Ohio Public Health Association
Ohio Journal of Public Health

Ohio Journal of Public Health, Vol. 6, Issue 2 ISSN: 2578-6180

RESEARCH ARTICLE

Racial Disparities in Obstetrical Outcomes: A Single Institution Study

Katie M. Whitehead[1]; Rose A. Maxwell[2]; David McKenna[2]

[1]Wright State University Boonshoft School of Medicine, Dayton, OH
[2]Department of Obstetrics and Gynecology, Wright State University Boonshoft School of Medicine, Dayton, OH

Corresponding Author: Katie Whitehead, 3640 Colonel Glenn Highway, Fairborn, OH 45324, whitehead.44@wright.edu

Submitted June 21, 2024 Accepted August 12, 2024 Published September 5, 2024 https://doi.org/10.18061/ojph.v6i2.9969

ABSTRACT

Background: Maternal and neonatal morbidity and mortality is a prevalent and pressing issue in our health care system that is disproportionately affecting minority populations at increasing rates. This study's objective is to analyze data from a single institution in southwest Ohio to determine if racial disparities are present and to what extent different measures of labor outcomes are influenced.

Methods: We analyzed retrospective data utilizing the electronic medical records system from a multicenter hospital system in southwest Ohio, dating January 2019 to July 2021. The dataset included demographic, obstetrical, and labor outcomes of patients who gave birth to singleton pregnancies at 37 weeks gestation or greater during the time period. Using the patients' self-identified race, chi-square tests and Student t tests were used to identify disparities in obstetrical outcomes.

Results: Of the 13 666 patients in the cohort, non-Caucasian patients experienced higher rates of cesarean delivery than Caucasian patients and were more likely to have higher maternal composite scores, indicating a higher rate of adverse effects during and after labor. The nulliparous, term, singleton, vertex (NTSV) rate was 5% higher among non-Caucasian patients than Caucasian patients. Significant differences in the length of time between induction and delivery were also found between race groups.

Conclusion: Our findings suggest the presence of unmeasured clinical and nonclinical factors that are affecting the care of minority patients, similar to the findings of current and past literature. This data can be utilized as a baseline for future interventions aimed at reducing the disparities in Ohio and across the country.

Keywords: Racial disparities; Labor outcomes; Maternal morbidity; Women's health

INTRODUCTION

The United States has the highest infant and maternal mortality rates among high-income countries, despite spending more per capita on health care than other high-income countries.[1] Within these high morbidity and mortality rates, there exists a pronounced disparity between White and minority patients. Black pregnant patients are up to 3 times more likely to die from pregnancy-related complications than White pregnant patients and are more likely to die from a preventable cause.[2,3] There have been observed disparities in cesarean delivery rates and indications among racial groups, with minority populations having significantly higher odds of having a cesarean delivery compared to White patients.[4]

There has been a rapid rise in the rates of cesarean delivery, up over 4% from 2019 to 2021, but without an associated decrease in the rates of maternal and neonatal mortality.[5] This increase was driven predominantly by primary cesarean deliveries (ie, patients who have not had a prior cesarean delivery).[6,7] Cesarean delivery is often a lifesaving procedure for both the mother and baby, but it is not without higher risks of maternal morbidity and mortality and adverse neonatal outcomes compared to vaginal deliveries.[8] These findings have led to the rate of cesarean deliveries among

patients with nulliparous, term, singleton, vertex pregnancies (NTSV) becoming the central metric used by health care systems for tracking interventions aimed at reducing cesarean delivery rates.[5,9] Regardless of race, NTSV rates are higher among patients with multiple comorbidities compared to patients with no comorbidities. However, among patients with no comorbidities, non-Hispanic Black patients have the highest NTSV rate among all race groups.[10]

As the growing cesarean rates become more apparent, induction of labor (IOL) has become an increasingly common procedure as it can reduce the risk of cesarean delivery and provide benefits for the baby.[11,12] About 1 in 5 pregnant patients in the United States will undergo IOL, but the process varies by patient, providers, and institution making the outcomes and levels of maternal birth satisfaction, assessed by the Birth Satisfaction Scale–Revised, also vary widely.[13,14] Historically, systemic racism both outside and within the health care system, as well as reports of mistreatment by minority patients, have been well-documented in literature to affect the trust and relationships between patients and their provider.[15,17] Specific to IOL, Black patients are more likely to describe lower levels of birth satisfaction, hypothesized to be associated with the higher rates of inductions resulting in cesarean delivery and longer laboring times also reported in this group.[14,18]

