Oregon Maternal Mortality and Morbidity Review Committee Biennial Report

February 2025

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Executive Summary

Maternal mortality and morbidity are considered a crisis in the US. Deaths that occur during pregnancy, labor and delivery, and the following year are tragic outcomes for those affected and for their families and communities. The number of maternal deaths nationally has increased from approximately 700 per year in 2018 to over 850 maternal deaths in 2020.[1] Maternal Mortality Review Committees existing at the state and local levels examine deaths and severe maternal morbidity with a temporal relationship to pregnancy to identify causes and associated risk and create recommendations to prevent these from occurring in the future. The Centers for Disease Control and Prevention (CDC) provides nationwide support to MMRCs through the Enhancing Review and Surveillance to Eliminate Maternal Mortality (ERASE MM) Program.

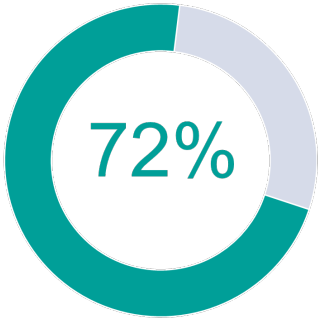
The Oregon Maternal Mortality and Morbidity Review Committee (MMRC) consists of a methodical review process used by a multidisciplinary, Governor-appointed board that reviews the lives and deaths of people who died during and the year following pregnancy. Board members fill a variety of medical, socio-behavioral, community, and at-large positions and are charged with leveraging their professional and lives experiences to advancing the critical work of the MMRC. When reviewing a case, the committee examines the cause of death, determines whether the death was pregnancy-related (Definition 1) or pregnancy-associated but not related (Definition 2), determines whether the death was preventable, and identifies factors that may have contributed to the outcome. Medical conditions and the social determinants surrounding each case are equally important conversations when reviewing these factors, as the goal of review is to promote positive changes among healthcare systems, communities, and individuals. Based upon its findings, the MMRC recommends interventions to reduce future deaths and improve systems of care for pregnant and postpartum people and families in Oregon. The Oregon MMRC was established in 2018 within the Oregon Health Authority (OHA) Public Health Division and is staffed by the Family and Child Health Section (ORS 432.600). Committee members were appointed in 2019 and workflows were

[1] Hoyert DL. Maternal mortality rates in the United States, 2020. NCHS Health E-Stats. 2022. https://www.cdc.gov/nchs/data/hestat/maternal-mortality/2020/maternal-mortality-rates-2020.htm#print

established using guidance from the ERASE MM Program. Case reviews began in August 2020.

As of January 2025, the committee has reviewed all 69 identified deaths that occurred between 2018 and 2021. This report summarizes the findings and recommendations from those reviews. Of all these, the deaths of 32 pregnant or postpartum people, or **46%** of the cases reviewed, **were determined by the MMRC to be pregnancy-related.** Pregnancy-related deaths are deaths during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.

In Oregon, nearly three out of four pregnancy-related deaths were determined by the MMRC to be ***preventable***



Among these pregnancy-related deaths, the deaths of 23 people (72%) were considered by the committee to be potentially preventable. It is of note that, of pregnancy-related deaths, nearly half of underlying causes of death were due to mental health issues and/or substance use disorders.

After reviewing the underlying cause of death, contributing factors, preventability, and any other circumstances that were present at the time of death the MMRC develops recommendations that may avert future deaths from occurring and ultimately improve systems of care.

Oregon's MMRC is also exploring the occurrence of severe maternal morbidity in the state. Severe maternal morbidities are very serious complications that can have significant long term detrimental consequences and are associated with an increased risk of maternal death. Data, including diagnosis and procedure codes from all hospital-based deliveries in Oregon are captured in the Hospital Discharge Dataset housed in the Office of Health Analytics at OHA. Analysis of all hospital deliveries showed that the rate of any severe maternal morbidity excluding blood transfusion only ranged between 60 cases per 10,000 deliveries in 2016 to a peak of 94 cases per 10,000 deliveries in 2023.

This report is located online on the Family and Child Health Section page (Public Health Division tab) of the OHA website. It can be accessed and downloaded at: www.healthoregon.org/MMRC.

Introduction

Pregnancy-related mortality has increased steadily in the United States since the 1980s.[2] MMRCs at the state and local levels address deaths that take place during pregnancy, labor and delivery, and up to a year postpartum. These multidisciplinary committees provide ongoing reviews of these deaths and are positioned to examine the causes of deaths during and after pregnancy and use their findings to develop tailored recommendations for prevention based on the unique needs of their state.

A CDC study that included data from Maternal Mortality Review Committees (MMRCs) in 36 states between 2017 to 2019 reported approximately 80% of deaths with pregnancy-related causes were preventable and that most deaths occurred during the year following the end of pregnancy.[3] Additionally, there are racial and ethnic disparities in maternal death rates. Pregnancy-related deaths for non-Hispanic American Indian/Alaskan Native and non-Hispanic Black women are disproportionately higher compared to non-Hispanic White women.[4] Maternal mortality is a tragic national burden that takes an even greater toll on communities of color and tribal communities.

Oregon's MMRC is also exploring occurrence of severe maternal morbidity in the state. Severe maternal morbidities are very serious health conditions that, even with timely intervention, have detrimental impacts and could have resulted in a maternal death. Understanding of the scope of severe maternal morbidities, which occurbetween 20 and 40 times more often than maternal deaths, can assist in making recommendations for prevention of both severe maternal morbidity and maternal deaths.

In 2016 OHA began matching reproductive-age female-identified decedents to certificates of live birth, of fetal deaths, and of infant deaths that occurred on or

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[2] Centers for Disease Control and Prevention. Pregnancy Mortality Surveillance System. Retrieved December 23, 2020 https://cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm

[3] Trost SL, Beauregard J, Njie F, et al. Pregnancy-Related Deaths: Data from Maternal Mortality Review Committees in 36 US States, 2017-2019. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2022.

https://www.cdc.gov/reproductivehealth/maternal-mortality/erase-mm/data-mmrc.html#table1

[4] Peterson, E.E., Davis, N.L., Goodman, D., et al. (2019). Racial/Ethnic Disparities in Pregnancy-Related Deaths-United States, 2007-2016. MMWR, 68(35), 762-65. https://www.cdc.gov/mmwr/volumes/68/wr/mm6835a3.htm

within 365 days of the pregnant or postpartum person's date of death. The use of this matching revealed an increased number of potentially pregnancy-associated deaths (i.e. the death of a person while pregnant or within one year of pregnancy, *regardless of the cause*) as compared to reviewing death certificates of reproductive-age people alone. Although these data were helpful in determining basic information about the causes of death during pregnancy and the postpartum period, they did not provide any background about life events that led up to and surrounded each death and whether the outcome may have been preventable.

The Oregon MMRC was established within OHA through House Bill 4133 during the 2018 Oregon legislative session, which was subsequently codified into law as ORS 432.600. Fifteen multidisciplinary committee members were appointed by the Governor the following year. During case review meetings members of the Oregon MMRC determine if deaths are directly related to pregnancy, discuss factors leading to and surrounding each death, and decide whether the outcome was preventable. Based upon each case that is reviewed, they discuss recommendations that can be made to prevent future maternal deaths.

OHA has convened 23 case review meetings since initiating reviews in 2020, and currently convenes 6 meetings per year. Deaths that have been reviewed took place during the years 2018-2022 and the recommendations and findings presented in this report are aggregated from these years.

Access to Records

Records are used to create deidentified summaries about the cases that are reviewed by the MMRC. The case narrative content is collected from multiple sources (e.g., birth and death certificates, medical records, autopsy and law enforcement reports), and "any other data or information the committee may deem relevant in connection with maternal mortality and severe maternal morbidity".[5] The process of obtaining appropriate records and abstracting relevant information is summarized later in this section.

