

INTRODUCTION

- The United States (U.S.) has the highest maternal mortality ratio of any high-income nation.¹
- Severe maternal morbidity (SMM) is a key risk factor for maternal deaths.^{1,2}
- Hospital delivery volume has been linked to severe maternal morbidity (SMM), which increases medical costs, readmissions, hospital stays, and mortality risk.^{3,4}
- From FY2019-2023, the Military Health System (MHS) rolled out a new electronic health record, merged facilities under Defense Health Agency (DHA) management, and weathered the COVID-19 pandemic.⁵⁻⁸

OBJECTIVE: This study aimed to examine the association between delivery volume and odds of SMM and 30-day readmissions for deliveries at U.S. military hospitals FY2019-2023.

METHODS

- Design:** This cross-sectional study analyzed healthcare claims data from MHS beneficiary women aged 15-54 years delivering FY2019-2023.
- Exposure:** Delivery volume was measured using ICD-10 and MS-DRG codes. Military hospitals were grouped into quartiles (lowest, lower middle, upper middle, highest) by volume over the study period.
- Outcomes:** SMM was measured by 21 ICD-10 indicators (any/none). Any postpartum readmission (yes/no) to the same hospital within 30 days of discharge was included.
- Covariables** included hospital identifier and maternal comorbidities and demographics associated with each delivery.
- Analysis:** Stepwise logistic regression was performed with the upper middle quartile as the reference category. Additional interaction testing was performed between age group and comorbidities for both outcomes. An additional stepwise logistic regression was performed for the SMM outcome only with all main effect variables controlled for the interaction between age group and comorbidities to investigate statistically significant interaction.

DISCUSSION

- The percentages of patients with both SMM and 30-day readmissions were higher in this FY 2019-2023 analysis (0.82-1.13% with SMM and 3.23-4.62% with 30-day readmissions across quartiles) compared to a previous FY 2015-2018 analysis by Hunter et al.⁹ (0.59-0.6% with SMM and 2.23-3.56% with 30-day readmissions across quartiles).
- Military treatment facility-level changes due to the transition of MHS management to the DHA from the individual services may have contributed to the differences seen in this study compared to the previous study by Hunter et al.^{9,10}
- Alterations to referral patterns, patient characteristics (e.g., demographics, acuity), or provider patient loads during the COVID-19 pandemic may also have contributed to the differences seen in this study compared to the predecessor findings of Hunter et al.^{7,9}

REFERENCES



RESULTS

- Women delivering at hospitals in the lowest, lower-middle, and highest volume quartiles had significantly lower (19-30%) odds of SMM compared to the upper-middle quartile in all adjusted models ($p < 0.05$) (**Table 1**).
- Those delivering at lower and lower-middle quartile hospitals had significantly higher (29-46%) odds of 30-day readmissions compared to the upper-middle quartile in all adjusted models ($p < 0.05$), with no significant difference found among those in the highest quartile (**Table 1**).

Table 1. Unadjusted and Adjusted Odds of Severe Maternal Morbidity and 30-Day Postpartum Readmissions by Military Treatment Facility Volume Quartile, Fiscal Years 2019-2023

	SEVERE MATERNAL MORBIDITY (SMM)						30-DAY POSTPARTUM READMISSIONS					
	Lowest		Lower Middle		Highest		Lowest		Lower Middle		Highest	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Unadjusted	0.76	0.66 – 0.89*	0.73	0.63 – 0.85*	0.72	0.61 – 0.85*	1.30	1.19 – 1.40*	1.45	1.34 – 1.57*	1.06	0.97 – 1.15
Adjusted:												
Age	0.75	0.64 – 0.87*	0.69	0.59 – 0.81*	0.70	0.59 – 0.82*	1.29	1.19 – 1.40*	1.42	1.31 – 1.54*	1.04	0.96 – 1.14
Age & Maternal Comorbidities	0.80	0.69 – 0.94*	0.72	0.62 – 0.84*	0.74	0.63 – 0.87*	1.31	1.20 – 1.42*	1.43	1.32 – 1.55*	1.06	0.97 – 1.15
All Patient Demographics	0.76	0.65 – 0.88*	0.69	0.59 – 0.81*	0.70	0.59 – 0.82*	1.29	1.19 – 1.40*	1.45	1.33 – 1.57*	1.05	0.96 – 1.14
All Patient Demographics & FY of delivery & Maternal Comorbidities	0.81	0.69 – 0.94*	0.72	0.61 – 0.84*	0.73	0.62 – 0.86*	1.31	1.21 – 1.42*	1.46	1.34 – 1.58*	1.06	0.97 – 1.16
All Patient Demographics & FY of delivery & Maternal Comorbidities Controlled for Age*Comorbidity Interaction	0.81	0.69 – 0.94*	0.71	0.61 – 0.84*	0.73	0.62 – 0.86*						

