SEVERE MATERNAL MORBIDITY

SURVEILLANCE & REVIEW PROGRAM FINDINGS AND RECOMMENDATIONS

DECEMBER 2025

Developed by the Maryland Maternal Health Innovation Program

MDMOM

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EXECUTIVE SUMMARY

Severe maternal morbidity (SMM) remains a critical public health issue in Maryland. In 2025, Maryland's SMM Surveillance & Review Program identified and reviewed 292 SMM events occurring across birthing hospitals statewide. Findings from these reviews highlight the complex interplay of clinical, systemic, and social factors that contribute to SMM, as well as opportunities for prevention.

Maryland is the first state in the U.S. to implement statewide mandatory SMM surveillance and review, following passage of the Maryland Maternal Health Act of 2024. Led by the Maryland Maternal Health Innovation Program (MDMOM), the initiative includes all 32 birthing hospitals which identify SMM events using standardized criteria, abstract detailed clinical and contextual information, and conduct multidisciplinary case reviews. These reviews assess underlying causes, preventability, contributing factors, and opportunities to strengthen clinical care and health-system processes. The resulting data create a robust resource to inform hospital-level quality improvement and policy development to prevent future cases of SMM.

KEY FINDINGS

Of the 292 SMM events reviewed in 2025, the majority (70%) occurred in the postpartum period, most within the first eight hours following delivery. Nearly one-quarter of events met both SMM criteria (ICU admission and transfusion of four or more units of blood products) underscoring the severity of maternal complications. Blood transfusion was required in nearly half of all events; among these, the average volume transfused was more than eight units.

Obstetric hemorrhage remained the leading cause of SMM in Maryland, accounting for over half (55%) of all events. Other common causes included hypertensive disorders of pregnancy (10%), infection (9%), pulmonary conditions (5%), and neurologic complications. Many patients had multiple preexisting or pregnancy related risk factors, including obesity, mental health conditions, anemia, placental disorders, and hypertensive disorders.

Disparities persist, with non-Hispanic Black women experiencing SMM at disproportionately high rates and accounting for 44% of all SMM events, despite representing only 28% of live births in Maryland. Older age and Medicaid insurance were also associated with higher SMM rates. Patients experiencing SMM were more likely than the general birthing population to have initiated prenatal care late or not at all.

Nearly one-third (31.5%) of all SMM events were preventable. Preventable cases most commonly involved hemorrhage and hypertensive complications. Provider-level factors, such as incomplete risk assessment, delayed recognition of clinical deterioration, or gaps in managing postpartum complications, were the most frequently identified contributors. System-level issues included limited care coordination between obstetric and non-obstetric providers, inconsistent postpartum follow-up processes, and insufficient behavioral health resources. Patient-level factors often reflected structural barriers to care, including difficulties obtaining medications, gaps in prenatal care, or delayed presentation for urgent symptoms.

HOSPITAL PRACTICE CHANGES

Participation in SMM reviews has already spurred meaningful practice improvements across Maryland hospitals. Eleven hospitals reported more than 30 implemented changes, including:

- Strengthened cross-disciplinary communication and handoff processes
- Expanded use of early warning tools and data monitoring systems
- Enhanced staff training for obstetric hemorrhage, hypertension, and sepsis
- Updated clinical protocols and resource allocation for high-risk patients
- Improved scheduling and support for postpartum follow-up

Most changes directly address leading causes of SMM and align with the Alliance for Innovation on Maternal Health (AIM) patient safety bundles.

RECOMMENDATIONS

Drawing on hospital-level reviews the report outlines recommendations to prevent future SMM:

Hospital-Level Recommendations

- Standardize postpartum discharge planning, including scheduling follow-up visits, providing medications prior to discharge, and reinforcing urgent warning-sign education.
- Improve utilization and training around hemorrhage management such as the Jada device and ensure alignment with AIM hemorrhage bundle protocols.
- Strengthen documentation for high-risk patients.
- Expand use of case managers or patient navigators for medically complex pregnancies.
- Enhance preparedness among non-obstetric providers caring for postpartum patients, including emergency department and ICU teams.
- Promote counseling and warm handoffs to mental health services after traumatic birth experiences.

Policy Recommendations

- Improve screening and documentation of social determinants of health during prenatal and postpartum care.
- Expand access to behavioral health and substance use treatment resources for pregnant and postpartum individuals.

Surveillance & Review Recommendations

- Conduct cross-hospital convenings to promote standardization and strengthen the consistency of review committees.
- Use all available data to capture all SMM events that occur in pregnancy and within 42 days postpartum.

CONCLUSION

Maryland's SMM Surveillance & Review Program continues to generate critical data to inform maternal health improvement statewide. The 2025 findings demonstrate that SMM is common and often preventable. By targeting leading drivers—especially hemorrhage and hypertension—and addressing systemic gaps in postpartum care, behavioral health access, and care coordination, Maryland has significant opportunities to reduce both SMM and maternal mortality. Continued efforts related to SMM surveillance, quality improvement, and equitable access to care will help in achieving the state's maternal health goals.

INTRODUCTION

Severe maternal morbidity (SMM) and maternal deaths are disproportionately high in the United States compared to other high-income countries, and both indicators have increased in recent years.[1,2] SMM refers to unexpected and significant health complications arising from labor and delivery that result in short- and long-term adverse health outcomes. Each year, approximately 50,000 to 60,000 individuals nationwide, including roughly 600 individuals in Maryland, experience SMM.[1] SMM events occur approximately 50 to 100 times more frequently than maternal deaths, offering critical information to identify systemic improvements and prevent future mortality.[3] Because SMM and maternal mortality share risk factors, efforts to reduce SMM can directly contribute to the prevention of maternal deaths as well.

SMM is a critical health issue. Women who experience SMM are more likely to have longer hospital stays, receive large volumes of blood transfusion, hysterectomies, and other major surgeries or medical interventions with the potential for long-term physical health consequences including infertility and cardiovascular disease.[4] In addition to these physical impacts, women who experience SMM are at higher risk for mental health complications during the postpartum period.[5,6] SMM also increases the likelihood of adverse neonatal outcomes, such as preterm birth, low birth weight, neonatal intensive care unit admission, stillbirth, and neonatal death. The financial burden of SMM is substantial; in the United States, excess medical expenditures from SMM total approximately $250 million annually.[7]

Disparities in who experiences SMM are well-documented. Higher rates are seen among Black birthing individuals, those insured by Medicaid, and residents of rural communities. More specifically, Black women experience SMM at approximately 1.6–2.1 times the rate of White women and those with Medicaid-covered deliveries are 1.5 times more likely to experience SMM than those with private insurance.[8, 9] The reasons behind these disparities are multifactorial and include socio-economic, clinical, and structural factors. In addition, other maternal characteristics increase the risk for SMM including advanced maternal age, having a pre-existing medical condition, carrying multiple fetuses, having a history of cesarean delivery, and being a first-time mother.[10]

Given the increasing incidence of SMM and persistent disparities across populations, urgent and coordinated action is needed. In fact, research consistently demonstrates that a large proportion of SMM events could be prevented through changes that address community, patient, and health system factors.[11–14] Clinical reviews by hospital committees are well suited to guide the design of large-scale interventions and quality improvement initiatives to eliminate preventable SMM and maternal mortality.[3] Consistent with guidance from the American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine (SMFM), Maryland initiated hospital-based SMM Surveillance & Review activities in July 2020.[12, 13, 15] Passage of the Maternal Health Act of 2024 strengthened this work by mandating participation from all 32 birthing hospitals statewide, with the goal of identifying drivers, risk factors, and causes of SMM across Maryland.[16]

The purpose of this report is to present findings from Maryland's SMM Surveillance & Review activities and offer evidence-based recommendations to support policy development, program implementation, and health-system improvement efforts aimed at reducing preventable SMM in Maryland.

MARYLAND'S SEVERE MATERNAL MORBIDITY SURVEILLANCE & REVIEW PROGRAM HISTORY

All birthing hospitals in Maryland are required to participate in the SMM Surveillance & Review Program following passage of the Maryland Maternal Health Act of 2024 (HB1051). SMM Surveillance & Review is coordinated by the Maryland Maternal Health Innovation Program (MDMOM), which is funded by the Health Resources and Services Administration (HRSA). Led by Johns Hopkins University, MDMOM is a five-year initiative to improve maternal health in Maryland. Other partners include the Maryland Patient Safety Center and the Maryland Department of Health.