The current gaps in the research lie in how to best create and implement solutions that will reduce the racial disparities in maternal and neonatal morbidity. Limited research has shown that applying standardized protocols to common obstetrical procedures has successfully reduced the overall maternal mortality rate as well as the differing rates of cesarean deliveries and neonatal morbidities between racial groups.[19] There are many factors that can contribute to the disparities seen in patient morbidity, but statistically significant risks may vary between providers, hospitals, and communities. Understanding how the patients within Ohio and our community are affected by these factors has significant implications for public health in Ohio and can be utilized to improve care for all patients. The purpose of our study is to analyze the data from a single institution in southwest Ohio to determine if racial disparities are present and to what extent different measures of labor outcomes are disproportionately affected. This data will allow us to better understand the disparities present in our community and in Ohio and will serve as a baseline for comparing the effectiveness of interventions on patient outcomes in the future.

METHODS

Data and Participants

Retrospective data were extracted from the electronic medical record at a large hospital system in southwestern Ohio. Patient identifiers were removed from the dataset prior to analysis. All pregnant patients at 37 weeks of gestational age or greater who were admitted to 1 of the 5 maternity locations within a single health system from January 2019 to July 2021 were eligible for inclusion. Individuals were excluded if they were carrying more than 1 baby to ensure the study population did not include those at increased risk for poor maternal or fetal outcomes due to multiple gestation. In total, 13 666 patients met criteria to be included in the study. The data included demographic information such as gestational age at delivery, self-identified race, zip code of residence, primary language spoken, type of insurance, and the presence of diabetes and/or hypertension. It also included measures of obstetrical outcomes such as date and time of admission and delivery, maternal morbidity and maternal outcome composite scores, neonatal morbidity and neonatal outcome composite scores, mode of delivery, birth weight, and induction of labor rates. This study was approved by the Wright State University Institutional Review Board (#07272).

Measures

Maternal outcome composite scores were calculated as a yes or no that at least 1 adverse effect occurred for the mother during labor and delivery or up to 4 weeks postpartum, effects included third- or fourth-degree perineal laceration, blood transfusion, endometritis, wound separation or infection, venous thromboembolism, hysterectomy, intensive care unit admission, eclampsia, cardiac arrest, or death. Neonatal outcome composite scores were calculated as a yes or no that at least 1 adverse effect occurred for the neonate during or after delivery, effects included severe respiratory distress, need for resuscitation, sepsis, and/or admission to the neonatal intensive care unit (NICU). If an adverse outcome was present, the patient received a score of 1, if no adverse outcome occurred, they received a 0. The average birth weight of the babies born to the whole cohort and to each race group was defined, as well as the percentage of babies that qualified as small for gestational age (SGA). Small for gestational age was defined as a weight less than the 10th percentile for the gestational age and sex of baby as set by the American Academy of Pediatrics.[20] A vaginal birth after cesarean delivery (VBAC) is a term used for patients who undergo vaginal delivery following a previous cesarean delivery in a prior pregnancy. The data included whether the patient attempted a VBAC and, if so, whether it was successful or failed. Using these data, we could calculate a successful VBAC rate by determining the ratio of successful VBACs to all attempted VBACs.

Statistical Analysis

Descriptive statistics of the data from each of the 4 sites within the hospital system were first completed to identify if there were significant differences in the patient populations between the sites. The demographics were not found to be significantly different between the sites, so the remaining analysis was done with data from all sites together. Patients were grouped by their self-identified race as recorded in the medical record. In this study the largest racial groups were Caucasian (73.2%) and Black or African American (21.7%). All patients who did not identify as Caucasian were also grouped into a secondary non-Caucasian category to allow for a comparison of Caucasian patients versus all other

races. Descriptive statistics were used to characterize the demographic and clinical data of the entire cohort and of each race group. The associations between the groups were compared using chi-square tests for categorical variables and Student t tests for the continuous variables. Statistical significance was defined as $P < 0.05$. All statistical analysis was performed on SPSS version 29.0 software (IBM, Armonk NY).