[5] Oregon Laws, Oregon Administrative Rules, ORS 432.600 Establishment of committee https://oregon.public.law/statutes/ors_432.600

Defined Membership

The Oregon MMRC consists of a multidisciplinary panel of fifteen Governor-appointed members. They possess expertise in clinical and community-based maternal health promotion and represent various specialties and systems throughout the state. During case reviews, MMRC members determine if deaths were directly related to pregnancy, identify factors that contributed to each death, and recommend interventions that could decrease and eliminate future maternal deaths. Appendix A contains a roster of current MMRC members.

Confidentiality

Data and information obtained specifically for MMRC activities are confidential. Records that are used to create case narratives are protected from disclosure to any parties not associated with the MMRC. OHA Maternal and Child Health MMRC staff redact all personal identifiers from the case narratives prior to disseminating these to committee members for review.

The goals of the MMRC are to:

- Perform thorough record abstraction to obtain details of events and issues leading up to a pregnant or postpartum person's death.
- Perform a multidisciplinary review of cases to gain a holistic understanding of the issues.
- Determine the annual number of maternal deaths related to pregnancy (pregnancy-related mortality).
- Identify trends and risk factors among pregnancy-related deaths in Oregon.
- Recommend improvements to care at the individual, provider, and system levels with the potential for reducing or preventing future events.
- Prioritize findings and recommendations to guide the development of effective preventive measures.
- Recommend actionable strategies for prevention and intervention.
- Disseminate the findings and recommendations to a broad array of individuals and organizations.
- Promote the translation of findings and recommendations into quality improvement actions at all levels.

MMRC Case Review Process

Maternal mortality review includes a set of OHA staff as well as the Governor-appointed committee members, with each group enacting specific procedures. The case review process is an ongoing activity with steps that are followed from case identification to committee findings and recommendations to information sharing. The committee members are essential to the process as they examine each case bringing their unique and varied expertise allowing better understanding of the causes and social and cultural factors underlying maternal mortality in Oregon. Recommended interventions are then made aiming to prevent future deaths during and after pregnancy.

Case Ascertainment

Case ascertainment for all potentially pregnancy-associated deaths is done through analysis of vital records data. Cases for committee review are initially obtained from Oregon death certificates of reproductive-aged female-identified decedents using any of the following methods:

- One of the applicable pregnancy checkbox options on the death certificate is selected.

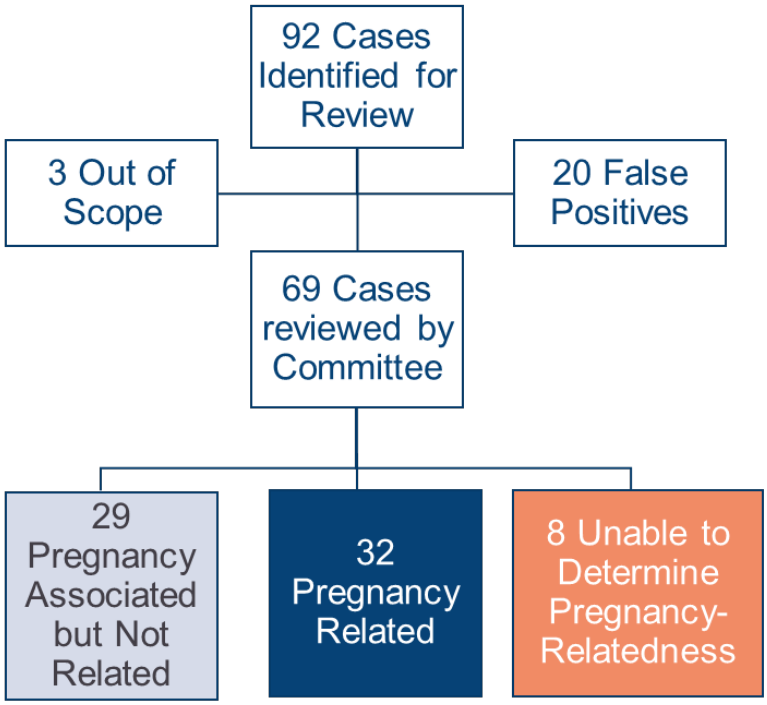
    The pregnancy checkbox indicates whether the decedent was determined by the individual completing the death certificate to be pregnant at time of death, pregnant within 42 days before death, or pregnant within 43 days to one year before death)

- An “obstetric” ICD-10 code is used in any cause of death field on the certificate. The National Center for Health Statistics assigns ICD-10 codes to all causes of deaths reported in the United States.
- The death certificates are linked with certificates of live births, fetal deaths, and infant deaths occurring on or within 365 days prior to the person’s date of death.
- A literal search for pregnancy-related keywords (e.g., “pregnancy”, “postpartum”) is performed on the death certificates.

For the years 2018 – 2021, there were 92 deaths identified for further investigation. See Figure 1 for a flowchart of identified and reviewed deaths. There were 23 cases that were either false positives (further investigation determined that they were not pregnant in the year before death) or were out of the committee scope (e.g. residents of other states). The committee has reviewed all 69 Pregnancy-Associated

cases to determine which were pregnancy-related. Due to small numbers impacting reliability in rates per year, a single pregnancy-related mortality ratio is presented for the four-year period of 2018-2021.

Figure 1: Pregnancy Associated Cases for Review 2018-2021



Investigation and Case Abstraction

The investigation phase begins as the vital records information from each case is reviewed for essential facts such as cause of death, location of death and significant dates to obtain “clues” about which organizations to contact to acquire pertinent information about the case. ORS 432.600 ensures information that is requested for the purpose of accurately presenting cases to the MMRC is made available by the agencies that possess this material.

Information is requested from all known entities that encountered the decedent in the time leading up to her demise or which were involved afterward. These include but are not limited to:

1.) Hospital records (including emergency room visit documentation)
2.) Clinic records
    a. Prenatal care provider
    b. Primary care provider
    c. Behavioral health/mental health provider
3.) First responder records
4.) Law enforcement records
5.) Social service records and child welfare records
6.) Medical examiner or coroner records

It is common for records received to reference records held by additional parties; we then contact those additional parties for further information about the case. There

are occasions when an individual may have died as the result of an injury, and questions are sometimes sent regarding why records are being requested in relation to maternal mortality in this instance. The members of the MMRC examine the significant life events that led to each death, as well as the clinical factors involved. Although it may initially appear that the death may not have been pregnancy-related, the committee will make this determination after reviewing the case narratives. Indeed, there have been instances when an injury resulted in death and through the records that were received and abstracted to create the case narrative, the members were able to determine the death was pregnancy-related (e.g., suicide).

The CDC has provided a national database known as the Maternal Mortality Review Information Application (MMRIA) to assist MMRCs with standardized data collection. MMRIA provides a common data standard that is recognized nationally by other state and local MMRCs. This system assists the Oregon MMRC's medical record abstractor with data organization and narrative creation that is free of any personal identifiers. In Oregon, the narratives describing each case are securely emailed to committee members ahead of review meetings so members can analyze each case before the committee convenes to discuss them.

Case Review Meetings

Review meetings are convened in closed non-public settings, allowing the committee to confidentially discuss the decedent's life and death, and the elements they feel contributed to each outcome. A narrative of the decedent's medical history is provided, as well as non-clinical components including the decedent's family environment, socioeconomic conditions, and the physical environment they lived in. Identifying factors, including specific location of the death, are removed from the narrative.