Maryland's SMM Surveillance & Review Program was first implemented in July 2020 as a pilot in six birthing hospitals (Figure 1). These hospitals voluntarily participated and provided feedback to refine surveillance procedures. In November 2021, a mixed-methods evaluation was conducted using the Centers for Disease Control and Prevention's (CDC's) guidelines for evaluating public health surveillance systems.[13] The evaluation included interviews with more than 20 stakeholders—representing each pilot hospital—and analysis of 192 SMM events identified and reviewed during the pilot period.

The evaluation found that the program met CDC criteria for a useful and effective public health surveillance system (Table 1). Minor refinements were made to improve the efficiency and effectiveness of the surveillance process. In April 2022, all remaining birthing hospitals in Maryland were invited to voluntarily join the program, and participation grew steadily, with more than 25 hospitals engaged prior to the 2024 statutory requirement. Maryland is the first state in the nation to implement statewide SMM surveillance.

FIGURE 1

TIMELINE OF SEVERE MATERNAL MORBIDITY SURVEILLANCE & REVIEW PROGRAM IMPLEMENTATION

SMM SURVEILLANCE & REVIEW PROGRAM: IMPLEMENTATION ATTRIBUTES AND EVALUATION INDICATORS AND DATA SOURCES

TABLE 1

IMPLEMENTATION		EVALUATION	
Attributes	**Description**	**Indicators**	**Source**[1]
Simplicity	• SMM events identified by trained abstractors using multiple data sources (e.g., EHR; automated maternal complications reports, blood bank reports; staff alerts) or through coordination with case identification for other perinatal adverse events reviewed • Detailed information on patient demographics, medical and obstetric history, and SMM abstracted and entered in REDCap database maintained by MDMOM • Hospital and group learning opportunities offered by MDMOM • Real-time data entry tracking allows for continuous data checking and cleaning, export and analysis by MDMOM	Method used to identify SMM events	
		Amount and type of data collected	
		Ease of abstracting and entering data	
		Training and learning requirements	
		Ease of managing, cleaning, and analyzing data	
Flexibility	• Accommodates EHR and surveillance case definition changes • Data entry system allows for changes and updates as needed • Hospital-based review committees typically include lead obstetrician, nurse or nurse-midwife, QI specialist(s) and data abstractor(s), with composition, size, and frequency of review meetings tailored to individual hospital needs	Adaptability of the data entry system	
		Composition of the abstraction team and review committees at hospital-level	
		Tracking emerging public health threats	
Acceptability	• Hospitals participate in case abstraction and regular check-in meetings, increasingly so with state legislation mandate in place • Increasing recognition of the value of SMM surveillance for QI, and strong physician and nursing leadership engagement	Hospital engagement	
		Perceived value of SMM surveillance and review	
Timeliness	• Data entry required within 1 month of event occurring, but some hospitals take up to 3 months due to delays in SMM event identification reports and limited staff capacity • Monthly to quarterly review meetings depending on case load • Complete data entry within days of review meetings • Data analyses at hospital- and state-level bi-annually, with data briefs, reports, and publications disseminated annually	Time between SMM event and entry in the data system	
		Time between SMM event and hospital review meetings	
		Time between hospital reviews and data entry completion for reviewed cases	
		Time between completion of data entry and data analysis	
Stability	• System experienced no outages and limited staff turn-over	Time when system is fully operating	
Data quality	• Data are from structured data elements available in EHR, yet missing for certain patient demographic (e.g., education, nativity), obstetric history (e.g., prenatal care) • Unstructured event summary and preventability assessment • Abstractors trained to verify data in external sources (e.g., birth certificates, CRISP, CareEverywhere • Monitoring and data quality checks incorporated in data entry system and completed by MDMOM	Completeness	
		Data validity	
Predictive value positive	• SMM events identified are determined to be true SMM cases during hospital reviews	Proportion of reported SMM events that are true severe morbidity	
Representativeness	• Pilot program with 6 hospitals expanded gradually to 27 hospitals; became statewide following state legislation mandate	Cause-specific morbidity	
Usefulness	• The systematic review of SMM events leads to actionable recommendations at hospital- and state-level • Hospitals develop and implement policy and practice changes following SMM reviews	Actual and perceived usefulness of the SMM surveillance data	

[1]**Data source legend:**

SMM surveillance data · *Qualitative interviews* · *MDMOM investigators* · *Program implementation monitoring* · *Provider surveys*

Notes: CRISP, Chesapeake Regional Information System for our Patients in Maryland; EHR, electronic health records; ICD, International Classification of Diseases; QI, quality improvement; SMM, severe maternal morbidity.

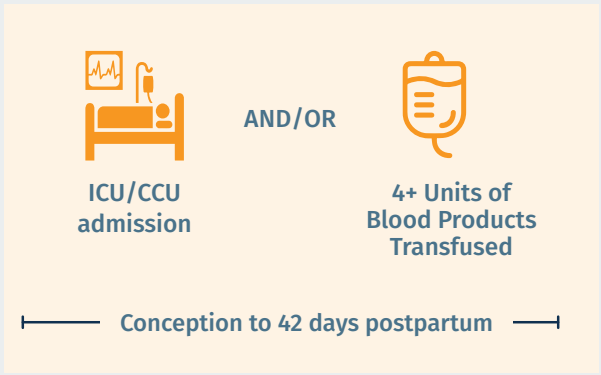
Source: Quian et al., 2023

MARYLAND'S SEVERE MATERNAL MORBIDITY SURVEILLANCE & REVIEW PROGRAM PROCESS

The process for SMM Surveillance & Review in Maryland follows recommendations from ACOG and SMFM.[3] The criteria used to identify SMM events include all hospitalized pregnant and up to 42-day postpartum patients who are: 1) admitted to the intensive care or critical care unit (ICU/CCU); and/or 2) receive transfusion of 4 or more units of blood products (Figure 2).

FIGURE 2

SEVERE MATERNAL MORBIDITY CASE DEFINITION



Within each hospital, designated data abstractors identify cases that meet SMM criteria (Figure 3). Abstractors are clinically trained and include registered nurses, physician assistants, and quality improvement specialists. Cases are entered into a standardized database in as close to real-time as possible (ideally within one month of the event).

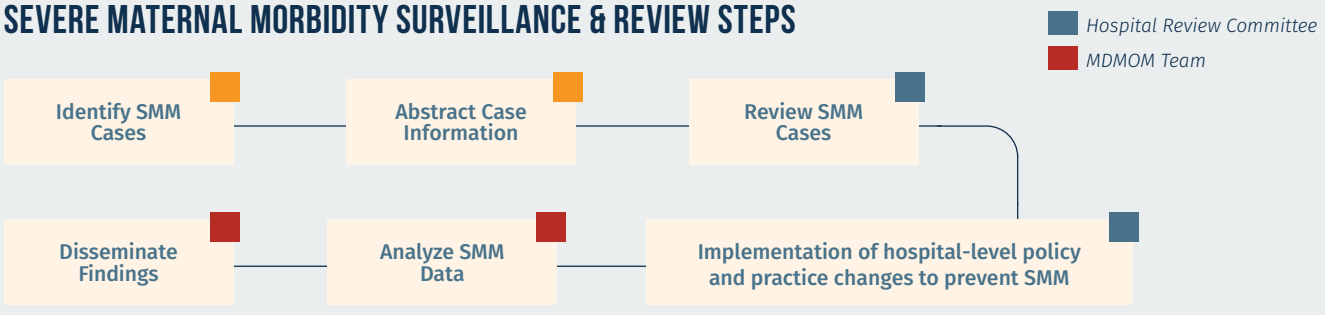
Hospital-based committees review and discuss SMM events, identify primary causes of each SMM event, determine whether each event was preventable, and make recommendations for preventing similar events from occurring. Cases are considered preventable if there were one or more factors during the antepartum, intrapartum, and/or postpartum periods which, if changed, might have prevented the SMM events or lessened its severity. These factors can be related to the provider, system, and/or patient. (See Appendix B for preventability assessment guide). The composition of the review committee is at the discretion of participating hospitals. At a minimum, review committees include an obstetrician, nurse, midwife (if part of the labor and delivery team), and the data abstractor.

SMM abstractors and hospital-based review teams use a SMM data abstraction form to document case information and recommendations. The form is divided into five modules. The first three modules are completed by the data abstractor prior to the review committee meeting and include: 1) basic information about the SMM event, 2) patient characteristics, and 3) a narrative timeline of key events leading to the SMM event (Figure 4; See Appendix A for PDF version of abstraction form). The final two modules are completed by the review committee and include a determination of the underlying and contributing causes of the SMM event, its preventability, and recommendations for future improvements in care. Collected information does not include personally identifiable information (PII) or protected health information (PHI).

Completed cases are analyzed by the MDMOM team. Aggregate state-level data are summarized annually in data briefs and other publicly available reports (See Appendix C & D for annual data briefs and peer reviewed publications related to SMM Surveillance & Review in Maryland). Disseminated data does not include any information that identifies hospitals, providers, or patients.