RESULTS

Cohort Demographics

Demographic and health history of the cohort grouped by race are reported in Table 1. Overall, 73% of the patients identified as Caucasian and 21.7% as Black or African American. In the period studied, there were no cases of maternal death and 8 cases of neonatal death, 5 Caucasian babies and 3 Black or African American babies, which each accounted for 0.1% of babies born to the respective groups. English was identified as the primary language spoken of 95% of the cohort. A prior parity was experienced by 64.5% of the cohort; this rate was similar across Caucasian and non-Caucasian patients. There were statistically significant differences for age, body mass index (BMI), maternal comorbidities, and insurance type between Caucasian and non-Caucasian patients. Caucasian patients tended to be older, have lower BMIs, and have diabetes at the time of labor while non-Caucasian patients were more likely to have hypertension and have Medicaid insurance. Over 77% of Black or African American patients utilized Medicaid compared to 34.7% of Caucasian patients.

Labor Outcomes

In total, 3 953 patients (28.9%) underwent a cesarean delivery. Non-Caucasian patients underwent a cesarean delivery at a significantly higher rate than Caucasian patients (30.0% vs 28.5%; $P < 0.01$). Of the patients who received cesarean delivery, 47.2% were experiencing cesareans for the first time, and this rate was similar across race groups. The rate of attempted VBAC was higher in non-Caucasian individuals than Caucasian individuals but was more often successful in Caucasian patients (78.6% vs 68.5%; $P < 0.01$). Examination of NTSV data showed a significantly higher rate in non-Caucasian patients when compared to Caucasian patients, a difference of 5%. Table 2 describes the labor outcomes for the entire cohort and group breakdowns.

Neonatal Outcomes

Neonatal outcomes included birth weight, the rate of NICU admission, the proportion of babies that were small for gestational age (SGA), and neonatal composite score (Table 3). Caucasian babies had an average neonatal composite score of 0.05 while non-Caucasian babies had an average neonatal composite score of 0.07. There was a statistically significant difference in the

Table 1. Demographic and Health History for Full Cohort and by Racial Groups

	Entire Cohort (n = 13666)	**Caucasian** (n = 9999)	**Black or African American** (n = 2965)	**All non-Caucasian** (n = 3667)	**P value** (Caucasian vs Black/African American)	**P value** (Caucasian vs non-Caucasian)
Age at Delivery [years (mean ± SD)]	28.1 ± 5.6	28.5 ± 5.4	26.5 ± 5.8	27.0 ± 5.9	<.001	<.001
BMI (mean ± SD)	33.4 ± 6.9	33.3 ± 6.7	34.1 ± 7.5	33.6 ± 7.3	<.001	.008
Gestational Age at Delivery [weeks (mean ± SD)]	38.9 ± 1.1	39.0 ± 1.1	38.8 ± 1.1	38.9 ± 1.1	<.001	<.001
Diabetes [n (%)]	1306 (9.6%)	994 (9.9%)	218 (7.3%)	312 (8.5%)	<.001	.005
Hypertension [n (%)]	2481 (18.2%)	1674 (16.7%)	712 (24.0%)	807 (22.19%)	<.001	<.001
Prior Parity [n (%)]	8690 (64.5%)	6348 (64.3%)	1915 (65.9%)	2337 (65.2%)	.159	.324
Medicaid Insurance [n (%)]	6090 (44.6%)	3465 (34.7%)	2290 (77.2%)	2634 (71.8%)	<.001	<.001

Table 2. Labor Outcomes for Full Cohort and by Racial Groups

	Entire Cohort (n = 13666)	**Caucasian** (n = 9999)	**Black or African American** (n = 2965)	**All non-Caucasian** (n = 3667)	**P value** (Caucasian vs Black/ African American)	**P value** (Caucasian vs non-Caucasian)
Cesarean Delivery [n (%)]	3954 (28.9%)	2855 (28.5%)	900 (30.3%)	1098 (30.0%)	.061	.028
Repeat Cesarean [n (%)]	1980 (52.8%)	1519 (53.4%)	461 (51.2%)	562 (51.2%)	.236	.126
Attempted VBAC [n (%)]	624 (4.6%)	384 (3.8%)	197 (6.6%)	240 (6.6%)	<.001	<.001
Successful VBAC Rate [n (%)]	469 (75.2%)	302 (78.6%)	92 (68.5%)	167 (69.6%)	<.001	<.001
NTSV Rate [n (%)]	1086 (27.5%)	774 (24.7%)	273 (29.8%)	312 (29.5%)	.006	.007