The MMRC determines whether mental health conditions, behavioral health disorders and/or substance use disorders existed prior to and near the time of death and whether any services and care coordination were received. The MMRC also determines, where possible, if the individual experienced any forms of discrimination in their life. Differential treatment is sometimes not documented within the records, and the abstractor takes special care to include within the case narratives any references to subtle actions that may indicate the presence of discrimination, racism, and social inequities.

These additional details assist the MMRC in becoming more familiar with the individual they are discussing and demonstrates the importance of obtaining records providing an account about the decedent's life. They also highlight the fact that

factors in addition to specific medical care can and do play a role in events leading to death. The members require comprehensive care narratives to determine whether a death was directly related to pregnancy, to identify the risk factors for each individual they review and based on what they've learned from each case, to recommend measures to help prevent future deaths related to pregnancy.

Self-Care

Vicarious trauma has been defined as "experiencing or feeling something by hearing the details of someone else's trauma, as opposed to experiencing it firsthand".[6] During each review meeting discussions take place about deaths that have pregnancy in their context. This can be difficult for all attendees, and everyone approaches this experience in their own way. To help decrease vicarious traumatization after engaging in conversations about these deaths, each meeting ends with a "check-in" to encourage everyone to share how they plan to provide self-care to assure personal physical and emotional well-being.

[6] Guidance for CDR and FIMR Teams on Addressing Vicarious Trauma. December 2016. National Center for Fatality Review and Prevention. Retrieved January 3, 2023. https://www.ncfrp.org/wp-content/uploads/NCRPCD-Docs/GuidanceVicariousTrauma.pdf

Guiding questions for MMRC case review:[7]

Was the death pregnancy-related?

Pregnancy-related deaths are defined as a death that occurred during pregnancy or within one year of the end of pregnancy due to a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.

What was the underlying cause of death?

The disease, condition or injury that initiated the chain of events leading to death, or the circumstances of the accident or violence that produced the fatal injury.

Was the death preventable?

A death is considered preventable if there was at least some chance of the death being averted by one or more reasonable changes to the systems that surrounded the decedent, the community they lived in, the facilities and providers they sought care from, and/or their personal and family life.

What other circumstances surrounded the death?

The committee determines if any of the following contributed to each death:

- Obesity
- Discrimination
- Mental health conditions
- Substance use disorder

What factors contributed to the death?

The committee discusses the factors that contributed to each death using the following levels:

- The systems that surrounded her life before, during and after pregnancy (e.g., payer sources and healthcare systems)
- The community she lived in, including physical location and areas of common interests and circumstances
- The facilities and providers she sought care from, and
- Her personal and family life

What recommendations does the committee have to prevent future deaths like this one?

After reviewing the underlying cause of death, the contributing factors, preventability, and any other circumstances that were present at the time of death the committee decides upon recommendations that may avert future deaths from occurring and ultimately improve systems of care.

MMRC Outputs: Sharing Information / Implementing Recommendations

MMRC members discuss and make decisions during confidential case review meetings. The next step in the MMRC process involves sharing these findings with others. By sharing the risk factors for maternal deaths and preventive recommendations as determined by the MMRC with legislators, health care facilities, relevant state agencies and community organizations, the MMRC program builds a foundation for implementation of the recommendations to take place.

The vision of the Oregon MMRC is to eliminate preventable maternal mortality and morbidity by reviewing pregnancy-related deaths, identifying contributing risk factors, and creating recommendations to reduce future deaths.

Similar to having a multidisciplinary board such as the MMRC that reviews cases and creates recommendations, engaging diverse partners that possess expertise in their fields is important to identify on-the-ground strategies and possible challenges to implementation of recommendations. The CDC resource "*State Strategies for Preventing Pregnancy-Related Deaths: A Guide for Moving Maternal Mortality Review Committee Data to Action*" provides guidance on putting priority recommendations created by MMRCs into motion and is meant to be tailored for use by individual states. This guidance includes the following steps summarizing the approaches for implementing actionable recommendations. It is important to incorporate a focus on equity within each of the following steps when moving MMRC data to preventive action:[8]

1. Use data to understand the scope of the problem.
    - Align the specific recommendation with other available population-level data (e.g., the Pregnancy Risk Assessment Monitoring System (PRAMS), hospital discharge data).

[8] Review to Action. State Strategies for Preventing Pregnancy-Related Deaths: A Guide for Moving Maternal Mortality Review Committee Data to Action. Retrieved January 3, 2023 from https://reviewtoaction.org/national-resource/state-strategies-preventing-pregnancy-related-deaths-guide-moving-maternal

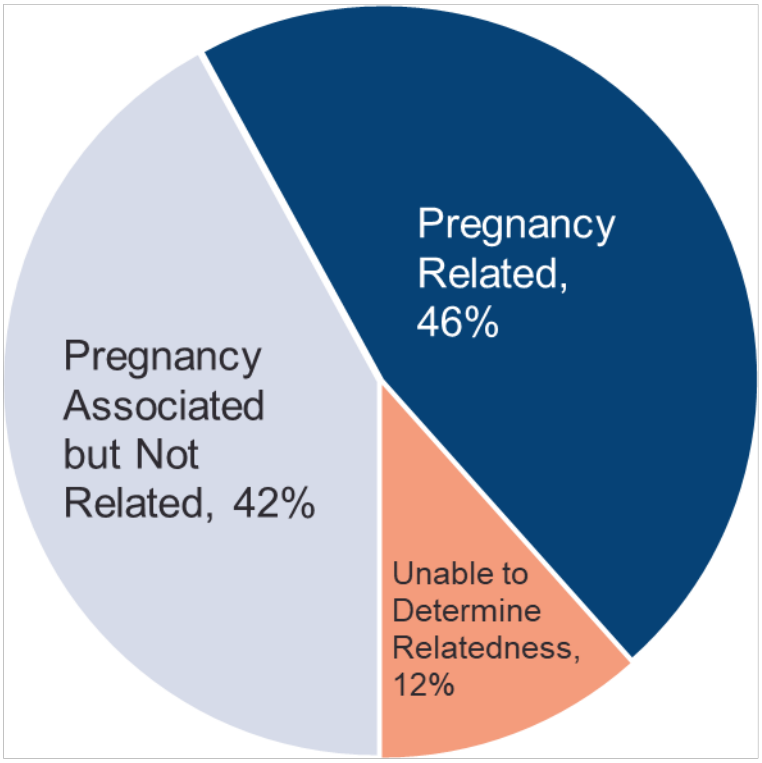
2. Understand the context of the solution.
    - Engage public health, clinical facilities, and community partners, including each organization's decisionmakers, to assist with identifying strengths and barriers for implementing the recommendation.
3. Identify potential goals and strategies.
    - This step also includes ensuring the "who should do what and when" of each recommendation is in place.
4. Act on the strategies.
    - Ensure the strategies that are decided upon are appropriate and acceptable to the needs of the population involved, are feasible and cost effective.

The guidance referenced above provides a foundation as Oregon MMRC recommendations are moved to implementation. The remainder of this report will present findings and recommendations made by the committee for all Pregnancy Related deaths between 2018 and 2021.

Committee Findings

Pregnancy Relatedness

Figure 2: Nearly half of all Pregnancy-Associated Deaths in Oregon 2018-2021 were **Pregnancy-Related.**



The most vital determination made by the committee is whether or not the death was pregnancy-related. According to CDC guidance that informs all MMRCs around the United States, a death is decided to be pregnancy-related if the death is “from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.”[9] Of the 69 deaths reviewed, 32 (46%) were determined by the committee to be pregnancy-related. In other words, they died as a direct result or complications associated with pregnancy or the effect of physical or emotional changes brought on by pregnancy. The Oregon pregnancy-related mortality ratio then shows that for every 100,000 live births in 2018 through 2021, there were 19.4 pregnancy-related deaths.