FIGURE 3

SEVERE MATERNAL MORBIDITY SURVEILLANCE & REVIEW STEPS



SEVERE MATERNAL MORBIDITY SURVEILLANCE FORM MODULES

FIGURE 4

SMM TYPE	ABSTRACTION	CASE NARRATIVE AND TIMELINE	CASE REVIEW ASSESSMENT	FINAL REVIEW COMMITTEE ANALYSIS
• SMM case definition • Timing of morbidity	• Patient sociodemographic characteristics and medical history • Prenatal care • Delivery information and blood loss • ICU/CCU admission • Surgery and other follow-up after SMM event • COVID-19	• Narrative synopsis • Timeline of key events	• Underlying causes of morbidity • Sequence of clinical causes of morbidity	• Opportunities to alter outcome • Practices that were done well • Overall recommendations for improvements
Completed by the Data Abstractor(s) in advance of the Hospital Review Committee meeting			**Completed during the Hospital Review Committee meeting**	
Data Abstractor(s) revise the information entered in the database as a result of Hospital Review Committee meeting				

CONTEXTUAL FACTORS IN MARYLAND

Maryland's maternal health population includes an estimated 1.2 million women of reproductive age (ages 15–44). In calendar year 2024, there were 65,797 live births statewide. These included 25,515 Non-Hispanic White births (38.8%), 15,174 Hispanic births of all races (23.1%), 18,408 Non-Hispanic Black births (28.0%), 4,495 Non-Hispanic Asian/Pacific Islander births (6.8%), and 79 American Indian births (0.1%) (Table 2).

Approximately half of deliveries were covered by private insurance, and 43.6% were financed through Medicaid. Nearly one-third of births occurred among individuals considered to be of advanced maternal age (35 years or older), and 3.2% were to adolescents. Maryland reported 1.8 fetal deaths per 100 live births and 103.2 cases of SMM per 10,000 live births in 2024.

Maryland has 32 birthing hospitals (Table 3; Figure 5), classified across four levels of maternal care. Six hospitals are Level I, 11 are Level II, 13 are Level III, and 2 are Level IV. Level I hospitals provide basic care for low- to moderate-risk pregnancies. Level II hospitals provide specialty care for moderate- to high-risk antepartum, intrapartum, and postpartum conditions. Level III hospitals offer subspecialty care for complex maternal medical conditions and complications, and Level IV hospitals serve as regional perinatal centers for the most complex maternal cases and for critically ill pregnant individuals and fetuses.

BIRTHS IN MARYLAND, 2024

TABLE 2

BIRTH CHARACTERISTICS	N	%
Live births	**65,797**	**100**
Maternal age (years)		
<20	2,087	3.2
20–24	8,516	12.9
25–29	15,624	23.7
30–34	21,785	33.1
35–39	14,000	21.3
40–44	3,441	5.2
45+	344	0.5
Race		
American Indian/Alaskan Native	79	0.1
Non-Hispanic Asian/ Pacific Islander	4,495	6.8
Non-Hispanic Black	18,408	28.0
Non-Hispanic White	25,515	38.8
Hispanic	15,174	23.1
Multi-race/other	2,126	3.2
Insurance Status		
Medicaid	28,719	43.6
Private Insurance	33,373	50.7
Self-pay/unknown	1,325	2.0
Other	2,380	3.6
Fetal deaths / fetal death rate*	**1,192**	**1.8**
SMM rate **		**103.2**

*Sources: CDC WONDER; HCUP Fast Stats. *Fetal deaths reported in 2023 per live births; **SMM rate reported in 2023 per 10,000 in-hospital deliveries; SMM is defined using ICD-10 coding*

BIRTHING FACILITIES IN MARYLAND

TABLE 3

HOSPITAL	Annual Deliveries (2024)	Level of Maternity Care	SMM Surveillance Initiation Date
Adventist HealthCare Shady Grove Medical Center	3,927	III	4/1/22
Adventist HealthCare White Oak Medical Center	1,868	II	1/1/24
Ascension Saint Agnes Hospital	1,502	III	1/1/25*
CalvertHealth Medical Center	388	I	4/1/22
Carroll Hospital Center	947	II	5/1/22
CristianaCare, Union Hospital	355	I	4/1/24
Frederick Health Hospital	2,452	III	7/1/24
Garrett Regional Medical Center	231	I	1/1/25*
Greater Baltimore Medical Center	3,445	III	1/1/23
Holy Cross Germantown Hospital	1,003	II	4/1/24
Holy Cross Hospital	7,464	III	10/1/24
Johns Hopkins Bayview Medical Center	1,202	III	1/1/22
Johns Hopkins Hospital	2,547	IV	8/1/20
Johns Hopkins Howard County Medical Center	2,415	III	8/1/20
Luminis Health Anne Arundel Medical Center	5,038	III	8/1/20
MedStar Franklin Square Medical Center	1,934	III	4/1/24
MedStar Harbor Hospital	984	II	1/1/25*
MedStar Montgomery Medical Center	630	II	4/1/22
MedStar Southern Maryland Hospital	929	II	1/1/25
MedStar St. Mary's Hospital	1,123	I	8/1/20
Mercy Medical Center	2,659	III	8/1/20
Meritus Medical Center	1,958	II	3/1/24
Lifebridge Sinai Hospital of Baltimore	1,424	III	8/1/20
TidalHealth Peninsula Regional Medical Center	2,082	II	1/1/24
University of Maryland Baltimore Washington Medical Center	1,780	II	10/1/24
University of Maryland Capital Region Medical Center	2,247	III	1/1/25
University of Maryland Charles Regional Medical Center	455	I	1/1/25*
University of Maryland Medical Center	1,757	IV	10/1/22
University of Maryland Saint Joseph Medical Center	2,095	III	10/1/24
University of Maryland Shore Medical Center at Easton	903	I	1/1/25
University of Maryland Upper Chesapeake Medical Center	1,234	II	1/1/25
UPMC Western Maryland	874	II	4/1/22

Level I=Basic care; Level II=Specialty care; Level III=Subspecialty care; Level IV=Regional perinatal health center
**SMM Surveillance initiated but case abstraction and reviews are outstanding for first three quarters of 2025.*

CHANGES IMPLEMENTED IN HOSPITALS PARTICIPATING IN SEVERE MATERNAL MORBIDITY SURVEILLANCE & REVIEW IN MARYLAND

One of the primary goals of SMM Surveillance & Review is to identify what worked or did not work in the process of care, prompting hospitals to implement specific practice changes or quality improvement initiatives to prevent future SMM. As part of SMM Surveillance, hospitals are not required to share changes in policies and practices that have resulted from their reviews, but many have made significant changes that are already having large impacts on patient outcomes. To date, 11 hospitals have shared more than 30 policy and practice changes attributable to their participation in SMM Surveillance.

These changes were organized into 6 themes: cross-disciplinary collaboration and communication enhancements (8 examples); education, training and competency development (5 examples); process and policy updates for patient safety and quality improvement (5 examples); data monitoring and early detection systems improvements (7 examples); clinical intervention protocols for high-risk patients (4 examples); and scheduling and resource allocation for patient-centered care (6 examples). Most of these changes were implemented to address the main causes of SMM, specifically obstetric hemorrhage (19 change examples), severe hypertension (5 examples), and sepsis (2 examples) (Table 4).

ANALYSIS METHODS

This report presents findings from the SMM Surveillance & Review program in 2025 and includes all SMM events contributed by birthing hospitals in Maryland between January 1, 2025–September 30, 2025. As described above, SMM events were identified by hospital-based abstractors and entered into a standardized database in REDCap. Each event was reviewed by a hospital based perinatal review committee.

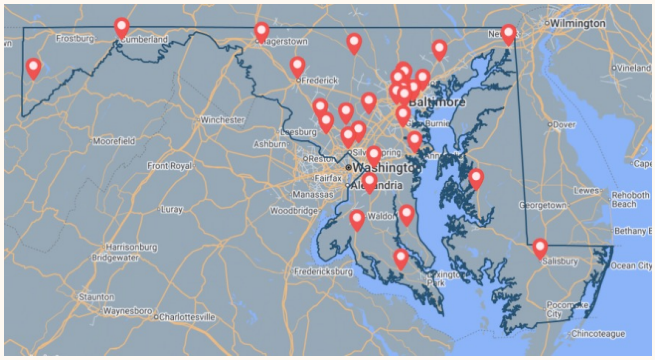
The committee determined the primary (i.e., underlying) cause of morbidity and contributing conditions through review of the abstracted information and case narrative. The abstraction form provided checkboxes for the top morbidity causes and an "other" open-ended field for rare causes. Committee's then applied a standardized preventability guide adapted from the model of preventability proposed by Geller et al., to assess whether the event was preventable, note factors that influenced the outcome, and identify opportunities for improvement.[17] Review committees also identified practices that were performed well and made recommendations for care improvement.

