

Military healthcare system mitigates racial disparities for severe maternal morbidity from preeclampsia



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BACKGROUND: In the United States, Black women die at 2.5 times the rate of White women and 3.5 times the rate of Hispanic women. These racial health care disparities have been largely attributed to access to health care and other social determinants of health.

OBJECTIVE: We hypothesize that the Military healthcare system models universal health care access seen in other developed countries and should equalize these rates.

STUDY DESIGN: Delivery data from 41 Military treatment facilities across the Department of Defense (Army, Air Force, and Navy) including over 36,000 deliveries from 2019 to 2020 were compiled in a convenience dataset through the National Perinatal Information Center. After aggregation, the parameters of percent of deliveries complicated by Severe Maternal Morbidity and percent of severe maternal morbidity secondary to pre-eclampsia with and without transfusion were calculated. Risk ratios were calculated by race for the resulting summary data. American Indian/Alaska Native were excluded because of limited total number deliveries preventing statistical analyses.

RESULTS: Overall, the risk of severe maternal morbidity was increased among Black women compared to White women. The risk of severe maternal morbidity related to pre-eclampsia showed no significant difference among races with or without transfusion. When other races were set as reference group, there was a significant difference for White women, suggesting a protective effect.

CONCLUSION: Although women of color still experience overall severe maternal morbidity at higher rates than their White counterparts, TRI-CARE may have equalized the risk of severe maternal morbidity for deliveries complicated by pre-eclampsia.

Key words: maternal morbidity, military healthcare, obstetrics, postpartum care, preeclampsia, quality assurance, racial disparities, social determinants of health, universal healthcare access

Introduction

The Centers for Disease Control and Prevention (CDC) reported that at least 700 people die annually during pregnancy or within the first year following pregnancy and that another 50,000 women survive pregnancy with serious associated complications in the United States.¹ Maternal mortality rates were reported to be 17.4 deaths per 100,000 live births in 2018.² Racial and ethnic

disparities persist with non-Hispanic Black women dying at a rate that is 2.5 times higher than that of non-Hispanic White women and 3.5 times higher than that of Hispanic women, and rates are consistently increasing with maternal age.³ Mortality rates in 2019 were highest for non-Hispanic Black women (44.0 per 100,000) when compared with non-Hispanic White (17.9) and Hispanic (12.6) women.³

Nearly half of the births in the United States were to women of color as of 2013, however, these women are enduring a disproportionately higher morbidity and mortality.⁴

Epidemiologists have demonstrated that certain racial and ethnic groups experience some diseases at a higher rate. However, those risks should be mitigated by access to universal health-care. Nine maternal mortality review

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The authors report no conflict of interest.

The view(s) expressed are those of the author(s) and do not reflect the official policy or position of Brooke Army Medical Center, the US Army Medical Department, the US Army Office of the Surgeon General, the Department of the Air Force, the Department of the Army or the Department of Defense, or the US Government.

Cite this article as: Lundeberg KR, Tindal RR, Grob PC, et al. Military healthcare system mitigates racial disparities for severe maternal morbidity from preeclampsia. *Am J Obstet Gynecol Glob Rep* 2023;XX:x.ex–x.ex.

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2666-5778/\$36.00

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<http://dx.doi.org/10.1016/j.xagr.2023.100215>

AJOG Global Reports at a Glance

Why was this study conducted?

This study aimed to determine the presence of racial differences in severe maternal morbidity (SMM) owing to preeclampsia and other maternal outcomes in the military healthcare system.

Key findings

Our results demonstrate that equal access to healthcare through the military healthcare system mitigates racial disparities in the relative risk for SMM, including and excluding blood transfusions, caused by preeclampsia.

What does this add to what is known?