Upper Middle quartile = reference; * = statistically significant $p < 0.05$; CI = confidence interval, FY = fiscal year, OR = odds ratio.

- An increase in SMM rates was observed overall and in each quartile over the five-year period (**Figure 1**).
- An increase in 30-day readmissions rates was observed in total and in each quartile over the study period, particularly between 2021 and 2023 (**Figure 2**). The largest overall change across the study period was observed in the lowest volume quartile which increased from 17.4 per 1,000 deliveries to 82.9 per 1,000 deliveries.

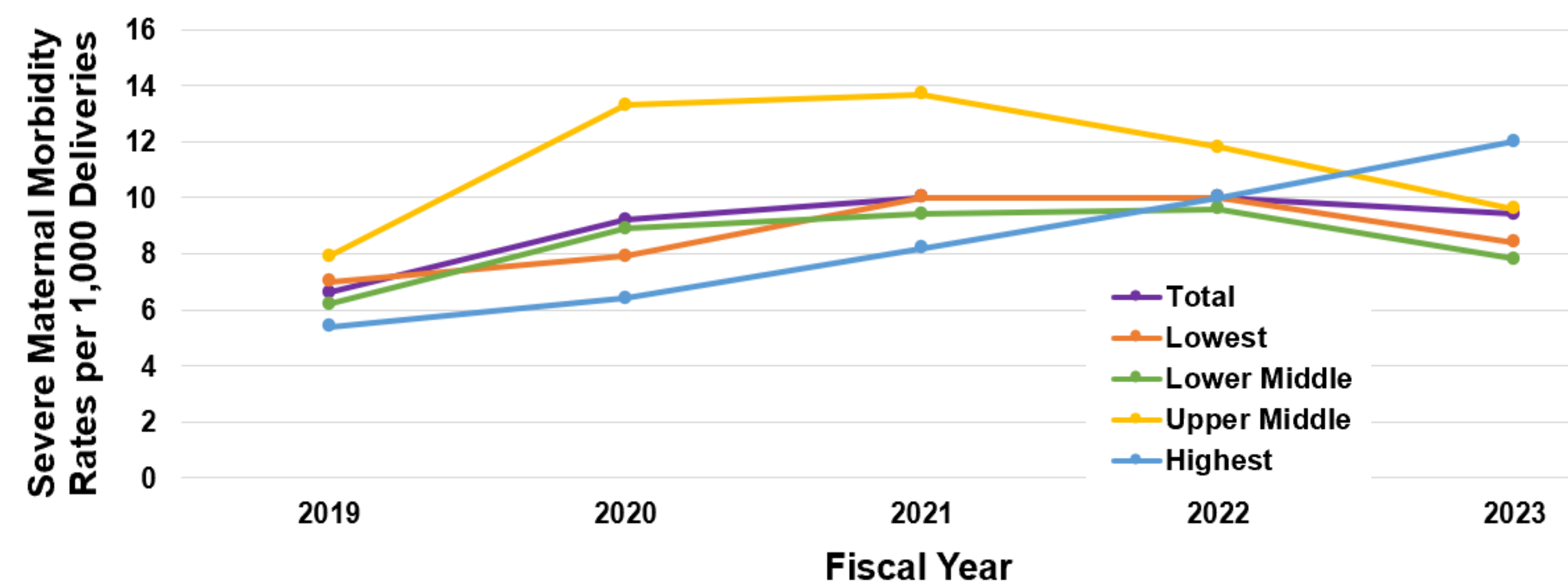


Figure 1. Trends in Severe Maternal Morbidity Rates in Total and by Volume Quartile, Fiscal Years 2019-2023