Using $\chi 2$ tests (a statistical tool to determine if there are significant differences between groups), we compared characteristics of patients with SMM and their delivery to those who had live births in Maryland during 2025 (January–August 25, 2025 based on the availability of data). A 2-sided $P < .01$ was considered statistically significant (i.e. results are considered significant if there was less than a 1% chance that it happened by chance alone). Birth data were obtained from CDC WONDER (Wide-ranging Online Data for Epidemiologic Research). Using descriptive analyses to examine each variable individually, we assessed levels, primary causes, timing, preventability, and patient, clinician, and health system factors associated with SMM. Data collected via text fields (preventability factors, recommendations, and practices performed well) were analyzed using qualitative content analysis methods.[18] Preventable factors, practices performed well, and recommendations were coded according to the 5Rs framework proposed by ACOG's Alliance for Innovation on Maternal Health for patient safety bundles and commonly used for maternity care quality improvement initiatives: readiness, recognition and prevention, response, reporting/system learning, and respectful care.[19, 20] MDMOM program researchers cleaned and analyzed case data using Stata (version 15; StataCorp LLC).

Rates of SMM were calculated overall by race and ethnicity, maternal age, and insurance status per 10,000 deliveries. This analysis was restricted to the 14 hospitals contributing data for the full 2024 calendar year due to limited availability of hospital-level birth data for 2025.

MARYLAND BIRTHING FACILITY LOCATIONS

FIGURE 5



IMPLEMENTED CHANGES IN HOSPITALS PARTICIPATING IN SEVERE MATERNAL MORBIDITY SURVEILLANCE AND REVIEW IN MARYLAND

TABLE 4

1. Cross-Disciplinary Collaboration and Communication Enhancements	4. Data Monitoring and Early Detection Systems Improvements
Collaboration with Cardiovascular and Interventional Radiology physicians to expedite care for patients with obstetric hemorrhage needing specialized interventions	Enhanced hypertension protocol in triage requiring Q1h vitals and Q15m BP monitoring for high BP
Quality Management Collaborative that engages multidisciplinary teams (e.g., nursing, anesthesia, blood bank) to improve cesarean and severe maternal morbidity rates	Quantitative blood loss monitoring in ICU and PACU-transferred OB patients
Enhanced communication pathways for rapid response, involving ICU and L&D management for critically complex patients	EHR-integration of scoring for early detection of sepsis
Re-education on escalation protocols for clinical care concerns across departments	Scale placed in general OR to allow quantification of blood loss
Expanded SMM review committee with multidisciplinary membership to address complex cases	Postpartum hemorrhage risk level included in bedside handoff report
Emergency department OB emergency education related to measuring blood loss, hypertension, and hemorrhage policies	Updated admission hemorrhage risk assessment to align with intrapartum hemorrhage risk assessment
Clarified expectations with Blood Bank regarding Massive Transfusion Protocol	Continued assessments of intake and output for 24-hours postpartum for all patients receiving magnesium sulfate during delivery
Clarified expectations around who is responsible for documentation of blood loss in the operating room versus other locations	
2. Education, Training, and Competency Development	**5. Clinical Intervention Protocols for High-Risk Patients**
Resident and attending training in FAST exams to improve the recognition of intra-abdominal bleeding	Institution of the Jada System for PPH management
Hands-on training with hysterectomy instrument sets for OB technicians during cesarean sections to improve preparedness for emergencies	Use of a standardized antibiotic prophylaxis for cesarean sections and added vaginal preps to reduce infection risks
Comprehensive simulation training for insulin administration on the Mother-Baby unit, with enhanced staff education on insulin drip errors and protocol adherence for IV line management to minimize errors	Implementation of a “500 Moment” to prompt early PPH interventions and decision-making
Re-education on management of postpartum hemorrhage protocol and activation of Massive Transfusion Protocol	Standardization of procedures for pulse oximetry, IV iron access, insulin administration, and management of placenta accreta spectrum
Education on indicators for Jada and best practices for management of Jada	
3. Process & Policy Updates for Patient Safety and Quality Improvement	**6. Scheduling and Resource Allocation for Patient-Centered Care**
Updated policies for OB-Stat code activation to empower early intervention for excessive bleeding	On-call gynecologic oncologist addition to the care team for immediate availability in relevant cases
Enhanced policy for transfers between L&D and Mother-Baby unit to avoid unnecessary movements and manage hemorrhage risk more effectively	Daily weight monitoring added to order sets for fluid management in preeclampsia
Updated order sets, education, and supply of sequential compression devices for patients with prolonged bedrest	IOL request screening by L&D nurses to prepare for high-risk cases, reducing unnecessary cesarean sections and improving patient flow
Blood Bank to adjust massive transfusion protocol standard initial dose to maintain recommended ratios	Nursing assessment of intake and output
Patients with BMI above 50 to delivery at a tertiary care facility	Provide freestanding emergency room with OB emergency kit
	Stocking every delivery room with postpartum hemorrhage medications

Notes: EHR, electronic health records; FAST, Focused Assessment with Sonography in Trauma; IOL, induction of labor; ICU, intensive care unit; PACU, post-anesthesia care unit; IV, intravenous; L&D, labor and delivery; OB, obstetrics; PPH, postpartum hemorrhage.

SEVERE MATRNAL MORBIDITY EVENT TYPES

FIGURE 6

*Numbers are provisional, as hospitals continue to identify and abstract SMM events for 2025.

ICU/CCU ADMISSION	BOTH CRITERIA	BLOOD TRANSFUSION ≥ 4 UNITS
40% (133)	24.7% (72)	35.3% (87)

292 SMM Events*

RESULTS

SUMMARY OF SEVERE MATERNAL MORBIDITY EVENTS

Two hundred and ninety-two SMM events were identified and reviewed in 2025. These events were composed of 72 events that met both ICU and blood transfusion criteria (24.7%), 133 events that met ICU admission criteria only (45.5%), and 87 events that met only blood transfusion criteria (35.3%; Figure 6). More than 70% of SMM events occurred during the postpartum period, most within 8 hours of delivery (Figure 7). Of the SMM events that occurred antepartum or intrapartum (n=82), 30.5% occurred before 28 weeks gestational age, 40.2% between 28 and 36 weeks, and 29.3% at 37 weeks or more gestational age (Figure 8).

An average of 8.3 units of blood products were transfused in events requiring transfusion, ranging from 1 to 43 units (cases with <4 units transfused qualified as an SMM event due to ICU admission). The massive transfusion protocol was called in relation to 66 SMM events (37.5% of events requiring blood transfusion), whether it was called was unknown for 9 SMM events due to incomplete documentation (5.1%). A massive transfusion protocol is a pre-planned, multidisciplinary response for patients with severe bleeding.

The average length of hospital stay for patients with an SMM event was 5 days, ranging from 1 to 48 days. Among patients with an ICU admission (n=205), the average length of ICU stay was 2 days, ranging from <1 to 34 days.

FIGURE 7

TIMING OF SEVERE MATERNAL MORBIDITY EVENTS

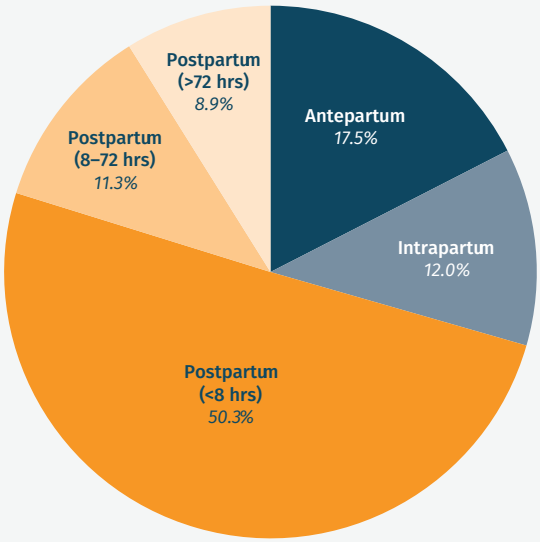
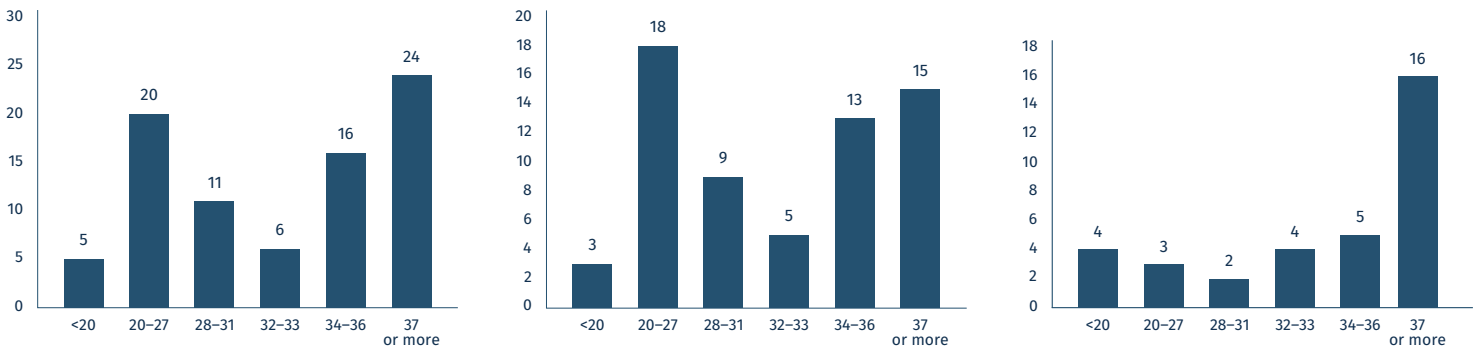