Racial disparities exist throughout medicine and have become the focus in the identification and addressing of modifiable risk factors for disease. Access to healthcare is a social determinant of health. This study demonstrates how TRICARE as a model of universal access to healthcare mitigates the relative risk for a significant maternal morbidity such as preeclampsia.

committees analyzed data between 2008 to 2017 and identified the leading causes of maternal death among non-Hispanic Black women in comparison with White women. They found that non-Hispanic Black women experienced the consequences of preeclampsia, eclampsia, cardiomyopathy, and embolism at a higher rate.⁵

Severe maternal morbidity (SMM) is considered to be an unexpected outcome of labor and delivery that have any effect on a woman's health and lasts for any length of time.⁶ In 2014, SMM affected more than 50,000 women in the United States with 1 in 7 cases affecting commercially insured women and 1 in 6 cases affecting Medicaid-insured women after discharge. The CDC reported that there is an average of 3 to 4 contributing factors per pregnancy-related death.⁷ Although many tiers of contributing factors exist, including community factors, health facility factors, patient factors, provider factors, and system-level factors, providers and health systems ultimately bear the responsibility of implementing prevention strategies.⁷ Analyzing and identifying possible causes of healthcare disparities cannot occur without considering social determinants of health, such as neighborhood and built environment, economic stability, education, food insecurity, social and community context, and health and healthcare systems.⁸

The United States military provides universal health insurance coverage for active-duty service members, dependents, and retirees. This coverage, TRICARE, should ideally provide a platform that creates equal opportunity in terms of access to healthcare resources irrespective of race, rank, marital status, employment status, or other outlying factors.⁹ The Affordable Care Act requires TRICARE to cover patients irrespective of preexisting medical conditions or if they develop severe medical illness during their period of coverage.⁹ With TRICARE coverage, patients must seek medical care at military treatment facilities (MTFs) and only seek care through civilian facilities if unavailable at their duty station.

Limited data exist on the analysis of military healthcare system and related healthcare outcomes. A 2014 study in 2014 that assessed the healthcare disparities in the military found no significant difference in the perceived access to healthcare, patient satisfaction, or health status across gender, race and ethnicity, or rank.⁹ In their discussion, they proposed that it was possible that the disparities in healthcare are a consequence of the "carry-over effect" of the unequal healthcare services from the civilian world before their military service. However, when analyzing the differences in outcomes related to women's health at MTFs, a different outcome is observed.

A study in 2021 analyzed maternal metrics from 13 MTFs through the National Perinatal Information Center (NPIC) to identify the presence of differences in delivery outcomes by race through the military healthcare system.¹⁰ Their study found that Black women experienced a higher rate of cesarean delivery, adult intensive care unit (ICU) admission, overall SMM, and SMM excluding blood transfusion than non-Hispanic Whites.¹⁰ This study demonstrates how TRICARE, as a model of universal access to healthcare, mitigates the relative risk for a significant maternal morbidity such as preeclampsia

Materials and Methods

The NPIC provides reports on maternal metrics by race and ethnicity. Race and ethnicity data are self-reported by patients and include race categories of White, Black, Asian or Pacific Islander (API), American Indian/Alaska Native (AI/AN), other, and unknown and ethnicity categories of Hispanic, non-Hispanic, and unknown. This retrospective cohort study included NPIC data from participating MTFs with obstetrical services in the Department of Defense (DoD) from April 2019 to March 2020, including more than 36,000 deliveries. The NPIC 2020 reports listed race and ethnicity separately. Reported race and ethnicity data were collected from the Standard Inpatient Data Record discharge file submitted to the NPIC. For ethnicity, there were only 3 categories, namely Hispanic, non-Hispanic, and other. The NPIC reports defined other as, "Any race, which does not fit into the above categories including discharges with multiple races." Patients who experienced SMM were identified using the CDC guidelines on the 21 indicators of SMM and the corresponding International Classification of Diseases, 10th Revision (ICD-10), codes used during delivery hospitalization.¹¹

The NPIC data for 41 MTFs were aggregated and included data for all 3 services (army, air force, and navy). The NPIC data are validated before inclusion and rely on trained research personnel to extract data, not simply on ICD-10 codes alone. The inclusion and