VBAC: vaginal birth after cesarean delivery; NTSV: nulliparous, term, singleton, vertex; Successful VBAC rate: The ratio of successful VBACs to attempted VBACs.

proportion of Caucasian babies admitted to the NICU versus the proportion of non-Caucasian babies admitted (4.9% vs 6.7%; P < 0.001). Non-Caucasian babies were more likely to be SGA than Caucasian babies (13.1% vs 6.4%, respectively). Black or African American babies qualified as SGA at a rate of 13.7%, while only 6.4% of Caucasian babies qualified as SGA.

Maternal Outcomes

During the period studied, there were no cases of maternal death. The average maternal composite score for Caucasian patients was 0.04 while the average maternal composite score for non-Caucasian patients was significantly higher at 0.05 (P < 0.01). The average length of stay (LOS) for patients giving birth was 2.2 days which was similar across the different racial groups (Table 4).

Inductions and Laboring Length of Time

Overall, 30% of the patients in the cohort were induced into labor. Patients in labor less than 2 hours or greater than 100 hours were excluded from this analysis. Patients who were induced showed a similar length of time between time of induction and time of eventual delivery, about 23 hours. For the patients who were induced into labor and delivered via cesarean delivery, non-Caucasian patients spent a significantly shorter length of time in labor than Caucasian patients (29.0 hours vs 33.3 hours, P < 0.01). When induced patients delivered vaginally, there was no significant difference in the length of laboring time between racial groups. For all patients presenting to any maternity site (all comers) who eventually had a vaginal delivery, the average length of laboring time was 14.8 hours and was significantly different between racial groups. For all comers who delivered via cesarean delivery, non-Caucasian patients spent a significantly longer length of time in labor when compared to Caucasian patients (13.5 vs 12.0, P < 0.01) (Table 5).

DISCUSSION

We found that patients of different racial groups experienced delivery outcomes, maternal complications, and neonatal complications at significantly different rates. Of the cohort, 28.9% of patients received a cesarean delivery and 27.5% of those patients qualified as NTSV. We found a significantly higher overall rate of cesarean delivery and a higher NTSV rate among the non-Caucasian patients when compared to the Caucasian patients. Our

Table 3. Neonatal Outcomes for Full Cohort and by Racial Groups

	Entire Cohort (n = 13666)	**Caucasian** (n = 9999)	**Black or African American** (n = 2965)	**All non-Caucasian** (n = 3667)	**P value** (Caucasian vs Black/ African American)	**P value** (Caucasian vs non-Caucasian)
NICU Admission [n (%)]	737 (5.4%)	491 (4.9%)	208 (7.0%)	246 (6.7%)	<.001	<.001
Neonatal Composite Score (mean ± SD)	0.06 ± 0.3	0.05 ± 0.24	0.08 ± 0 .29	0.07 ± 0.29	<.001	<.001
Small for Gestational Age (SGA) [n (%)]	1123 (8.2%)	642 (6.4%)	406 (13.7%)	479 (13.1%)	<.001	<.001
Neonatal Death [n (%)]	8 (0.06%)	5 (0.05%)	3 (0.1%)	3 (0.08%)	.395	.426

Table 4. Maternal Outcomes for Full Cohort and by Racial Groups

	Entire Cohort (n = 13666)	**Caucasian** (n = 9999)	**Black or African American** (n = 2965)	**All non-Caucasian** (n = 3667)	**P value** (Caucasian vs Black/ African American)	**P value** (Caucasian vs non-Caucasian)
Composite Score (mean ± SD)	0.04 ± 0.21)	0.04 ± 0.20)	0.04 ± 0.23	0.05 ± 0.24	.017	<.001
Length of Stay (LOS) (mean ± SD)	2.2 ± 2.5	2.1 ± 2.7	2.2 ± 2.0	2.2 ± 1.9	<.001	<.001