FIGURE 8

GESTATIONAL AGE (WEEKS) FOR ANTEPARTUM/INTRAPARTUM SEVERE MATERNAL MORBIDITY EVENTS

Note: Blood transfusion includes patients with ≥4 units transfused.



8a. All SMM Events
N=82

8b. ICU/CCU Admission
N=63

8c. Blood Transfusion
N=34

CHARACTERISTICS OF PATIENTS WITH SMM EVENTS (JAN. 1–SEPT. 30, 2025) AND LIVE BIRTHS (JAN. 1–AUG. 25, 2025) IN MARYLAND

TABLE 5

CHARACTERISTICS	All SMM (N=292)		Statewide births (N=42,926)	
Maternal age (years)				
<20 years	8	2.7	1,217	2.8
21-34 years	165	56.5	29,812	69.4
≥35 years	119	40.8	11,897	27.7
Maternal race and ethnicity				
Asian	18	6.2	2,894	6.7
Hispanic	44	15.1	9,824	22.9
Multi-race/other	10	3.4	1,619	3.8
Non-Hispanic Black	128	43.8	11,807	27.5
Non-Hispanic White	92	31.5	16,782	39.1
Insurance type				
Private	140	48.0	21,785	50.8
Medicaid	135	46.2	18,700	43.6
Self-pay or no insurance	7	2.4	721	1.7
Other/unknown	10	3.4	1,720	4.0
Timing of prenatal care initiation				
First trimester	176	60.3	31,449	73.3
Second trimester or later	40	10.3	9,579	22.3
No prenatal care	25	8.6	555	1.3
Delivery method*				
Spontaneous vaginal	37	16.4	26,399	61.5
Assisted vaginal	5	2.2	1,232	2.9
Cesarean	184	81.4	15,290	35.6
Twin or higher order multiples	19	6.5	1,326	3.1
Use of assisted reproductive technology	31	10.6	2,247	5.2

MEDICAL HISTORY OF PATIENTS WITH SEVERE MATERNAL MORBIDITY

TABLE 6

CONDITIONS	%
Significant medical history	**75.3**
Obesity	37.7
Mental health disorder	29.1
Anemia	22.3
Chronic hypertension	16.4
Asthma	12.0
Substance use	11.6
Diabetes	5.1
Cardiovascular condition	2.1
Complications in prior pregnancy	**73.9**
Pregnancy loss	42.7
Cesarean delivery	33.9
Hypertensive disorder of pregnancy	19.3
Gestational diabetes	6.0
Complications in current pregnancy	**72.6**
Hypertensive disorders of pregnancy	38.7
Placental abnormality	15.8
Gestational diabetes	13.4

CHARACTERISTICS OF PATIENTS WITH SEVERE MATERNAL MORBIDITY

Compared to the general population of women with live birth deliveries in Maryland, a higher proportion of patients with SMM were advanced maternal age (35 years or older) (40.8% among those with SMM compared to 27.7% in the general population) (Table 5). They were also in higher proportion non-Hispanic Black (43.8% versus 27.5%). About half of patients with SMM had private insurance (48%) and 46% had Medicaid – these rates were similar to the general populations with live birth deliveries.

The vast majority of patients (75.3%) had a significant medical history prior to the SMM event (Table 6). The most common comorbidity was obesity (37.7%), followed by a mental health disorder (29.1%), and anemia (22.3%). More than 10% had a history of substance use; opioids (38.2%), marijuana (35.3%), and tobacco (32.4%) were the most frequently reported substances. Many patients experienced prior pregnancy complications (73.9% among 218 patients with prior pregnancies). A similar proportion experienced a complication in their current pregnancy, the most common being hypertensive disorders of pregnancy (38.7%), placental abnormalities (15.8%), and gestational diabetes (13.4%). Use of assisted reproductive technology was reported in 10.6% of SMM events, which was significantly higher than among the general population of women in Maryland with live births (5.2%).

Only 60.3% of patients initiated prenatal care in the first trimester (compared to 73.3% among women with live births in Maryland), and 8.6% had no prenatal care. While not directly measured for this report, many patients were also reported to have sporadic or insufficient prenatal care.

*Note (Table 5): Data are from the Maryland SMM Surveillance and Review Database and Provisional Natality, 2023 through Last Month records of the Centers for Disease Control and Prevention WONDER (Wide-ranging Online Data for Epidemiologic Research) database. All P values assessing differences in group distributions of all SMM vs statewide births are statistically significant at a 2-sided P < .01, with the exception of insurance type which was not significant (p=0.56). Timing of prenatal care unknown among 61 patients with SMM and 1,343 live birth deliveries. *Delivery method reported for SMM patients with live birth deliveries (n=226).*

Note (Table 6): Reported percentages are based on events with available data for the characteristic shown. Complications in prior pregnancy reported among those with a prior pregnancy (n=218)

DELIVERY OUTCOMES AMONG PATIENTS WITH SEVERE MATERNAL MORBIDITY

More than four in five (81.2%) SMM events occurred during the delivery hospitalization (Table 7). Nineteen occurred antepartum where the patient was discharged still pregnant, 29 occurred during an admission in the postpartum period, and 7 resulted in a fetal death or miscarriage during the hospitalization (<20 weeks gestational age).

Among SMM events that occurred during the delivery hospitalization, 95.4% resulted in live-born infants. Most (81.4%) were delivered via cesarean, 42.9% of live born infants were admitted to the neonatal intensive care unit (NICU), 39.4% were born preterm (prior to 37 weeks gestational age) and 38.5% were low birth weight (<2,500 grams).

PRIMARY CAUSE OF SEVERE MATERNAL MORBIDITY AND CONTRIBUTING FACTORS

The most common primary causes of SMM were obstetric hemorrhage (55.1%), hypertensive disorders of pregnancy (9.9%), infection (8.9%), and pulmonary conditions (4.8%) (Figure 9). Among the 205 events requiring ICU admission, the top 5 primary causes of SMM were obstetric hemorrhage (38.5%), hypertensive disorders of pregnancy (13.7%), infection (12.2%), pulmonary conditions (6.8%), and neurologic conditions (5.9%).

Common contributing conditions for all types of SMM events were hypertensive disorders of pregnancy (15.8%), obstetric hemorrhage (5.5%), infection (5.5%), and hematologic conditions (5.5%).