exclusion criteria were as follows: patients included were retirees, active-duty service members, and dependent spouses or children who had access to government-sponsored health insurance plans (TRICARE) and who delivered at a MTF between April 1, 2019 and March 31, 2020. The NPIC uses the perinatal discharge database and does not include miscarriages and ectopic pregnancies. The data used for analysis was directly provided by the NPIC, thus did not have any missing data to adjust or account for. The parameters of percentage of deliveries complicated by SMM and percentage of SMM with and without transfusion secondary to preeclampsia or postpartum hemorrhage (PPH) (defined as a loss of ≥ 1000 mL blood during any route of delivery) and cesarean deliveries and adult ICU admissions were calculated. Comparisons were made using risk ratios (RRs) with 95% confidence intervals (CIs) by race. RRs were calculated using the Wald Method in R (version 4.0.0) (R Core Team, Vienna, Austria) with the package “epitools.” Chi-squared analyses were also conducted to compare the 2 groups with a *P* value of $<.05$ considered to be statistically significant. Because of the overall numbers of women who identified as AI/AN and

the high numbers of women who identified as “other” or “unknown race,” comparisons were limited to Black, White, and API women. In addition, subsequent RRs for delivery outcomes for Hispanic women in comparison with White women were calculated in a similar fashion. In an “all others” analysis, the rate of a particular statistic for the entire study population excluding the group that was being compared was calculated and then compared with the rate of the excluded group.

Results

Overall risk for major maternal delivery outcomes by race

With White women set as the reference group, the overall SMM risk was increased among Black (Absolute Risk (AR), 2.25%; RR, 1.46; 95% CI, 1.2–1.79) and API (AR, 2.93%; RR, 1.64; 95% CI, 1.23–2.19) (Table 1, Table 4) populations. Furthermore, there was an increased risk for cesarean delivery among API (AR, 25.72%; RR, 1.1; 95% CI, 1.01–1.19) and Black (AR, 29.44%; RR, 1.26; 95% CI, 1.19–1.32) women, but only API women experienced a significantly increased risk for ICU admissions (RR, 3.09; 95% CI, 1.14–8.44). When all others were set as the reference group, the risk for SMM (RR,

0.67), ICU admissions (RR, 0.42), and cesarean delivery (RR, 0.88) were all significantly decreased for White women. Table 4 presents the absolute risks for associated maternal morbidities.

Risk for severe maternal morbidity in deliveries complicated by preeclampsia by race

The risk for SMM with or without transfusion in deliveries complicated by preeclampsia showed no significant difference among races when White participants or any of the other races were set as the reference group (Table 2).

Risk for severe maternal morbidity in deliveries for Hispanic women

There was no significant increase in the risk for overall SMM or for SMM in deliveries complicated by preeclampsia or PPH with or without transfusion when Hispanic women were compared with White women (Table 3). In addition, the rates of cesarean delivery and ICU admissions showed no statistical difference in risk between Hispanic women and White women (however, ICU admissions had a relatively low number).

TABLE 1

Risk for cesarean delivery, intensive care unit admission, and SMM by race with 95% confidence intervals

Cesarean delivery	White as reference group relative risk (CI)	All others as reference group relative risk (CI)
API	1.1 ^a (1.01–1.19)	1.03 ^a (0.95–1.12)
Black	1.26 ^a (1.19–1.32)	1.21 ^a (1.16–1.27)
White	1 (Ref)	0.88 ^a (0.85–0.92)
Intensive care unit admission		
API	3.09 ^a (1.14–8.44)	1.86 (0.75–4.65)
Black	1.28 (0.5–3.26)	0.71 (0.31–1.65)
White	1 (Ref)	0.42 ^a (0.23–0.74)
Overall risk for severe maternal morbidity		
API	1.64 ^a (1.23–2.19)	1.32 (1.0–1.74)
Black	1.46 ^a (1.2–1.79)	1.19 (0.99–1.43)
White	1 (Ref)	0.67 ^a (0.58–0.77)

API, Asian Pacific Islander; CI, confidence interval.

^a Indicates significance at a *P* value of $<.001$.

Lundeberg. Preeclampsia maternal morbidity in a military health system. *Am J Obstet Gynecol Glob Rep* 2023.