Twenty-nine (42%) reviewed deaths were determined to be pregnancy-associated, but not related – meaning the circumstances or causes of those deaths were not related to or exacerbated by pregnancy. In other words, the death was likely to have occurred even if she hadn't been pregnant. The committee was unable to determine the degree of relatedness for eight (12%) reviewed deaths. Unless otherwise stated, the findings in this report are based upon the 32 deaths that were determined to have been pregnancy-related.

[9] https://www.reviewtoaction.org/learn/definitions

Figure 3: The proportion of Pregnancy Associated Deaths that are Pregnancy-Related has remained steady over time.

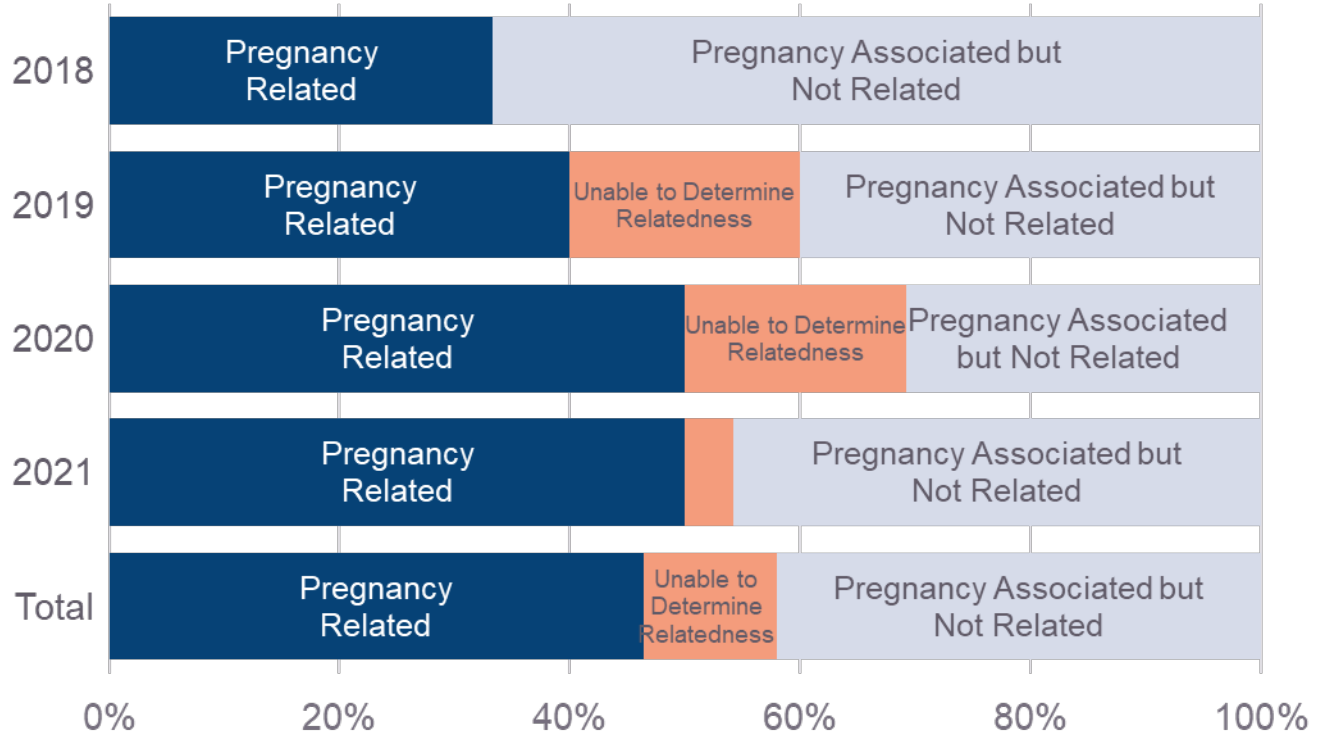


Figure 3 shows the relative proportion of deaths determined to be pregnancy-related by year of death. Between 2019 and 2021, the proportion of deaths that were determined to be pregnancy related has remained reasonably stable. For 2019 cases onward, the MMRC adopted new clarifying criteria for classifying mental health and substance use related deaths.[10]

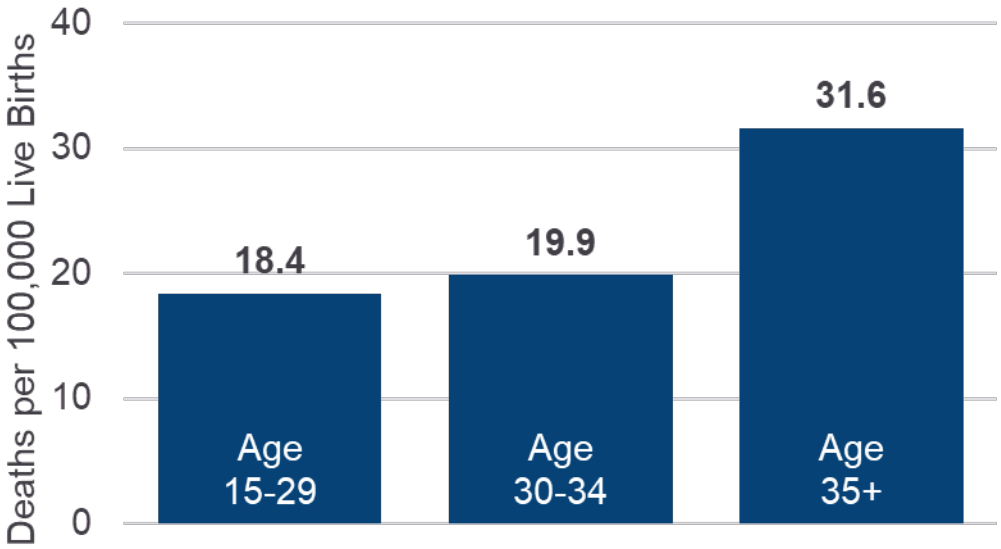
Demographics of Pregnancy-Related Deaths

Among all pregnancy-related deaths, age at the time of death ranged from 17 to 42 years, with an average of 31 years. Eleven (34%) pregnancy-related deaths were age 35 or older. Of note, pregnancy-related mortality ratio for ages 35 and older was 31.6 deaths per 100,000 live births, nearly one third larger than the pregnancy

[10] Smid MC, Maeda J, Stone NM, Sylvester H, Baksh L, Debbink MP, Varner MW, Metz TD. Standardized Criteria for Review of Perinatal Suicides and Accidental Drug-Related Deaths. Obstet Gynecol. 2020 Oct;136(4):645-653. doi: 10.1097/AOG.0000000000003988. PMID: 32925616; PMCID: PMC8086704.

related mortality ratios for ages 15-29 (18.4 deaths per 100,000 live births) and ages 30-34 (19.9 deaths per 100,000 live births) (Figure 4).

