Appendix to: Severe Obstetric Complications Electronic Clinical Quality Measure (eCQM) Methodology Report, version 2.0 – Appendix E, July 2024

Prepared by:
Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation
Lisa Suter, MD, Project Director

This material was prepared by Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (CORE), under contract to the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services. The contents presented do not necessarily reflect CMS policy.

Table of Contents

List of Tables

1.1 Background

There are stark differences in maternal outcomes by race & ethnicity and payer[1-4] .The Severe Obstetric Complications eCQM was developed without race & ethnicity and payer as risk factors, as it was determined that adjusting for these factors could mask their effect and allow hospitals to provide worse care to underserved groups without affecting their quality score. Instead, illumination of outcome disparities stratified by these social and demographic risk factors would better inform stakeholders and consumers of health care and be most impactful in incentivizing improvements in the quality and equity of maternal care. This supplementary material to the original methodology report presents the methodology and testing results for race & ethnicity and payer stratification analyses.

Objectives

The aim of this appendix is to examine the Severe Obstetric Complications eCQM outcomes across 1) Race & Ethnicity, and 2) Payer groups. This report presents the methodology and testing results for observed and risk standardized Severe Obstetric Complications outcome rates and risk standardized rate differences across these groups.

Methods

Data Sources: Inpatient hospitalization data extracted from the electronic health record from deliveries in 2020 from 25 member hospitals of The Joint Commission (TJC) were used. This aligns with the data set used for Stage I Beta testing.

Stratification analyses: We performed two stratification analyses for both outcomes i) Severe Obstetric Complications and ii) Severe Obstetric Complications excluding blood transfusion-only encounters. The first stratification was based on an individual's race & ethnicity, and the second stratification was based on an individual's payer. This report presents descriptive statistics of hospitals and deliveries with observed numbers and rates of both outcomes, and distribution of risk-standardized rate differences among race & ethnicity and payer group comparisons.

Race & Ethnicity variables: The EHR – extracted data had the following racial groups: African American, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, Other or Multiple, White, Declined/refused, Null/not specified/unknown, and the following ethnic groups: Hispanic, Not Hispanic, Declined/refused, Null/not specified/unknown. For stratification analyses, we combined race and ethnicity as follows:

- Hispanic
- Non-Hispanic - African American
- Non-Hispanic - American Indian or Alaska Native
- Non-Hispanic – Asian or Native Hawaiian or Pacific Islander
- Non-Hispanic – Other or Multiple
- Non-Hispanic – White
- Declined/unknown

Payer variables: We identified Medicare, Medicaid, Private Insurance, Self-pay or Uninsured, Other, and Unknown payers from the EHR extracted Payer Type. We combined Medicare, Self-pay or Uninsured,

Other, and Unknown payers into one category, “Other”. Therefore, the three payer types in this analysis were:

- Medicaid
- Private
- Other

CMS disparity methods:

To support efforts to improve health equity and to better inform consumers about hospitals’ quality of care, CMS has contracted with CORE to develop methodologies for examining quality differences between subgroups of individuals with and without social and demographic risk factors. In 2018, CORE developed two CMS disparity methods.[5]1) The Within-Hospital Disparity Method examines differences in outcomes for individual groups based on social risk factors and specific demographic factors within a hospital, and 2) The Across-Hospital Disparity Method allows for comparison of performance in care for individuals with social risk factors and specific demographic factors across hospitals.

Severe Obstetric Complications eCQM stratification development and testing used eight healthcare sites including 25 hospitals. Given limited sample size for eCQM testing, the measure will be implemented using the within-hospital disparity method. There is the possibility to test and add across-hospital stratification results in future years.

Within-Hospital Disparity Method: The goal of this method is to illuminate differences in outcomes between a comparator group and a referent group of patients in the same hospital.

For race & ethnicity, we examined differences in outcomes between non-Hispanic white patients versus Hispanic, Non-Hispanic African American, and Non-Hispanic Asian or Native Hawaiian or Pacific Islander race & ethnicity.

For payer, we examined differences in outcomes between patients with Medicaid versus patients with Private insurance.

In the methodology for calculating the within-hospital disparities, we assume that the individual-level demographic and clinical risk factors should have the same impact on individuals who are White compared to individuals who are Hispanic, African American, Asian or Native Hawaiian or Pacific Islander; or those who have Medicaid compared to those who have Private insurance. Mathematically, this means that the regression coefficients for the risk factors should be the same for all comparison groups. Therefore, by applying the same model to all individuals (and retaining all comparison groups in the model when generating the regression coefficients), the Within-Hospital Disparity Method reveals differences by race and ethnic category or by payer type as opposed to level of illness. Specifically, we utilize the same three-step approach from 2024 CMS Disparity Methods Updates and Specifications Report[6] to estimate the within-hospital disparities.