TABLE 7

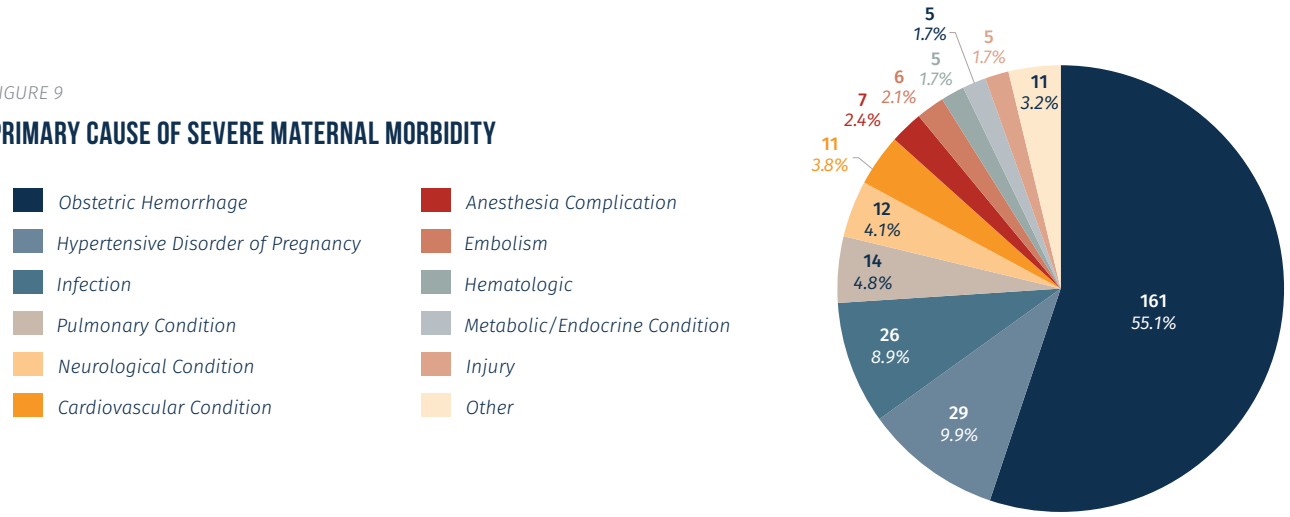
PREGNANCY/DELIVERY OUTCOMES AMONG PATIENTS WITH SEVERE MATERNAL MORBIDITY

CAUSE	%	N
SMM Event Occurred During Delivery Hospitalization	**81.2**	**237 of 292**
Live birth	**95.4**	**226 of 237**
Gestational age, mean (range)		37W1D (23W2D–41W5D)
NICU admission	42.9	97 of 226
Preterm birth	39.4	89 of 226
Low birthweight	38.5	87 of 226
Stillbirth (>20 weeks gestation)	**4.6**	**11 of 237**
Gestational age, mean (range)		28W (20W4D–39W)
Fetal Death (<20 weeks gestation)	**2.4**	**7 of 292**

Note: w, weeks, d, days, NICU, Neonatal intensive care unit; Reported denominators are based on events with available data for the relevant characteristic. Delivery hospitalization defined as a birth to an infant or fetus >20 weeks gestational age.

FIGURE 9

PRIMARY CAUSE OF SEVERE MATERNAL MORBIDITY



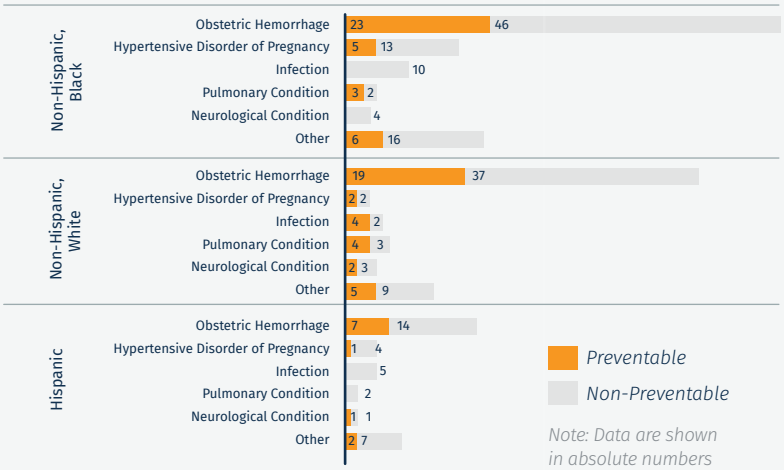
PREVENTABILITY OF SEVERE MATERNAL MORBIDITY

TABLE 8

CAUSE	%	N
Obstetric Hemorrhage	32.9	53 of 161
Hypertensive Disorder of Pregnancy	31.0	9 of 29
Infection	23.1	6 of 26
Pulmonary Condition	50.0	7 of 14
Neurological Condition	33.3	4 of 12
Cardiovascular Condition	27.3	3 of 11
Anesthesia complications	42.9	3 of 7
Embolism	16.7	1 of 6
Hematologic	20.0	1 of 5
Metabolic/Endocrine Conditions	40.0	2 of 5
Injury	40.0	2 of 5
Other	18.2	2 of 11

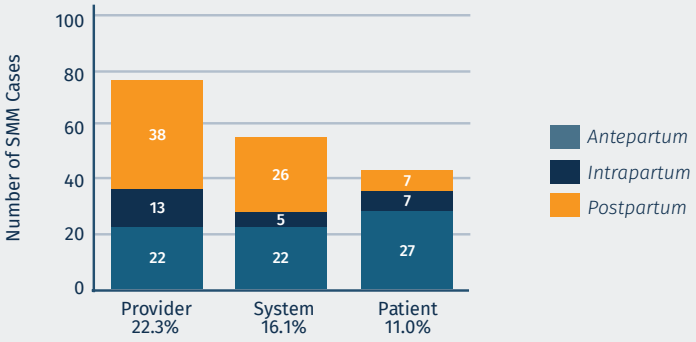
PRIMARY CAUSE AND OPPORTUNITY TO ALTER THE SEVERE MATERNAL MORBIDITY OUTCOME BY RACE AND ETHNICITY

FIGURE 10



LEVEL AND TIMING OF FACTORS THAT COULD HAVE ALTERED THE SEVERE MATERNAL MORBIDITY OUTCOME

FIGURE 11



PREVENTABILITY OF SEVERE MATERNAL MORBIDITY

SMM events were considered preventable if changes in provider, system, and/or patient-level factors could have altered the SMM outcome. Preventability assessments were determined by each participating hospital through the SMM review committee. In 2025, 31.5% of SMM events (n=92) were considered preventable. Preventability of SMM events varied by primary cause, ranging from 50% for pulmonary conditions to 16.7% for embolism (Table 8). Preventability also varied by race and ethnicity, with 25% of SMM events among Hispanic women considered preventable, 28.9% among non-Hispanic Black women, and 39.1% among non-Hispanic White women (Figure 10). Obstetric hemorrhage was the most common primary cause of preventable SMM events for all racial and ethnic groups.

Hospital review committees determined that addressing provider, system, and patient-level factors could have altered outcomes in 65 (22.3%), 47 (16.1%), and 32 (11%) SMM events, respectively (Figure 11). About 17.1% of SMM events could have been prevented by addressing factors in the antepartum period (Figure 12). Most of these were related to recognition and response domains. Antepartum provider-level factors included accurate risk assessments of patients to allow for appropriate pre-delivery planning. System-level factors included need for increased availability of mental health and substance use treatment options. Patient-level factors included inadequate prenatal care and non-compliance with medical recommendations.

About 6.9% of SMM events could have been prevented by addressing factors in the intrapartum period. Most of these were related to the response domain. Provider-level factors included faster recognition of patient's declining status. System-level factors included non-obstetric provider's lack of familiarity with obstetric hemorrhage and hypertensive protocols. Very few patient-level factors were noted during the intrapartum period.

About 16.1% of SMM events could have been prevented by addressing factors in the postpartum period. Most of these were related to recognition and response domains. Provider level factors included closer patient monitoring in the postpartum period. System-level factors included improved coordination of care across specialists and obstetric providers. Patient-level factors included earlier presentation to hospital in the response to urgent warning signs.

PRACTICES THAT WERE DONE WELL IN RELATION TO SEVERE MATERNAL MORBIDITY EVENTS REVIEWED

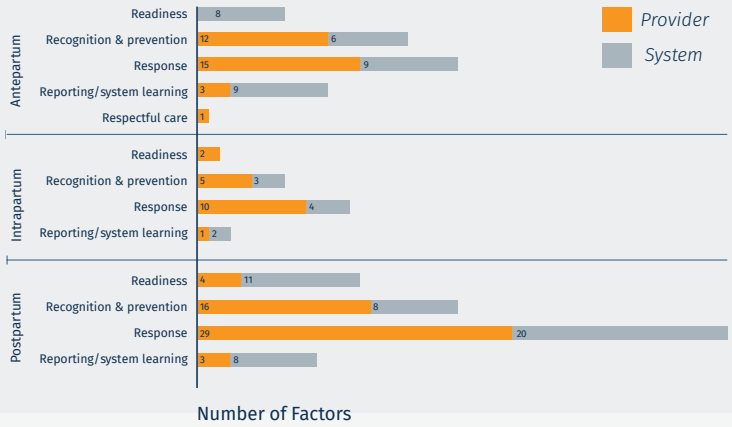
For all SMM events, hospital review committees listed up to three practices that were done well and should be reinforced in their hospitals. Ten themes emerged (Figure 13). The most commonly reported practices were appropriate treatment (mentioned in 112 reviews of SMM events, 38.4%) and care coordination between units (mentioned in 110 reviews, 37.7%).