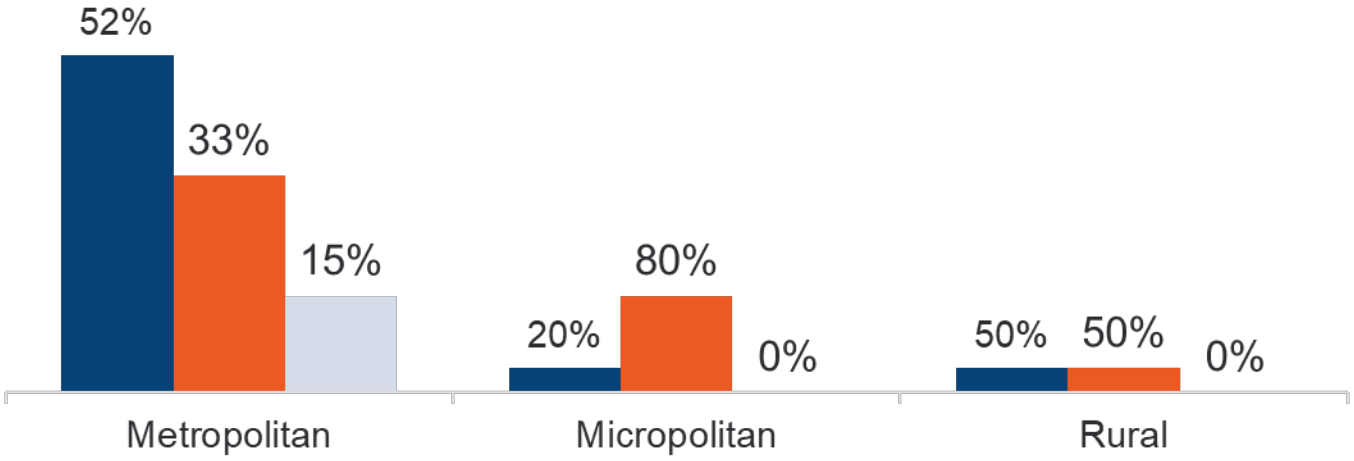
Figure 4: Pregnancy-related mortality ratios by age, Oregon 2018-2021



There was a wide range of educational experience among people who died of pregnancy-related causes, however 15 (47%) of pregnancy-related deaths had a high school diploma or less.

Many pregnancy-related cases had a history of significant social or emotional stressors: 10 (31%) cases had a documented history of childhood trauma while seven (22%) cases had a documented history of domestic violence.

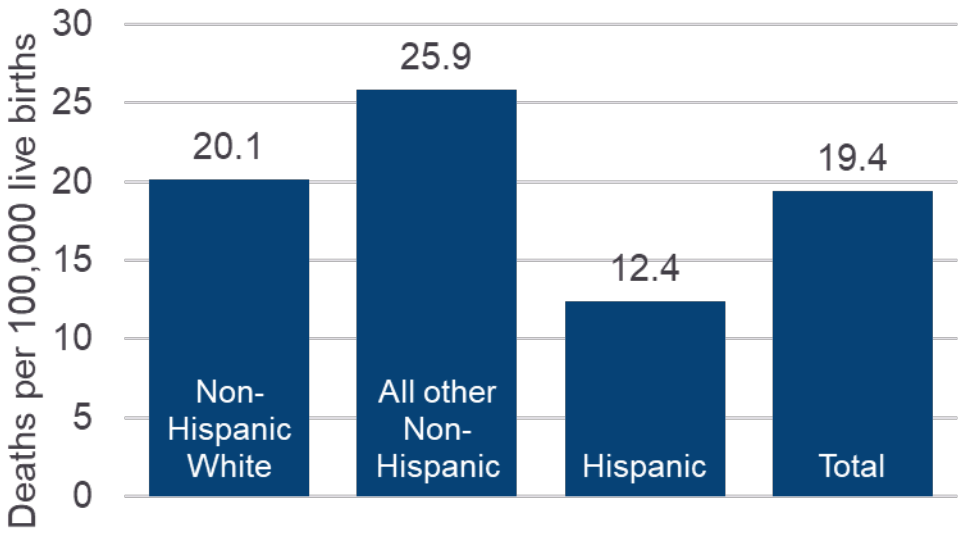
Figure 5: In Metropolitan counties, 52% of reviewed cases were determined to be Pregnancy-Related and 33% of cases were Pregnancy-Associated but not related, while only 20% of cases in Micropolitan counties were determined to be Pregnancy-Related, Oregon 2018-2021



Pregnancy-related deaths were identified in all areas of the state (Figure 5): 28 cases (86%) had a last known residence in a metropolitan county of Oregon (counties with more than 250,000 residents), while four cases (13%) resided in either a micropolitan or rural county. Nationally, maternal mortality and morbidity rates are higher for women residing in rural areas and face diminishing access to maternal care.[11] Still, aggregate results from 36 state MMRCs found 82% of pregnancy related decedents lived in urban counties.[12] Five (16%) decedents had a documented history of homelessness at some point in their lives.

Case materials for each of the 32 decedents had documentation of race and ethnicity available where possible the self-reported race and ethnicity on a related birth or fetal death certificate is given precedence. While details for races other than Non-Hispanic Whites (NHW) and Hispanics are suppressed due to small numbers, Figure 6 shows the pregnancy-related mortality ratios for Non-Hispanic Whites, Hispanic and all other non-Hispanic populations combined. While both the combined non-white, non-Hispanic pregnancy-related mortality ratio and the Hispanic ratio differ from the NHW ratio, these should be interpreted with caution due to small numbers.

Figure 6: Pregnancy-related mortality ratios by race/ethnicity, Oregon 2018-2021



[11] Rural Health Information Hub, 2024. Rural Maternal Health [online]. Rural Health Information Hub. Available at: https://www.ruralhealthinfo.org/topics/maternal-health [Accessed 24 February 2025]

[12] Trost, S. L., Beauregard, J. L., Smoots, A. N., Ko, J. Y., Haight, S. C., Moore Simas, T. A., Byatt, N., Madni, S. A., & Goodman, D. (2021). Preventing Pregnancy-Related Mental Health Deaths: Insights From 14 US Maternal Mortality Review Committees, 2008-17. *Health affairs (Project Hope)*, *40*(10), 1551–1559. https://doi.org/10.1377/hlthaff.2021.00615

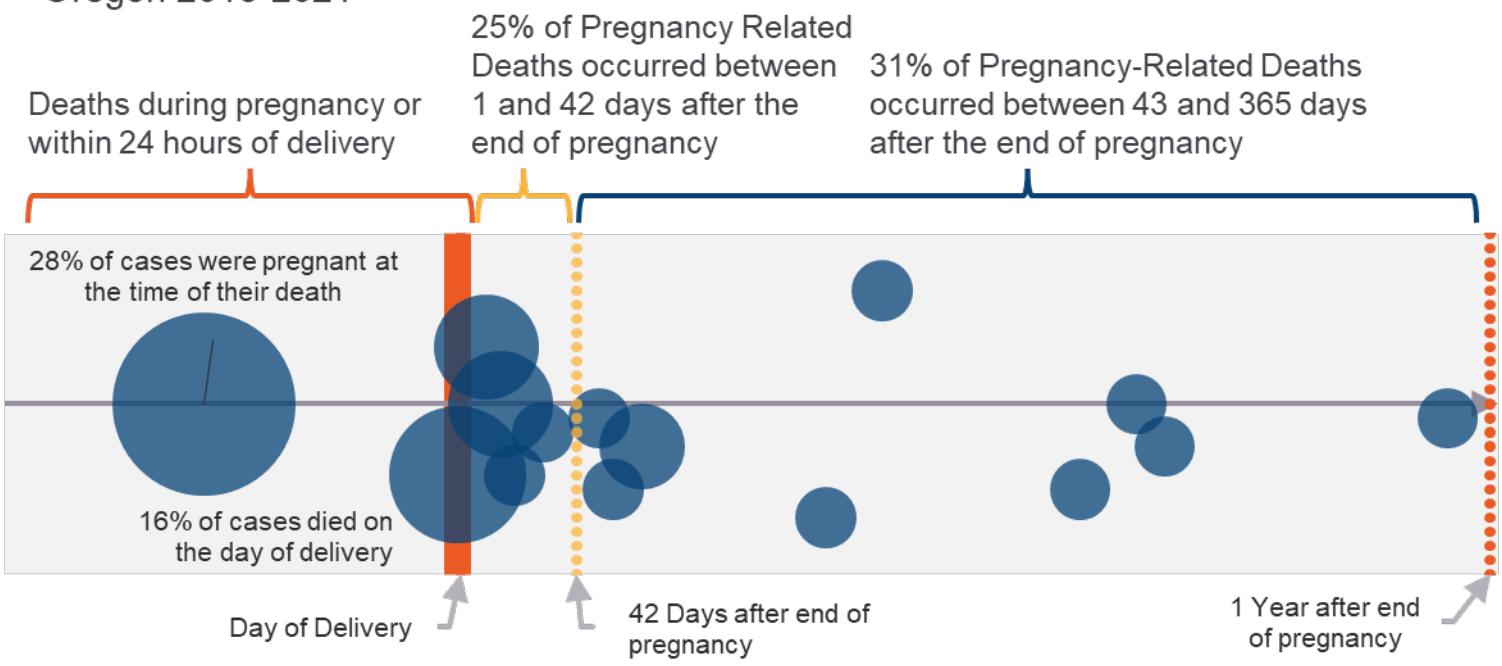
Timing of Pregnancy-Associated and Pregnancy-Related Deaths