First, we estimate a risk model including all patients and the original risk factors for the measure, to ensure that risk adjustment is consistent across hospitals. This model is used to output a predicted risk of experiencing the outcome for each patient – this “risk score” is then carried forward to the second step.

The second step estimates a separate model for each hospital. For race & ethnicity stratification, each of these hospital-level models include the risk score for each patient from the first step model with race &

ethnicity variables, and for payer stratification each hospital-level model includes the risk score for each patient from the first step model with payer variables. This allows us to assess the association of race and ethnicity or payer with the outcome after accounting for patient risk. The patient risk score is included as an offset, to ensure that patient risk has a common effect across all hospitals. Using two sequential models allows us to perform risk adjustment using all patients while assessing the effect of race and ethnicity or payer using only patients from a given hospital.

Third, we "smooth" the results of these hospital-level models to account for the non-independence across hospitals. This smoothing is analogous to the "shrinkage" that occurs when estimating a mixed effects model such as used in the calculations of the overall measure. Specifically, we apply a Bayesian Hierarchical Model to parameter estimates from the hospital models (technically, the intercept and slope) to produce updated parameter estimates which account for the shared information across hospitals.

Table 1. Observed counts and rates of i) Severe Obstetric Complications and ii) Severe Obstetric Complications excluding blood transfusion-only encounters by Race & Ethnicity

Race/Ethnicity Category	**Deliveries N (%)**	**Severe Obstetric Complications**		**Severe Obstetric Complications excluding blood transfusion-only encounters**	
	Total N= 60,184 (100)	**Outcome N**	**Outcome rate (per 10,000)**	**Outcome N**	**Outcome rate (per 10,000)**
Non-Hispanic - White	33,371 (55.4)	683	204.7	157	47.0
Non-Hispanic - African American	11,853 (19.7)	412	347.6	70	59.1
Hispanic	8,431 (14.0)	213	252.6	43	51.0
Non-Hispanic - Asian/Native Hawaiian/Pacific Islander	2,932 (4.9)	74	252.4	15	51.2
Non-Hispanic - Other/Multiple	1,537 (2.6)	33	214.7	4	26.0
Non-Hispanic - American Indian or Alaska Native	144 (0.2)	3	208.3	1	69.4
Declined/unknown	1,916 (3.2)	48	250.5	12	62.6

Table 2 provides the descriptive statistics by payer stratification for total number of observed outcomes and outcome rate per 10,000 deliveries for Severe Obstetric Complications and Severe Obstetric Complications excluding blood transfusion-only encounters.

The highest rate of both outcomes was among patients with Medicaid. The rates were 335.4 per 10,000 deliveries for Severe Obstetric Complications, and 63.5 per 10,000 deliveries for Severe Obstetric Complications excluding blood transfusion-only encounters.

Table 2. Observed counts and rates of i) Severe Obstetric Complications and ii) Severe Obstetric Complications excluding blood transfusion-only encounters by Payer

Payer Category	Deliveries N (%)	Severe Obstetric Complications		Severe Obstetric Complications excluding blood transfusion-only encounters	
	Total N= 60184 (100)	Outcome N	Outcome rate (per 10,000)	Outcome N	Outcome rate (per 10,000)
Medicaid	16221 (27.0)	544	335.4	103	63.5
Private	41066 (68.2)	843	205.3	184	44.8
Other	2897 (4.8)	79	272.7	15	51.8

Table 3 shows the total number of hospitals and deliveries, as well as hospitals and deliveries with adequate sample size used in estimating risk-standardized rate differences between race/ethnicity and payer groups. All 25 hospitals have adequate sample size of patients who are Hispanic and White. Based on adequate sample size, 22 hospitals were included for Non-Hispanic African American versus White comparison, and 15 hospitals were included for Non-Hispanic Asian or Native Hawaiian or Pacific Islander versus White comparison. Twenty-four hospitals have adequate sample size for Medicaid versus Private insurance risk-standardized rate difference calculations.

Number of deliveries shown in the table include the total number of deliveries in the comparator and referent groups.

Table 3. Number of hospitalizations and deliveries with adequate sample size* in the risk-standardized rate differences by race & ethnicity and payer groups

For both groups in a comparison	Total hospitals	Total deliveries**	Hospitals with Adequate Sample Size	Deliveries in Hospitals with Adequate Sample Size**
Race & Ethnicity groups				
Non-Hispanic African American versus White	25	45,224	25	44,602
Hispanic versus White	25	41,802	25	41,802
Non-Hispanic Asian or Native Hawaiian or Pacific Islander versus White	25	36,303	15	33,260
Payer groups				
Medicaid versus Private	25	57,287	24	53,383

*Adequate sample size of at least 25 total deliveries and at least 12 patients each in both the referent (White) and comparator groups for each comparison. ** Number of deliveries include sum of deliveries in the comparator and referent groups.

Tables 4 and 5 show the distribution of risk-standardized rate differences across hospitals for both outcomes stratified by race/ethnicity and payer, respectively.