Table 5. Inductions and Laboring Length of Time for Full Cohort and by Racial Groups

	Entire Cohort (n = 13666)	**Caucasian** (n = 9999)	**Black or African American** (n = 2965)	**All non-Caucasian** (n = 3667)	**P value** (Caucasian vs Black/ African American)	**P value** (Caucasian vs non-Caucasian
Induction Rate [n (%)]	4105 (30.7%)	3109 (31%)	878 (29.5%)	996 (27%)	.099	.067
Time to Delivery (All comers – Cesarean) [hours (mean ± SD)]	12.4 ± 14.8	12.0 ± 15.0	13.4 ± 13.9	13.5 ± 14.1	.012	.007
Time to Delivery (All Comers – Vaginal) [hours (mean ± SD)]	14.8 ±11.1	15.0 ± 11.2	14.3 ± 10.7	14.2 ± 10.6	.017	.006
Time to Delivery (Inductions – Cesarean) [hours (mean ± SD)]	32.1 ± 16.1	33.3 ± 16.6	28.8 ±13.9	29.0 ± 14.2	<.001	<.001
Time to Delivery (Inductions – Vaginal) [hours (mean ± SD)	21.1 ± 12.6	21.2 ± 12.7	20.8 ± 11.8	20.6 ± 11.8	.492	.241

findings also showed more negative health outcomes, such as small for gestational age, NICU admissions, and higher composite scores, to be experienced by non-Caucasian babies at a higher rate than Caucasian babies. These adverse experiences as a neonate can increase the risk for chronic diseases, obesity, psychosocial barriers, and more.[21,22] The results suggest that unmeasured clinical and nonclinical factors may be affecting providers' judgments on the progression of labor or whether a cesarean delivery is warranted.

Our findings are consistent with current and past literature reporting that racial disparities are present in a wide range of labor outcomes and measures of maternal and neonatal morbidity. These patterns have persisted both across the United States and in many single-institution or state-specific studies.[23,24] Many providers in the field have turned toward the goal of creating and implementing efforts to narrow or eliminate racial and ethnic disparities, yet a specific path that solves this problem has yet to be agreed upon. Howell et al provides a framework and resources for those hoping to address the etiologies of these disparities and highlight the essential idea that each health care system requires modified interventions specific to their patients, community, and resources.[25]

Our data, showing that non-Caucasian patients experience labor outcomes at different rates than Caucasian patients, highlight a specific area in which modifiable factors may be affecting patient care. These include gaps in patient-provider communication, bias, stereotyping, and variations in provider experience.[4] With the discordance between cesarean rates and outcomes, in combination with the rising rates of maternal and neonatal morbidity, we can utilize our data to suggest that nondifferential treatment by providers is contributing in some capacity. A survey given to members of the Society of Maternal Fetal Medicine found that 83% of respondents agreed that disparities influence their practice, but only 29% believed their personal biases affected the care of their patients.[26] Although this shows a delay for some providers to acknowledge their own biases, the racial disparities found in the health care field today are products of the entire system, not any one individual.

Strength and Limitations

A key strength of this study was the large cohort from a hospital system that is racially diverse and representative of the geographic area it serves. There were a large number of variables included in the dataset that allowed us to explore many different associations between race groups and labor, maternal, and neonatal outcomes. The data originate from a multicenter hospital system that is capable of providing any level of care necessary before, during, and after labor. Data were included from all 4 maternity sites in the hospital system, ensuring we captured patients from diverse race groups, socioeconomic statuses, ages, and obstetrical history.

One major limitation of this study is that we utilized a retrospective dataset. There were multiple instances in which we had to exclude patients from analysis due to missing, incomplete, or inconsistencies in the data. Variables such as indications for cesarean delivery, ethnicity, and fetal heart tones, were not included in the dataset and may have provided greater insight for our analysis and future interventions. However, this retrospective dataset provided a large amount of data that was readily available for our use and allowed us to identify many disparities in obstetrical outcomes.