Pregnancy-associated deaths are defined as all deaths that occur during or within one year of pregnancy, regardless of cause. Generally, timing of pregnancy-associated deaths can be broken into three categories based upon how long after pregnancy the death occurred (Figure 7):

1. Pregnant at time of death or died on the day of delivery
2. Pregnant within 42 days of death (early postpartum period)
3. Pregnant 43 days to 1 year before death (late postpartum period)

Of pregnancy related deaths, 9 (28%) were pregnant at time of death, 5 (16%) died on the day of delivery, 8 (25%) died between 1 and 42 days after the end of pregnancy and 10 deaths (31%) occurred in the later postpartum period between 43 days to one year after the end of pregnancy. The majority of deaths occurred in the late postpartum period and cases in the late postpartum period were more likely to be pregnancy associated but not related than deaths occurring closer to the pregnancy. Of pregnancy-related deaths, 22 (69%) happened either during pregnancy or during the early postpartum period.

Figure 7: Timing of death among Pregnancy-Related deaths in relation to pregnancy, Oregon 2018-2021

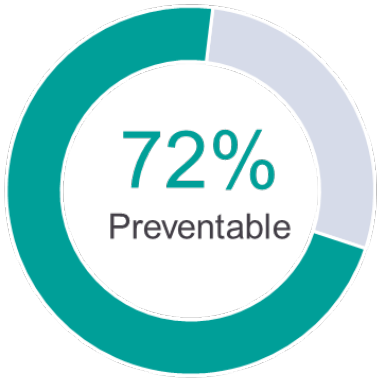


*Circle sizes correspond to the number of deaths.

Most Maternal Deaths are Preventable Deaths

A death is considered potentially preventable if there was at least some chance of the death being averted by one or more reasonable changes to the systems that surrounded the decedent, the community they lived in, the facilities and providers they sought care from, and/or their personal and family life. The committee determined that through one or more reasonable changes to patient, provider, system or community factors, 23 (72%) pregnancy related deaths had at least some chance of being prevented (Figure 8).

Figure 8: Nearly three out of four pregnancy-related deaths were potentially ***preventable***.



Underlying Causes of Death

Along with determining whether the death was directly related to pregnancy, the MMRC is tasked with determining an underlying cause of death for each case. The underlying cause of death is defined as the disease, condition, or injury that initiated the chain of events leading to death, or the circumstances of the accident or violence that produced the fatal injury. After reviewing each decedent's case narrative, the MMRC decides upon an underlying cause of death. Their decision often matches the cause of death listed on the death certificate, yet in a small number of cases additional information available to the committee or specific committee expertise leads to a different conclusion.

Figure 9: Leading causes of pregnancy-related death, Oregon 2018-2021

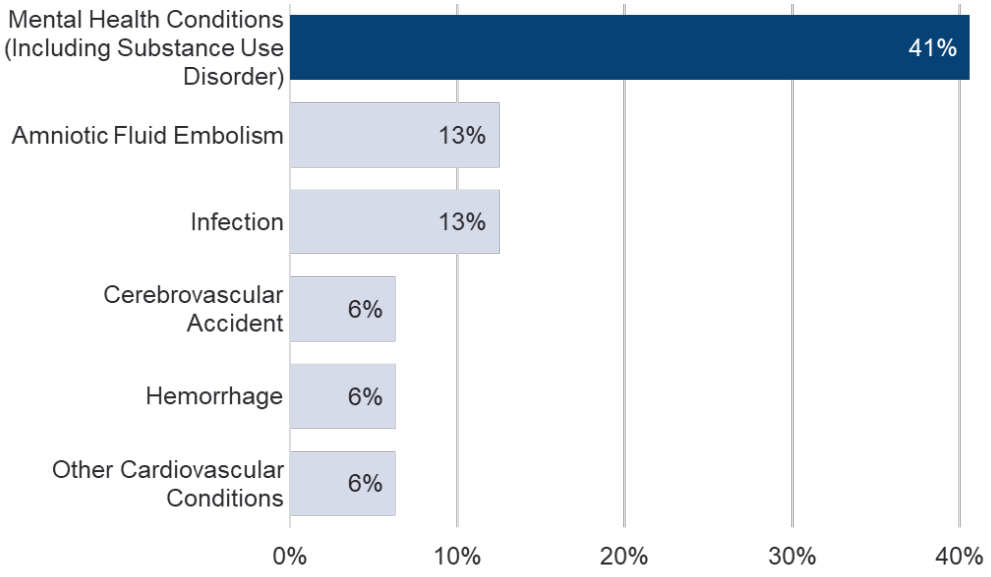


Figure 9 shows the six leading underlying causes of pregnancy-related death. The most frequent

category for underlying cause of death was mental health conditions including substance use disorder, accounting for 13 (41%) pregnancy-related deaths. Four (13%) deaths had an underlying cause of substance-use disorder. Mental health conditions including substance use disorder was the most frequent cause of death not only among pregnancy-related deaths but also among the larger group of all reviewed deaths.

Amniotic fluid embolism and infection tied for second with four (13%) pregnancy related deaths each.

Circumstances Surrounding the Death

Seven (22%) pregnancy-related deaths were classified as suicides by the MMRC while the MMRC identified one pregnancy-related death to be a homicide. Of note, 4 (13%) cases had a documented history of prior suicide attempts.

For each case, the MMRC decides whether of one or more of four specific factors was present that may have contributed to the pathway leading to death.

Figure 10: Committee determinations on circumstances surrounding the death among pregnancy related deaths, Oregon 2018-2021