SEVERE MATERNAL MORBIDITY RATES IN MARYLAND

The SMM rate was 92.7 SMM events per 10,000 delivery hospitalizations among the 14 hospitals contributing data for the full 2024 calendar year. This analysis was restricted to these 14 hospitals, because hospital-level birth data was aggregated by calendar year and not available as monthly estimates. Rates were elevated among non-Hispanic Black and Asian women compared to non-Hispanic White women; specifically, Asian women had 2.1 times the rate of SMM compared to non-Hispanic White women and non-Hispanic Black women at 2.5 times the rate (Figure 14). Rates were also highest among older women, with those with pregnancy at age 40 or older having nearly 4 times the rate of SMM compared to those in the lowest risk age group (25–29 years). Women with Medicaid also experienced SMM at higher rates than those with private insurance (118.3 among those with Medicaid compared to 74.1 among those with private insurance). These differences in rates mirror those observed at the national level, and highlight racial minority groups, older women, and those with Medicaid as being particularly vulnerable to experiencing SMM in Maryland.

TYPES OF FACTORS THAT COULD HAVE ALTERED THE SEVERE MATERNAL MORBIDITY EVENT OUTCOME

FIGURE 12

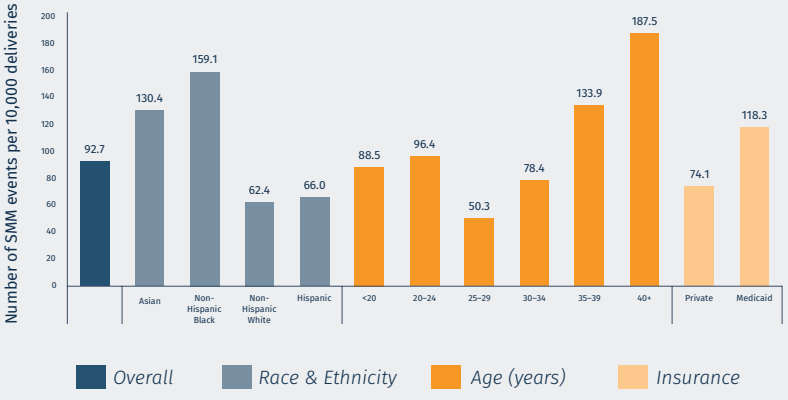


PRACTICES DONE WELL IN RELATION TO SEVERE MORBIDITY EVENTS REVIEWED

FIGURE 13

SEVERE MATERNAL MORBIDITY RATES BY MATERNAL CHARACTERISTICS, 2024

FIGURE 14



Note: Rates are calculated among the 14 hospitals participating in SMM Surveillance & Review Denominators for the full 2024 calendar year. Denominators are from AHRQ's Maryland Statewide Inpatient Database.

DISCUSSION

Nearly one-third of SMM events in Maryland are preventable. Hospital-level reviews of these SMM events identified provider, system, and patient factors that contributed to preventable events. The largest proportion of provider and system level factors were identified in the postpartum period, while most patient level factors were identified during the period of pregnancy (antepartum). Strategies to help providers prevent SMM include enhanced patient monitoring and risk identification. At the system level, changes are needed to improve postpartum discharge and well as collaboration across specialists and increased availability and access to behavioral health services such as substance use and mental health treatment. Patient factors identified were often related to barriers to following medical recommendations and low compliance with taking medications – often due to transportation challenges, unstable housing, or healthcare access barriers.

Obstetric hemorrhage remains the leading cause of SMM in Maryland, comprising more than half of cases overall and more than half of SMM events deemed preventable. Many patients experiencing SMM have known risk factors, including preexisting medical conditions, complications in a prior pregnancy, and advanced maternal age. Behavioral risk factors are also notable among patients with SMM, with 29.1% having a documented mental health condition and 11.6% having a history of substance use.

Obstetric hemorrhage is the current focus of the Maryland Perinatal-Neonatal Quality Collaborative, through implementation of the Alliance for Innovation on Maternal Health (AIM) patient safety bundle. Hospitals have made substantial progress implementing the bundle, though through hospital reviews of SMM events, some gaps were identified in universal adherence to all bundle elements. Efforts to reinforce existing policies and protocols will help ensure system-wide alignment.

As a result of their participation in Maryland's SMM Surveillance & Review, birthing hospitals have already begun implementing policy and process changes to help curb preventable SMM, particularly related to hemorrhage, severe hypertension, and infection/sepsis. These strategies target factors related to providers and systems, but cannot easily address patient factors. The planned statewide use of the Maryland Prenatal Referral Assessment form (MPRA) and the Postpartum Infant Maternal Referral Form (PIMR) will support patients to access specialty care during pregnancy and postpartum and increase postpartum monitoring of high-risk patients. The postpartum phone call that is now required for all patients within 48 hours of discharge after delivery has been noted as an important strategy for identifying patient needs during the postpartum period.

ALIGNMENT WITH THE MATERNAL HEALTH STRATEGIC PLAN

As part of the MDMOM program, a statewide Maternal Health Improvement Task Force was established to coordinate programs and policies to improve the health and well-being of pregnant and postpartum women in Maryland. The Task Force was first charged in 2020 with developing a five-year strategic plan to improve maternal health in Maryland, building upon the 2020 Maryland Title V Needs Assessment and updating that plan every five years.[21]

Findings from SMM Surveillance & Review informed the development of the 2025 Maryland Maternal Health Improvement Strategic Plan and reinforced the need to address challenges related to behavioral health and unnecessary cesarean deliveries. SMM reviews identified mental health complications and substance use as common comorbidities among patients who experience SMM. These conditions are also the leading cause of pregnancy-associated mortality in Maryland. Also, SMM reviews show that one-third of patients with SMM had a prior cesarean delivery. While many patients experiencing SMM have a cesarean with a clear medical indication, reviews of SMM events in Maryland identified patients who received a medically unnecessary cesarean, which then contributed to their subsequent morbidity.

The Maternal Health Improvement Action Plan also consists of four goals that align with findings and recommendations from SMM Surveillance & Review (Table 9).

TABLE 9

ACTION PLAN FOR ADDRESSING MATERNAL HEALTH NEEDS

GOALS
Goal 1: Prevent complications of pregnancy.
Obj 1.a: Increase the proportion of pregnant women who receive comprehensive postpartum care by 12 weeks following delivery.
Obj 1.b: Ensure standardized maternal urgent warning signs education is incorporated into the perinatal care continuum so that all pregnant women, their families/ support networks, healthcare providers, and clinical support staff are exposed to the information.
Obj 1.c: All hospitals will use evidence-based and comprehensive prevention strategies to lower severe maternal morbidity.
Obj 1.d: Improve prevention, diagnosis, and treatment of hypertension across the perinatal continuum.
Obj. 1.e: Improve prevention, diagnosis, and treatment of diabetes and reduce obesity in preconception women.
Goal 2: Improve maternal mental/behavioral health through enhanced screening, diagnosis, and treatment.
Obj. 2.a: Enhance screenings (i.e., SBIRT), counseling, and medical and non-medical therapies for behavioral health conditions, including substance use disorders, depression, and anxiety.
Obj. 2.b: Train the perinatal work force to provide mental and behavioral health support to pregnant and postpartum women and their families.
Goal 3: Support pregnant and postpartum women and their families by connecting them with comprehensive services.
Obj. 3.a: Increase pregnancy and postpartum referrals and connections to services.
Obj. 3.b: Increase enrollment in evidence-based and promising practice home visiting programs that provide comprehensive case management.
Goal 4: Improve the ongoing collection and utilization of maternal health data.
Obj. 4.a: Annually evaluate the causes of maternal mortality (MMRT) and severe maternal morbidity in Maryland through analysis of surveillance data and facility-based case reviews with a focus on risk factors and underlying causes.
Obj. 4.b: Enhance maternal health surveillance and quality initiatives through the collection of qualitative data that captures the perspectives of mothers.
Obj. 4.c: Disseminate maternal health data using a centralized state-wide maternal health data reporting tool.

Source: The Maryland Maternal Health Strategic Plan, 2025

RECOMMENDATIONS

RECOMMENDATIONS TO PREVENT SEVERE MATERNAL MORBIDITY IN MARYLAND HOSPITALS

Hospital-specific recommendations from Review Committees were collated to generate system-level recommendations as follows.

Enhance and standardize patient discharge and coordination of postpartum care, especially for high-risk patients

- Provide universal education for women and families about urgent maternal warning signs prior to hospital discharge after delivery.
- Reinforce the importance of postpartum visits for all patients.
- Establish a system for scheduling postpartum care visits and specialty care visits prior to patient discharge after delivery; document appointments in patient's medical record.
- Prioritize provision of necessary prescription medications to patients prior to leaving the hospital.
- Standardize follow-up timeframe for high-risk patients in line with ACOG guidelines.
- Inform patients that the hospital will call them within 48 hours of their discharge and encourage them to answer the call and report any problems or needs.