PUBLIC HEALTH IMPLICATIONS

This study highlights the ongoing racial disparities that are prevalent in health care systems, both across the country and in Ohio. The state of Ohio has implemented programs such as the Ohio Pregnancy-Associated Mortality Review Program to monitor maternal mortality in Ohio and use data to implement informed activities and programs to reduce these rates, but it is clear that there is still work to be done. The pregnancy-related mortality rate has increased in Ohio from 2008 to 2018, with a disproportionately high rate among non-Hispanic Black patients.[27]

Our data specifically suggest that patients in Ohio of different racial groups are experiencing poorer labor outcomes at differing rates. Future steps include utilizing these results to target specific labor outcomes and create standardized protocols aimed at reducing the disparities we report. By removing the opportunity for unconscious bias of providers to affect the care of minority populations, we hope to see the disappearance of disparities in adverse labor outcomes and achieve lower rates of these outcomes for all patients.

ACKNOWLEDGMENTS

This project was presented as a poster at the ACOG Annual Clinical & Scientific Meeting, May 2024, San Francisco.

Author Contribution

Katie Whitehead participated in the study's design, data analysis and interpretation, drafted the original manuscript and contributed to the final edits of the submission. Rose Maxwell processed the dataset, performed the analysis and organization of results, and contributed to the edits of the final manuscript. David McKenna conceptualized the study, coordinated and supervised data collection and analysis, and contributed to the edits of the final manuscript.

REFERENCES

1. Gunja MZ, Gumas ED, Williams RD II. US health care from a global perspective, 2022: accelerating spending, worsening outcomes. The Commonwealth Fund. Published January 31, 2023. https://www.commonwealthfund.org/publications/issue-briefs/2023/jan/us-health-care-global-perspective-2022
2. Admon LK, Winkelman TNA, Zivin K, Terplan M, Mhyre JM, Dalton VK. Racial and ethnic disparities in the incidence of severe maternal morbidity in the United States, 2012–2015. *Obstet Gynecol.* 2018;132 (5):1158-1166. https://doi.org/10.1097/aog.0000000000002937