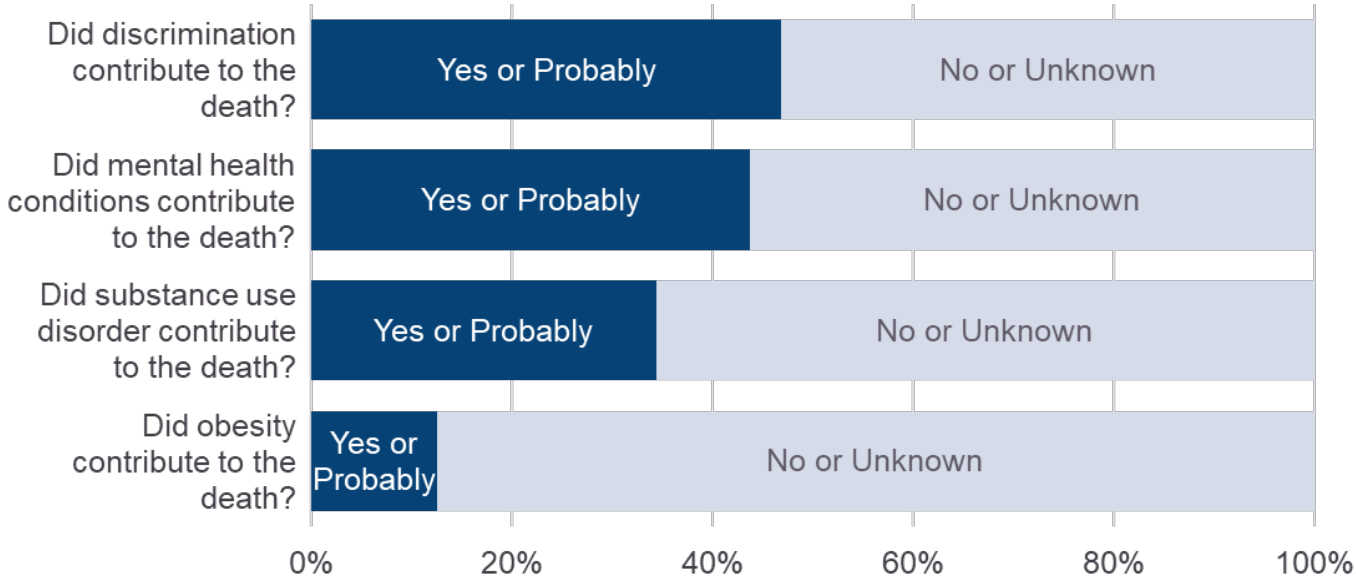


Figure 10 shows the percent of pregnancy-related deaths affected by each category, where discrimination was noted as a contributing factor in 15 (47%) deaths. It is of note that the discrimination factor encompasses a variety of biases and prejudices that the decedent may have encountered in their life and in their medical and social experiences. Examples include, but are not limited to, the decedent having experienced discrimination based upon the language they speak, perceived race or ethnicity, poverty, substance use, mental health status, or weight.

Severe Maternal Morbidity

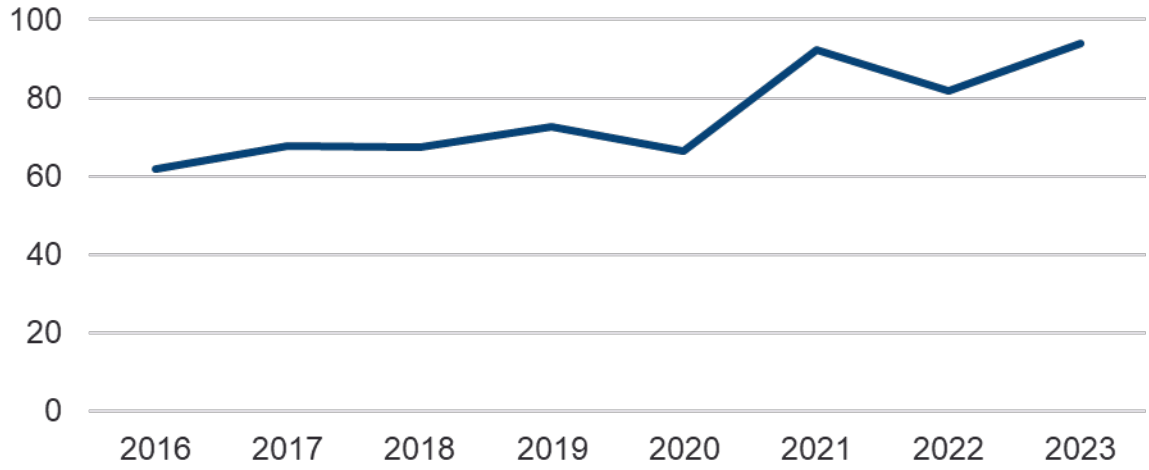
In addition to reviewing cases of maternal mortality, Oregon's MMRC program is tasked with studying the incidence of Severe Maternal Morbidity (SMM) in Oregon. SMM is defined by the Centers for Disease Control and Prevention as "unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health". It encompasses very serious health conditions that, even with timely intervention, have detrimental impacts and could result in maternal death. Many of these cases can be considered as a "near miss" for maternal mortality (i.e. that the individual was at significant risk of dying). Based on Oregon data for 2018 through 2021, for every case of pregnancy-related death, there were approximately 35 cases of severe maternal morbidity.

Like maternal mortality, there are some situations in which severe maternal morbidity is preventable. Therefore, it is important to examine the incidence and causes of severe maternal morbidity. Preventing SMM reduces the risk of maternal death. Tracking and understanding patterns of severe maternal morbidity, along with developing and carrying out interventions to improve the quality of maternal care, are essential to reducing both severe maternal morbidity and maternal mortality.

Increases in pregnancy-related complications throughout the United States may be, in part, connected to changes in the overall health of the population of people giving birth. Pre-pregnancy obesity, preexisting chronic medical conditions, cesarean deliveries, and maternal age are all factors increasing the risk of SMM. Not only are there serious health implications for the person affected, there also are associated higher medical costs and longer hospitalization stays as well as trauma affecting the family.

Using Hospital Discharge Data from OHA's Health Policy and Analytics Division, instances of severe maternal morbidity in delivery hospitalizations were identified using a nationally validated list of 21 clinical indicators (Appendix C) and their corresponding diagnosis or procedure codes. The presence of any of these indicators, except for blood products transfusion alone, identifies a case of SMM. Among all cases in 2023, 30% were identified as having two or more SMM diagnoses or procedures.

Figure 11: Severe Maternal Morbidity as number per 10,000 delivery hospitalizations by year, Oregon 2016-2023.



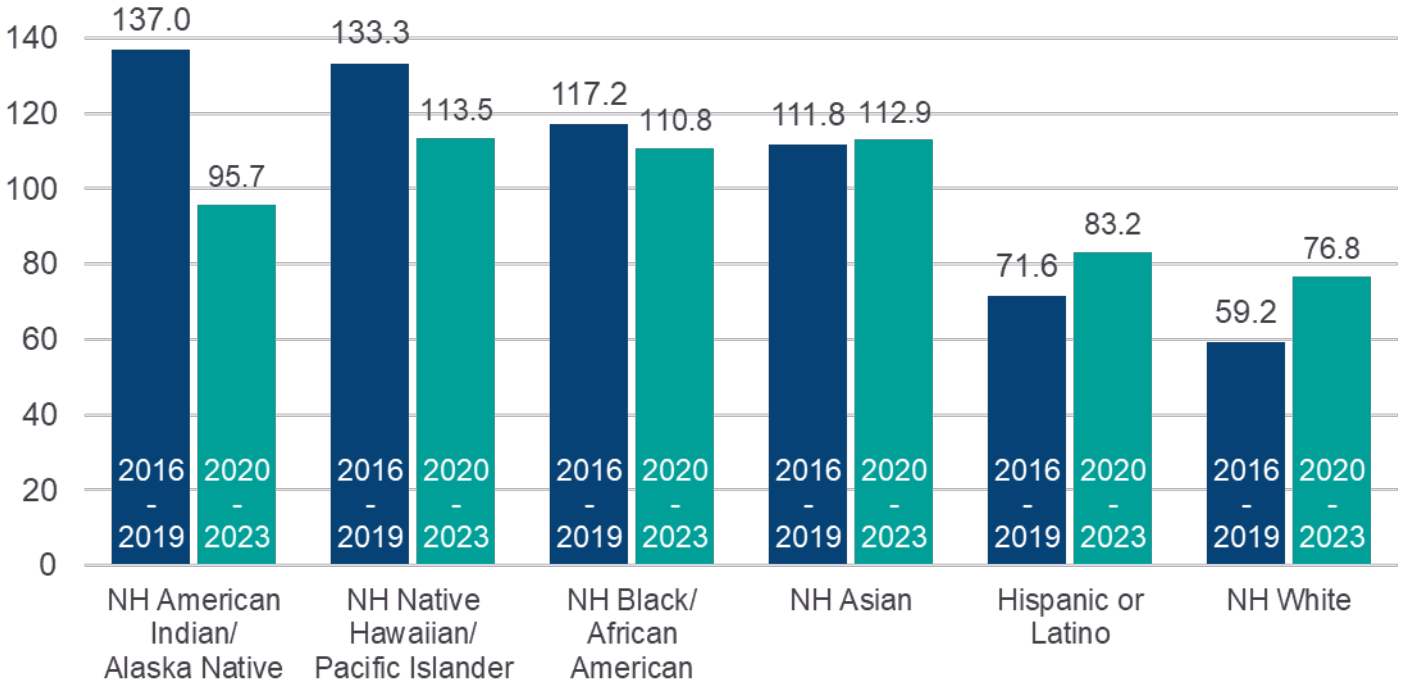
*Excludes transfusion-only cases.