TABLE 2**Risk of severe maternal morbidity in pregnancy complicated by preeclampsia by race with 95% confidence intervals**

Risk for preeclampsia including blood transfusions	White as reference group (CI)	All others as reference group (CI)
API	1.11 (0.52–2.36)	1.26 (0.61–2.59)
Black	0.73 (0.4–1.36)	0.79 (0.44–1.41)
White	1 (ref)	1.2 (0.81–1.78)
Risk for preeclampsia excluding blood transfusions		
API	0.93 (0.22–4.0)	0.96 (0.24–3.92)
Black	1.07 (0.42–2.76)	1.14 (0.48–2.71)
White	1 (ref)	1.07 (0.54–2.11)

API, Asian Pacific Islander; CI, confidence interval.

Lundeberg. Preeclampsia maternal morbidity in a military health system. *Am J Obstet Gynecol Glob Rep* 2023.

Discussion

The DoD's 2019 report on the demographic profile of the United States military, including race, ethnicity, reported gender, and the percentage of active-duty personnel is illustrated in the Figure.¹² The military healthcare system should reflect equal access to healthcare, eliminating several layers of social determinants of health. Although the DoD profile omitted a statistic on the percentage of Hispanic service members, it moderately reflects the 2019 United States census racial statistics with 76.3% non-Hispanic Whites, 13.4% Black or African Americans, 18.5% Hispanic or Latino, and 5.9% Asian people, but 50.8% of the United

States population are female.¹³ By analyzing delivery outcomes for those enrolled in TRICARE, one can make a comparison between the outcomes of a civilian healthcare system and those of the equal-access military healthcare system. One area for discussion is the assumption that the patients included in our study were exclusively active-duty members and thus healthier. The NPIC data set included patients covered by TRICARE and those who delivered at MTFs, including service members and their dependents. Although some risk factors for preeclampsia and PPH are modifiable, many are not and are theoretically affecting patients without TRICARE coverage at the same rate as

those enrolled in TRICARE. However, this is an area for further investigation.

We hypothesized that the military healthcare system as a model of universal access to medical care would equalize the overall risk for SMM among active-duty service members and their family members regardless of race. Furthermore, we hypothesized that the risk for SMM with or without transfusions in deliveries complicated by preeclampsia or PPH would also be minimized as well. Our results revealed an increase in the overall risk for SMM among API and Black women, as well as an increased risk for ICU admissions and cesarean deliveries, which is consistent with previous findings.¹⁰ However,

TABLE 3**Risk of severe maternal morbidity in pregnancies complicated by postpartum hemorrhage, preeclampsia, cesarean delivery, ICU admission, and overall severe maternal morbidity for Hispanic women in comparison with White women with 95% confidence intervals**

Variable	Relative risk	95% confidence interval
Postpartum hemorrhage risk	0.93	0.79–1.08
Severe maternal morbidity including transfusion related to postpartum hemorrhage	1.07	0.85–1.35
Severe maternal morbidity excluding transfusion related to postpartum hemorrhage	0.77	0.36–1.64
Severe maternal morbidity	1.12	0.91–1.39
Severe maternal morbidity including transfusion related to preeclampsia	1.24	0.72–2.15
Severe maternal morbidity excluding transfusion related to preeclampsia	0.48	0.12–1.97
Cesarean delivery	0.97	0.92–1.03
ICU admission	1.26	0.49–3.23

ICU, intensive care unit.

Lundeberg. Preeclampsia maternal morbidity in a military health system. *Am J Obstet Gynecol Glob Rep* 2023.

TABLE 4
Absolute risks for maternal morbidities and associated complications by race

Variable	Deliveries	PPH	SMM	SMM with transfusion secondary to preeclampsia	SMM without transfusion secondary to preeclampsia	Absolute risk for cesarean delivery (%)	Absolute risk for PPH (%)	Absolute risk for SMM (%)	Absolute risk for SMM including transfusion secondary to preeclampsia (%)	Absolute risk for SMM excluding transfusion secondary to preeclampsia (%)
All patients	36,861	1761	829	90	33	25.03	4.78	2.25	10.86	3.98
API	1777	130	52	7	2	25.72	7.32	2.93	13.46	3.85
Black	5169	275	135	12	6	29.44	5.32	2.61	8.89	4.44
American Indian or Alaska Native	108	3	2	0	0	28.7	2.78	1.85	0	0
White	17,598	744	314	38	13	23.44	4.23	1.78	12.1	4.14
Other	10,379	495	280	36	12	25.39	4.77	2.7	12.86	4.29
Hispanic	3882	173	98	13	2	24.47	4.46	2.52	13.27	2.04
Non-Hispanic	31,268	1504	702	75	30	25.11	4.81	2.25	10.68	4.27

API, Asian Pacific Islander; PPH, postpartum hemorrhage; SMM, severe maternal morbidity.