3. Jain JA, Temming LA, D'Alton ME, et al. SMFM special report: putting the "M" back in MFM: reducing racial and ethnic disparities in maternal morbidity and mortality: a call to action. *Am J Obstet Gynecol*. 2018;218(2):B9-B17. https://doi.org/10.1016/j.ajog.2017.11.591
4. Okwandu IC, Anderson M, Postlethwaite D, Shirazi A, Torrente S. Racial and ethnic disparities in cesarean delivery and indications among nulliparous, term, singleton, vertex women. *J Racial Ethn Health Disparities*. Published online July 12, 2021. https://doi.org/10.1007/s40615-021-01057-w
5. CDC. Infant Mortality. Published May 14, 2024. https://www.cdc.gov/maternal-infant-health/infant-mortality/index.html
6. Osterman MJK. Changes in primary and repeat cesarean delivery: United States, 2016–2021. Vital Statistics Rapid Release; no 21. Hyattsville, MD: National Center for Health Statistics. July 2022. https://doi.org/10.15620/cdc:117432
7. Barber EL, Lundsberg LS, Belanger K, Pettker CM, Funai EF, Illuzzi JL. Indications contributing to the increasing cesarean delivery rate. *Obstet Gynecol*. 2011;118(1):29-38. https://doi.org/10.1097/aog.0b013e31821e5f65
8. Caughey AB, Cahill AG, Guise JM, Rouse DJ. Safe prevention of the primary cesarean delivery. *Am J Obstet Gynecol*. 2014;210(3):179-193. https://doi.org/10.1016/j.ajog.2014.01.026
9. Main EK, Chang SC, Cape V, Sakowski C, Smith H, Vasher J. Safety assessment of a large-scale improvement collaborative to reduce nulliparous cesarean delivery rates. *Obstet Gynecol*. 2019;133(4):613-623. https://doi.org/10.1097/aog.0000000000003109
10. Wetcher CS, Kirshenbaum RL, Alvarez A, et al. Association of Maternal Comorbidity Burden With cesarean Birth Rate Among Nulliparous, Term, Singleton, Vertex Pregnancies. *JAMA Netw Open*. 2023;6(10):e2338604. https://doi.org/10.1001/jamanetworkopen.2023.38604
11. Mishanina E, Rogozinska E, Thatthi T, Uddin-Khan R, Khan KS, Meads C. Use of labour induction and risk of cesarean delivery: a systematic review and meta-analysis. *CMAJ*. 2014;186(9):665-673. https://doi.org/10.1503/cmaj.130925
12. Wood R, Freret TS, Clapp MA, Little S. Rates of induction of labor at 39 weeks and cesarean delivery following publication of the ARRIVE trial. *JAMA Netw Open*. 2023;6(8):e2328274-e2328274. https://doi.org/10.1001/jamanetworkopen.2023.28274
13. American College of Obstetricians and Gynecologists. Induction of Labor. Published 2020. https://www.acog.org/clinical/clinical-guidance/practice-bulletin/articles/2009/08/induction-of-labor
14. Hamm RF, Srinivas SK, Levine LD. Risk factors and racial disparities related to low maternal birth satisfaction with labor induction: a prospective, cohort study. *BMC Pregnancy Childbirth*. 2019;19(1). https://doi.org/10.1186/s12884-019-2658-z
15. OjiNjideka Hemphill N, Crooks N, Zhang W, et al. Obstetric experiences of young black mothers: an intersectional perspective. *Soc Sci Med*. 2022;317:115604. https://doi.org/10.1016/j.socscimed.2022.115604
16. Bailey ZD, Krieger N, Agénor M, Graves J, Linos N, Bassett MT. Structural racism and health inequities in the USA: evidence and interventions. *Lancet*. 2017;389(10077):1453-1463. https://doi.org/10.1016/s0140-6736(17)30569-x
17. Bower KM, Geller RJ, Perrin NA, Alhusen J. Experiences of racism and preterm birth: findings from a pregnancy risk assessment monitoring system, 2004 through 2012. *Womens Health Issues*. 2018;28(6):495-501. https://doi.org/10.1016/j.whi.2018.06.002
18. Wang X, Walsh D, Allsworth JE. The role of labor induction in racial disparities in cesarean delivery. *Mo Med*. 2021;118(3):246-252. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8210985/
19. Hamm RF, Srinivas SK, Levine LD. A standardized labor induction protocol: impact on racial disparities in obstetrical outcomes. *Am J Obstet Gynecol MFM*. 2020;2(3):100148. https://doi.org/10.1016/j.ajogmf.2020.100148
20. Aris IM, Kleinman KP, Belfort MB, Kaimal A, Oken E. A 2017 US reference for singleton birth weight percentiles using obstetric estimates of gestation. *Pediatrics*. 2019;144(1). https://doi.org/10.1542/peds.2019-0076
21. Martín-Calvo N, Goni L, Tur JA, Martínez JA. Low birth weight and small for gestational age are associated with complications of childhood and adolescence obesity: systematic review and meta-analysis. *Obes Rev*. Published online November 16, 2021. https://doi.org/10.1111/obr.13380
22. Lean RE, Rogers CE, Paul RA, Gerstein ED. NICU hospitalization: long-term implications on parenting and child behaviors. *Curr Treat Options Pediatr*. 2018;4(1):49-69. https://doi.org/10.1007/s40746-018-0112-5
23. Sastow DL, Jiang SY, Tangel VE, et al. Patient race and racial composition of delivery unit associated with disparities in severe maternal morbidity: a multistate analysis 2007–2014. *Int J Obstet Anesth*. 2021;47:103160. https://doi.org/10.1016/j.ijoa.2021.103160
24. Huang RS, Spence AR, Abenhaim HA. Racial disparities in national maternal mortality trends in the United States from 2000 to 2019: a population-based study on 80 million live births. *Archives of Gynecology and Obstetrics*. 2023;309. https://doi.org/10.1007/s00404-023-06999-6
25. Howell EA, Brown H, Brumley J, et al. Reduction of peripartum racial and ethnic disparities: a conceptual framework and maternal safety consensus bundle. *J Obstet Gynecol Neonatal Nurs*. 2018;47(3):275-289. https://doi.org/10.1016/j.jogn.2018.03.004
26. Jain J, Moroz L. Strategies to reduce disparities in maternal morbidity and mortality: patient and provider education. *Semin Perinatol*. 2017;41(5):323-328. https://doi.org/10.1053/j.semperi.2017.04.010
27. Ohio Department of Health. Ohio Maternal Health Data and Reports. Published 2021. https://odh.ohio.gov/know-our-programs/pregnancy-associated-mortality-review/Reports