Data Definitions

Term	Definition
Study period	1/1/2017 to 12/31/2024
Study population	First-time births documented where the mother: • Was between ages 14 and 50 • Had no previous birth result or evidence of a prior pregnancy • Had indication of whether this birth resulted in a cesarean delivery or not • Had a baby with a gestational age between 22 and 45 weeks Events were considered the same birth if they occurred within three months of one another. If two events fall into this case, we used the minimum date between them. If a patient had evidence of both types of birth (e.g.: vaginal and cesarean within the same 3 months), we removed them from the population entirely
Cesarean delivery	A delivery with cesarean delivery flag
RUCA	Rural-urban commuting area, a classification of geographic areas based on population density, urbanization, and daily commuting. It ranges from 1 to 10, with lower values indicating more urban areas and higher values indicating more rural areas. The groups were categorized as: • Metropolitan: 1-3 • Micropolitan: 4-6 • Small town: 6-9 • Rural: 10
Race and ethnicity	The patient's self-reported race and ethnicity. Patients could be represented in more than one group if they were multiracial, though patients with a Hispanic ethnicity were counted in only that group.
Social Vulnerability Index	The social vulnerability quintile for the ZIP Code of the patient's latest address
Adjustments	In the logistic regression model, the following criteria were considered: A diagnosis within the 9 months before the birth: • Substance use disorder: F10*, F11*, F12*, F13*, F14*, F15*, F16*, F17*, F18*, or F19* A diagnosis any time before the date of birth: • HIV: B20 • Diabetes: E11*, E10*, O24.4*, E08*, E09*

- Preeclampsia and pregnancy hypertension: O10*, O11*, O12*, O13*, O14*, O15*, O16*, or I10
- Placenta accreta: O43.21*
- Low-lying placenta: O44.4* or O44.5
- Placenta previa: O44* (except for O44.4 and O44.5)

A diagnosis around the day of birth (seven days before through seven days after):

- Placenta abruption: O45*
- Uterine rupture: O71.1
- Cord complications: O69*
    - Prolapse of cord: O69.0*
    - Cord around neck with compression: O69.1*
    - Cord entanglement with compression: O69.2*
    - Short cord: O69.3*
    - Vasa previa: O69.4*
    - Vascular lesion of cord: O69.5*
    - Other cord complications: O69.8* or O69.9*
- Fetal distress: O77*
- Maternal hemorrhage: O20*, O67*, or O72*
- Breech: O32.1*

Social Vulnerability Index: quintiles

RUCA

Race and ethnicity

Mother's age at the time of birth:

- 14-17
- 18-26
- 27-34
- 35-50

Birth outcomes:

- Neonatal demise

Gestational age (in weeks)

- 22-23
- 24-29
- 30-34
- 35-37

	• 38-40 • 41-42 • 43-45 Pregnancy with multiples: Y/N Census region: • Northeast • West • Midwest • South **Prenatal care:** Y/N
C-section	A delivery with cesarean delivery flag
Race and ethnicity	The self-reported race and ethnicity of the patient. The patients were placed into a category first based on ethnicity, and then race. The races were grouped into White, Black, Asian, Hawaiian or Pacific Islander (Hawaiian or PI), Native American, and multiracial.
Prenatal care	Whether the patient had any encounter with the same organization that reported the birth within 6 months before the birth, excluding the date of birth, that was of type 'routine prenatal', 'initial prenatal', 'fetal care consult' or 'fetal procedure' or that was an 'office visit' encounter in a department like 'Obstetrics*'.

Table 1: Rate of Cesarean Deliveries Among First-Time Deliveries by Demographic Factors

	Rate	95% CI Low	95% CI High
Race/Ethnicity			
Black	33.8%	33.6%	34.0%
Asian	32.7%	32.4%	33.0%
White	30.7%	30.6%	30.8%
Indigenous American	30.5%	29.7%	31.3%
Hawaiian or PI	30.5%	29.7%	31.3%
Hispanic	27.9%	27.7%	28.1%
Census Region			
MW	29.7%	29.5%	29.8%
NE	31.5%	31.3%	31.7%
S	32.0%	31.8%	32.1%

W	28.7%	28.5%	28.9%
Social Vulnerability Index			
Quintile 1	30.8%	30.6%	31.0%
Quintile 2	31.4%	31.3%	31.6%
Quintile 3	31.3%	31.1%	31.4%
Quintile 4	31.0%	30.8%	31.1%
Quintile 5	29.9%	29.8%	30.0%
Rural-Urban Commuting Area			
Metropolitan	30.8%	30.7%	30.9%
Micropolitan	30.7%	30.4%	31.0%
Small Town	30.9%	30.5%	31.4%
Rural	29.1%	28.6%	29.6%

Table 2: Logistic Regression Sensitivity Analysis

	Odds Ratio	Lower CI	Upper CI
Is Black	1.29	1.26	1.31
Is Asian	0.96	0.94	0.98
Is ANOPI	1.05	1.00	1.09
Is Native American	1.02	0.98	1.06
Is White	0.89	0.87	0.90
Is Hispanic	0.94	0.92	0.96
Had HIV	1.75	1.54	1.99
Had Diabetes	1.56	1.54	1.57
Had Preeclampsia Hypertension	1.85	1.82	1.88
Had Uterine Rupture	4.08	3.22	5.16
Had Prolapse Of Cord	16.08	14.69	17.60
Had Cord Around Neck	0.41	0.40	0.42
Had Cord Entanglement	0.94	0.91	0.98
Had Short Cord	0.41	0.38	0.44
Had Vasa Previa	27.15	21.39	34.47
Had Vascular Lesion Of Cord	1.72	1.54	1.92
Had Other Cord Complication	0.48	0.47	0.48
Had Placenta Abruption	3.18	3.08	3.28
Had Placenta Previa	1.32	1.30	1.35
Had Fetal Distress	2.03	2.02	2.05
Had Substance Use Disorder	1.19	1.17	1.21
Had Maternal Hemorrhage	1.06	1.05	1.07
Had Breech	55.43	53.91	56.99
Had Placenta Accreta	1.88	1.62	2.18
Had IUGR	1.59	1.55	1.63
Had Pelvic Outlet Issue	32.84	30.71	35.11
Had Asynclitic	7.00	6.81	7.19

Had Fetal Macrosomia	4.54	4.47	4.61
Had Prenatal Care	0.87	0.86	0.87
SVI_<.2	0.91	0.90	0.92
SVI_[.2,.4)	0.96	0.95	0.97
SVI_[.4,.6)	0.98	0.97	0.99
SVI_[.6,.8)	1.00	0.99	1.01
RUCA Micropolitan	1.11	1.09	1.12
RUCA Small Town	1.16	1.14	1.18
RUCA Rural	1.05	1.03	1.08
Census Region NE	0.99	0.98	1.00
Census Region S	1.11	1.10	1.12
Census Region W	0.88	0.87	0.89
Gestational Age_[22,23]	0.20	0.17	0.22
Gestational Age_[24,29]	3.27	3.14	3.40
Gestational Age_[30,34]	2.50	2.46	2.55
Gestational Age_[35,37]	1.31	1.30	1.33
Gestational Age_[41,42]	1.47	1.45	1.49
Gestational Age_[43,45]	2.27	1.64	3.12
Age At Birth Date 14-17	0.51	0.50	0.53
Age At Birth Date 27-34	1.49	1.48	1.51
Age At Birth Date 35-50	2.62	2.60	2.65