The largest difference between the risk-standardized Severe Obstetric Complications rates were among Non-Hispanic Asian/Native Hawaiian/Pacific Islander and White patients (mean= 156.5, and median= 144.3). The largest difference between the risk-standardized Severe Obstetric Complications excluding blood transfusion-only encounters rates were among Non-Hispanic Asian/Pacific Islander and White patients (mean= 53.1, and median= 43.8).

Table 4. Risk-standardized rate differences per 10,000 for i) Severe Obstetric Complications and ii) Severe Obstetric Complications excluding blood transfusion-only encounters between race/ethnicity groups and the White referent group

Comparisons (versus White)	Mean	SD	Min	5%tile	25%tile	Median	75%tile	95%tile	Max
Severe Obstetric Complications									
Hispanic	102.6	69.0	0.0	11.6	60.1	78.6	151.2	212.9	310.2
Non-Hispanic African American	34.6	40.3	-48.0	-30.0	3.4	32.1	64.4	91.0	124.0
Non-Hispanic Asian or Native Hawaiian or Pacific Islander	156.5	55.7	55.7	55.7	119.0	144.3	207.4	258.5	258.5
Severe Obstetric Complications excluding blood transfusion-only encounters									
Hispanic	37.0	38.1	0.0	0.0	8.3	26.7	55.1	82.0	166.0
Non-Hispanic African American	11.4	13.2	-2.6	0.0	0.0	5.6	23.9	29.8	44.0
Non-Hispanic Asian or Native Hawaiian or Pacific Islander	53.1	49.1	0.0	0.0	27.9	43.8	69.2	190.9	190.9

Table 5. Risk-standardized rate differences per 10,000 for i) Severe Obstetric Complications and ii) Severe Obstetric Complications excluding blood transfusion-only encounters between Medicaid and Private insurance

Comparisons (versus Private)	Mean	SD	Min	5%tile	25%tile	Median	75%tile	95%tile	Max
	Severe Obstetric Complications								
Medicaid	17.3	28.3	-35.5	-11.4	-2.8	10.5	47.4	62.1	69.4
	Severe Obstetric Complications excluding blood transfusion-only encounters								
Medicaid	5.1	8.5	-9.7	-9.2	-0.3	3.8	10.8	17.9	22.4

1.3 Summary

This report is a supplement to the original Severe Obstetric Complications eCQM methodology report[7]. The goals were to outline the stratification approach to be used and to examine the Severe Obstetric Complications outcomes stratified by 1) Race & Ethnicity, and 2) Payer groups. We found the highest observed rate of Severe Obstetric Complications was among Non-Hispanic African American, and the lowest was among Non-Hispanic White. The results demonstrated that the largest gaps between both risk-standardized Severe Obstetric Complications outcome rates were between Non-Hispanic Asians/Pacific Islander versus White, followed by Hispanic versus White, and then the Non-Hispanic African American versus White. Risk-standardized rate differences show Patients with Medicaid coverage had worse outcomes compared to Private insurance. The addition of these stratification analyses supports the Severe Obstetric Complications eCQM measure goal of lowering the occurrence of maternal complications through illuminating potential within hospital disparities.

References

1. Brown CC, Adams CE, Moore JE. Race, Medicaid Coverage, and Equity in Maternal Morbidity. *Women's Health Issues*. 2021;31(3). doi:https://doi.org/10.1016/j.whi.2020.12.005
2. Leonard SA, Main EK, Scott KA, Profit J, Carmichael SL. Racial and ethnic disparities in severe maternal morbidity prevalence and trends. *Annals of Epidemiology*. 2019;33:30-36. doi:https://doi.org/10.1016/j.annepidem.2019.02.007
3. Petersen EE, Davis NL, Goodman D, et al. Racial/Ethnic Disparities in Pregnancy-Related Deaths — United States, 2007–2016. *MMWR Morbidity and Mortality Weekly Report*. 2019;68(35):762-765. doi:https://doi.org/10.15585/mmwr.mm6835a3
4. Creanga AA, Bateman BT, Kuklina EV, Callaghan WM. Racial and ethnic disparities in severe maternal morbidity: a multistate analysis, 2008-2010. *American Journal of Obstetrics and Gynecology*. 2014;210(5):435.e1-435.e8. doi:https://doi.org/10.1016/j.ajog.2013.11.039
5. Lloren A, Liu S, Herrin J, et al. Measuring hospital-specific disparities by dual eligibility and race to reduce health inequities. *Health Services Research*. 2019;54:243-254. doi:https://doi.org/10.1111/1475-6773.13108
6. QualityNet Home. qualitynet.cms.gov. Accessed June 7, 2024. https://qualitynet.cms.gov/inpatient/measures/disparity-methods/methodology
7. Severe OB Methodology Report | eCQI Resource Center. ecqi.healthit.gov. Accessed May 31, 2024. https://ecqi.healthit.gov/severe-ob-methodology-report