Improve utilization of tamponade devices, particularly the Jada device for prevention of SMM due to obstetric hemorrhage

- Provide training to all relevant staff (including operating room nurses) in use of tamponade devices and troubleshooting when devices are not working.
- Ensure widespread understanding of indications for the use of the Jada device and encourage sharing of best practices regarding its use.

Implement use of case managers or patient navigators for medically complicated patients and those with rare conditions.

Improve documentation related to the care of high-risk obstetric patients

- Documentation of Intake and Output (I&Os) for all patients receiving magnesium sulfate therapy, and continued for at least 24 hours postpartum.

Promote counseling and warm handoffs to psychological services for patients who experience birth-related trauma

Standardize care of obstetric patients outside of Labor & Delivery / Mother Baby units and by providers from non-obstetric specific specialties

- Improve process for managing fundal checks when patient is in the ICU.
- Enhance emergency department awareness for obstetric specific antihypertensive protocols.
- Provide education on obstetric order sets with non-obstetric care teams, including specific vital sign parameters.
- Ensure anesthesia and emergency department providers are familiar with the differences between the OB hemorrhage protocol and other hemorrhage protocols.

Ensure responses to obstetric hemorrhage are in line with the Obstetric Hemorrhage AIM patient safety bundle

- Assess and document postpartum hemorrhage risk scores to ensure pre-delivery planning when warranted.
- Follow steps in the hemorrhage algorithm, particularly regarding the use of uterotonics.
- Document the activation of massive transfusion protocols.

POLICY RECOMMENDATIONS TO PREVENT SEVERE MATERNAL MORBIDITY IN MARYLAND

- Reinforce documentation of a minimum set of social determinants of health screening questions during routine office visits for all obstetric patients.
- Increase availability and access to mental health and substance use disorder resources during pregnancy and postpartum.

RECOMMENDATIONS TO IMPROVE SEVERE MATERNAL MORBIDITY SURVEILLANCE & REVIEW

- Conduct cross-hospital convenings to promote standardization of the case review process.
- Use all available data sources to capture all SMM events that occurred in pregnancy and within 42 days postpartum.
- Review all SMM cases and enter the information in the REDCap database within 30 days of occurrence.

REFERENCES

1 Fink, D.A., et al., Trends in Maternal Mortality and Severe Maternal Morbidity During Delivery-Related Hospitalizations in the United States, 2008 to 2021. JAMA Netw Open, 2023. 6(6): p. e2317641

2 Chen, Y., et al., Pregnancy-Related Deaths in the US, 2018–2022. JAMA Netw Open, 2025. 8(4): p. e254325.

3 American College of, O., et al., Severe maternal morbidity: screening and review. Am J Obstet Gynecol, 2016. 215(3): p. B17–22.

4 Geller, S.E., et al., A global view of severe maternal morbidity: moving beyond maternal mortality. Reprod Health, 2018. 15(Suppl 1): p. 98.

5 Wolfson, C.L., J.T. Angelson, and A.A. Creanga, Is severe maternal morbidity a risk factor for postpartum hospitalization with mental health or substance use disorder diagnoses? Findings from a retrospective cohort study in Maryland: 2016–2019. Res Sq, 2024.

6 Garland, C.E., S.E. Geller, and A.R. Koch, Adverse Delivery and Neonatal Outcomes Among Women with Severe Maternal Morbidity in Illinois, 2018–2019. J Womens Health (Larchmt), 2024. 33(2): p. 163–170.

7 Phibbs, C.M., et al., A Comprehensive Analysis of the Costs of Severe Maternal Morbidity. Womens Health Issues, 2022. 32(4): p. 362–368.

8 Brown, C.C., et al., Mental Health Conditions Increase Severe Maternal Morbidity By 50 Percent And Cost $102 Million Yearly In The United States. Health Aff (Millwood), 2021. 40(10): p. 1575–1584.

9 Liu, J., et al., Severe maternal morbidity by race and ethnicity before vs. during the COVID-19 pandemic. Ann Epidemiol, 2023. 88: p. 51–61.

10 Gray, K.E., et al., Population-based study of risk factors for severe maternal morbidity. Paediatr Perinat Epidemiol, 2012. 26(6): p. 506–14.

11 Trost, S., et al., Pregnancy-Related Deaths: Data from Maternal Mortality Review Committees in 36 US States, 2017–2019. 2022, Centers for Disease Control and Prevention, US Department of Health and Human Services: Atlanta, GA.

12 Wolfson, C., et al., Findings From Severe Maternal Morbidity Surveillance & Review in Maryland. JAMA Netw Open, 2022. 5(11): p. e2244077.

13 Qian, J., et al., Evaluating a pilot, facility-based severe maternal morbidity Surveillance & Review program in Maryland-an American College of Obstetricians and Gynecologists and Society for Maternal-Fetal Medicine Rx at work. Am J Obstet Gynecol MFM, 2023. 5(4): p. 100888.

14 Lawton, B., et al., Preventability of severe acute maternal morbidity. Am J Obstet Gynecol, 2014. 210(6): p. 557 e1–6.

15 Creanga, A.A., et al., Centering Equity and Fostering Stakeholder Collaboration and Trust-Pillars of the Maternal Health Innovation Program in Maryland. Health Equity, 2024. 8(1): p. 406–418.

16 Maternal Health – Assessments, Referrals, and Reporting (Maryland Maternal Health Act of 2024), in HB1051. 2024.

17 Geller, S.E., S.M. Cox, and S.J. Kilpatrick, A descriptive model of preventability in maternal morbidity and mortality. J Perinatol, 2006. 26(2): p. 79–84.

18 Hsieh, H.F. and S.E. Shannon, Three approaches to qualitative content analysis. Qual Health Res, 2005. 15(9): p. 1277–88.

19 Mann, S., What We Can Do about Maternal Mortality — And How to Do It Quickly. The New England Journal of Medicine, 2018. 379(18).

20 Main, E.K., et al., National Partnership for Maternal Safety. Anesthesia & Analgesia, 2015. 121(1): p. 142–148.

21 Maryland Maternal Health Improvement TaskForce. Raising hope by birthing change: 2020 Maryland Maternal Health Improvement Strategic Plan. 2020. Available at: https://mdmom.org/sites/default/files/documents/taskforce/9.15.21_StrategicPlan.pdf

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Adventist HealthCare White Oak Medical Center

Ascension Saint Agnes Hospital

CalvertHealth Medical Center

Carroll Hospital Center

CristianaCare, Union Hospital

Frederick Health Hospital

Garrett Regional Medical Center

Greater Baltimore Medical Center

Holy Cross Germantown Hospital

Holy Cross Hospital

Johns Hopkins Bayview Medical Center

Johns Hopkins Hospital

Johns Hopkins Howard County Medical Center

Luminis Health Anne Arundel Medical Center

MedStar Franklin Square Medical Center

MedStar Harbor Hospital

MedStar Montgomery Medical Center

MedStar Southern Maryland Hospital

MedStar St. Mary's Hospital

Mercy Medical Center

Meritus Medical Center

Lifebridge Sinai Hospital of Baltimore

TidalHealth Peninsula Regional Medical Center

University of Maryland Baltimore Washington Medical Center

University of Maryland Capital Region Medical Center

University of Maryland Charles Regional Medical Center

University of Maryland Medical Center

University of Maryland Saint Joseph Medical Center

University of Maryland Shore Medical Center at Easton

University of Maryland Upper Chesapeake Medical Center

UPMC Western Maryland

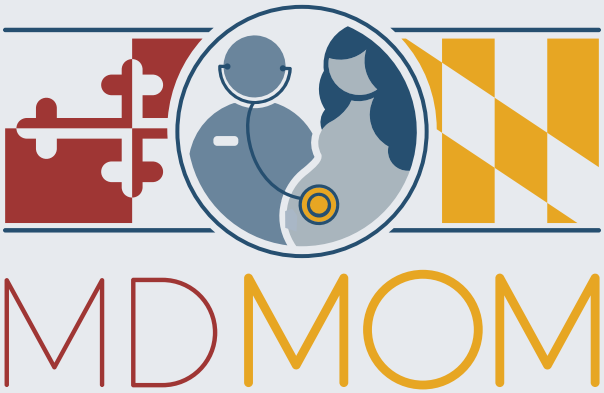
APPENDIX

A. Data Abstraction Form

B. Preventability Assessment Guide

C. Data Briefs

D. Publications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