Lundberg. Preeclampsia maternal morbidity in a military health system. *Am J Obstet Gynecol Glob Rep* 2023.

when analyzing the risk for SMM in pregnancies complicated by preeclampsia, which occur more commonly among Black women than among White women,⁵ there was no significant difference in the risk, either among deliveries with or without transfusion. This suggests that TRICARE, a model of universal access to medical care, is effectively managing pregnancies complicated by preeclampsia and minimizing adverse effects. Furthermore, when all other races were set as the control, there was a significant difference for SMM among White women. This difference in care and delivery outcomes among races warrants further research and quality improvement strategies. In addition, previous analyses have not provided adequate data to investigate delivery outcomes for Hispanic women who received treatment through MTFs. Our analysis showed no significantly increased risk for our variables, namely cesarean delivery, ICU admission, overall SMM, and SMM in deliveries affected by PPH or preeclampsia with or without transfusion.

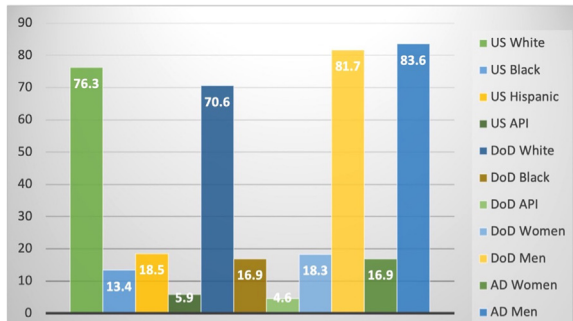
Universal insurance coverage, in this case through TRICARE, serves as an ideal model for medical outcomes, especially because not all diseases are created equally. The data presented here demonstrate improved delivery outcomes, suggesting that equal access to care may reduce SMM associated with preeclampsia. Although disparities are mitigated among Hispanic women when compared with their White counterparts, the overall SMM risk among Black and API women remains high. This increased risk, especially among API women and for SMM related to PPH, needs further evaluation and research.

Strengths and Limitations

This study in which the maternal health outcomes among active-duty service members across the United States and the 3 branches of service (air force, army, and navy) were compared, has several strengths. In addition, this study included a greater diversity of delivery data including data for both smaller and large MTFs.

FIGURE

Data acquired from the 2019 United States Census Bureau and the 2019 Service member demographic profile of reported race, gender, and active-duty status



AD, active duty; DoD, Department of Defense.

Lundberg. Preeclampsia maternal morbidity in a military health system. *Am J Obstet Gynecol Glob Rep* 2023.

Some limitations of this study include the NPIC convenience data set that did not allow for individual reports of patient age, parity, chronic medical conditions, etc. Furthermore, the NPIC data set included patients' self-reported race of "other." This reflects the incredible growth of the American society's demographic composition, but it makes accurate comparisons among races another limitation. Further studies that could address the limitations of our study could analyze the maternal outcomes of TRICARE beneficiaries who received care in civilian sectors when MTF care was not available. In addition, equal access to healthcare in the military healthcare system in comparison with the civilian sector is possibly a reason for the equal rates of SMM related to preeclampsia and PPH seen in our study, but further research is necessary to determine if there are unique barriers to accessing obstetrical care in the TRICARE universal insurance model. Furthermore, the consistent racial disparities in maternal morbidity demonstrated here should be considered a major concern

to national security and should thus be addressed as such.

Conclusion

Racial disparities in obstetrics and gynecology unfortunately persist in the United States and was built through generations of unequal access to medical care. In this study, we demonstrated how universal access to healthcare can mitigate several of these barriers to care, leading to optimal delivery outcomes in terms of SMM, ICU admissions, and risk for cesarean delivery. However, racial disparities still exist for certain delivery outcomes, even with universal insurance like TRICARE, warranting further investigation. ■

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