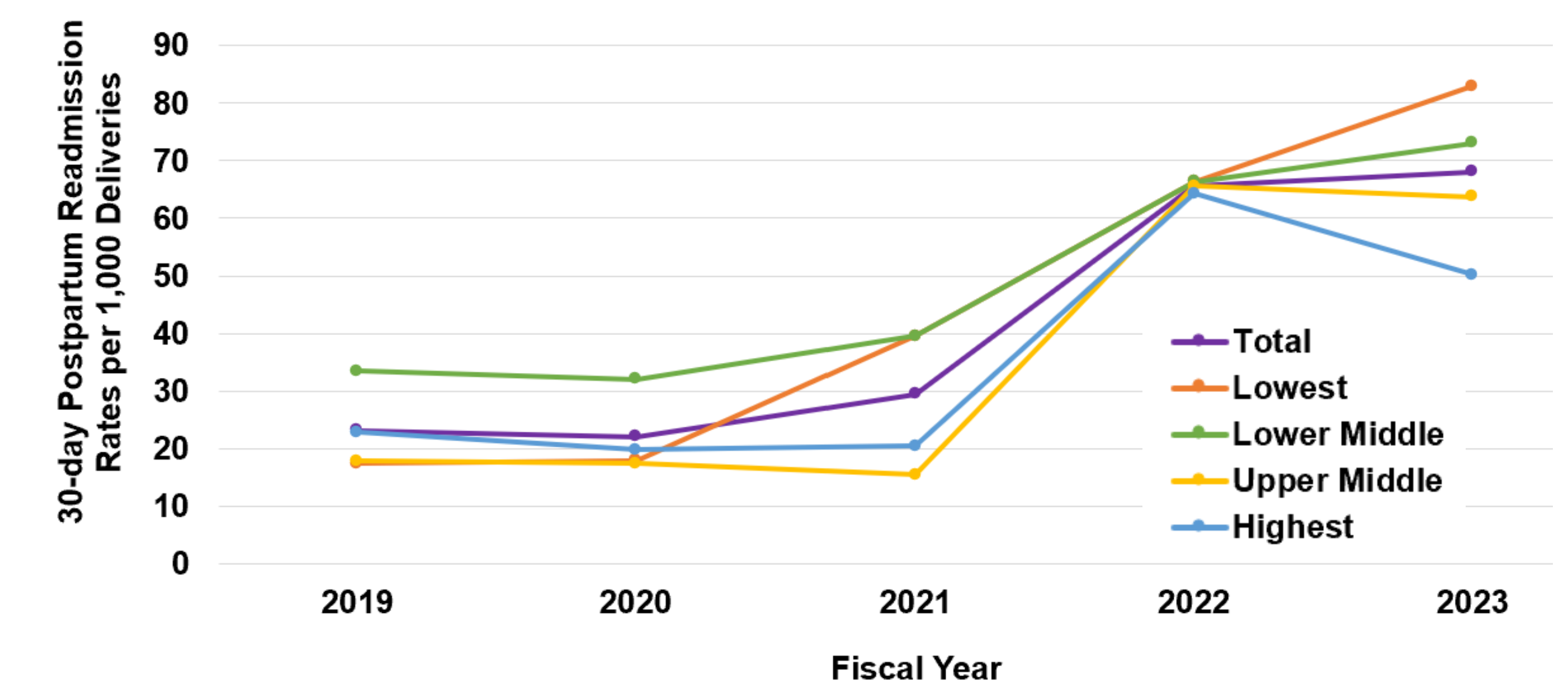


Figure 2. Trends in 30-Day Postpartum Readmission Rates in Total and by Volume Quartile, Fiscal Years 2019-2023

CONCLUSIONS

- This study suggests that military hospital obstetric delivery volume may have played a significant role in the changes in individual odds of SMM and 30-day readmission between FYs 2019 and 2023.
- Concurrent effects of the DHA transition and COVID-19 pandemic cannot be ruled out.
- Future research should endeavor to identify modifiable risk factors that may further improve outcomes for MHS beneficiaries giving birth at military hospitals across all obstetric volume quartiles, and especially facilities in the lowest and lower middle volume quartiles.

DISCLAIMER

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