The rate of severe maternal morbidity, excluding blood product transfusion only, for 2016 (at a low of 60.0 per 10,000 delivery hospitalizations) through 2023 (94.0 per 10,000 delivery hospitalizations) are shown in Figure 11.

An overview describing SMM among race and ethnicity groups in Oregon is shown in Figure 12. Due to small numbers, data are provided on a rolling four-year average. It is important to note that race and ethnicity data from hospital records can be of variable quality due to missing data and varying methods of collection and categorization compared to similar data contained in public health vital records.

The lowest rates of severe maternal morbidity were for Hispanic populations, followed by those identified as Non-Hispanic White. Overall, the highest severe maternal morbidity rates were seen among people identified as Pacific Islander and other race/ethnicity, followed by American Indian or Alaska Native, Asian, and Black.

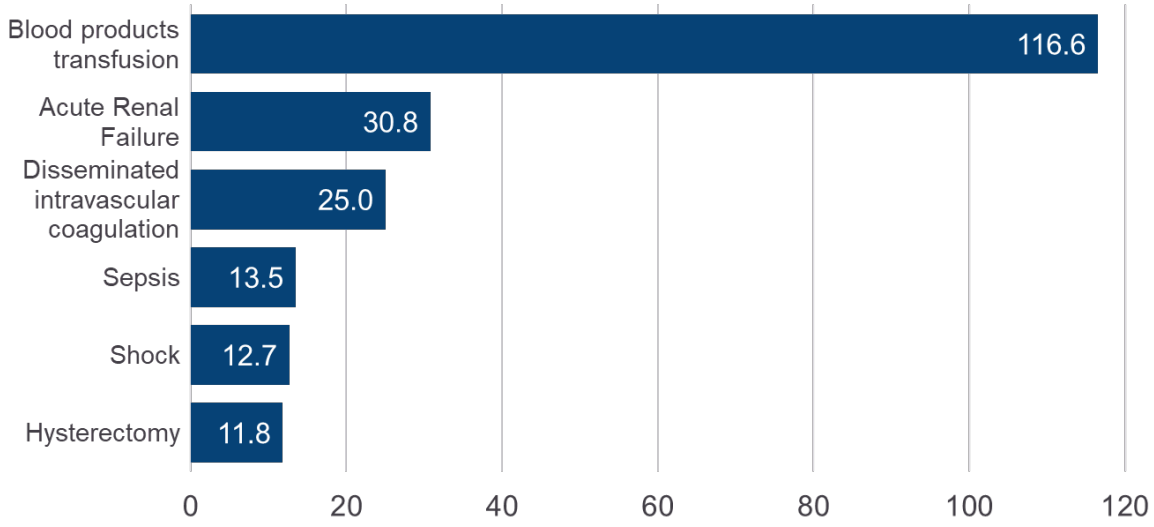
Figure 12: Severe Maternal Morbidity* per 10,000 delivery hospitalizations, four year average by race/ethnicity, Oregon 2016-2019 and 2020-2023



*Excludes transfusion-only cases.
Oregon Health Authority, Hospital Reporting Program 2024 Oregon Hospital Discharge Data

Besides blood products transfusion, the leading maternal morbidities were acute renal failure, disseminated intravascular coagulation, sepsis, shock and hysterectomy (Figure 13).

Figure 13: Leading categories of Severe Maternal Morbidity in number per 10,000 delivery hospitalizations, Oregon 2023



Committee Recommendations

Listed below are the ten most frequent and impactful recommendations given by the committee based on review of pregnancy-related deaths. Some recommendations are new, while others have been included in previous reports and continue to be recommended by the committee as areas of needed change. Strategies to address these recommendations can be implemented at various levels, such as systems, hospitals and providers, and community.

All payers, including Medicaid, should prioritize coordinated mental health/substance use disorder care for pregnant people.

During reviews, MMRC members often emphasize the role of care coordination to address challenges navigating the healthcare system, highlighting the importance of home visiting services, postpartum doula support, childcare partnerships, Medicaid and CCO funding for health-related social needs, support systems for fathers, housing priorities, diverse workforce development, taking an equity approach, focusing on vulnerable communities in Oregon, and behavioral health and substance use disorder treatment and integration.

Systems could benefit from creating a standard of care whereby providing social support and help with its coordination is part of a patient's discharge plan, especially for patients with a history of depression and/or anxiety.

Previous suicide attempts should flag patients for more provider time to spend assessing mental health status beyond basic screening tools.

Systems need to support improved communication between care teams across medical specialties and disciplines.

All systems need to encourage better communication between internal and external providers, especially between behavior and medical providers when caring for pregnant people with a history of mental health conditions.

Systems should have standardized flows that prompt providers to provide recommendations for social and mental health services.

Care teams need implicit bias training and support.

Discrimination against people with mental health and/or substance use disorders was a leading contributing factor. The committee identified some form of discrimination as a contributing factor in 15 (47%) pregnancy-related deaths.

“We know that so many people are subject to various forms of discrimination [and] people stand back and shy away when there is mental health involved with a patient."

Culturally appropriate support services should be made available for patients and providers alike.

Continue to strengthen postpartum support systems statewide.

While recently expanded postpartum coverage is an important step, a continued common theme among all reviews was the need for improved postpartum support systems. For several deaths, MMRC members felt that the presence of a traditional health worker or doula could have helped prevent or ameliorate circumstances leading to that death. Early and consistent follow-up, especially for high-risk patients can prevent future deaths due to suicide or overdose.

Patients with significant risk factors identified during pregnancy would benefit from a single person to coordinate care through both the pregnancy and postpartum period.

Improve education and support for gun safety, especially in cases with known mental health conditions.

Three (9%) pregnancy-related deaths were due to injuries sustained from a firearm. Improved screening and education about safe gun storage as well as documented safety planning could prevent future deaths.

Encourage vaccine uptake in traditionally underserved communities with culturally specific outreach.

Infection was tied with amniotic fluid embolism (AFE) as the second most frequent underlying cause of death among pregnancy-related cases. Three of these deaths were determined by the committee to have been preventable deaths. Several decedents had refused vaccination prior to or during the sentinel pregnancy due to

mistrust of the health system. To better prevent further deaths from infection, the state should develop culturally specific outreach on vaccines in traditionally low uptake communities to encourage trust before emergencies arise.

“Had she been given information in a way that was meaningful to her, if she had been given the information in a way that was helpful to her maybe she would have had a different outcome.”

Increase access to blood products for hemorrhage management in delivery settings.

All labor and delivery departments need timely access to blood products. There should be a public health push for improving blood donation and sometimes that can seem disconnected from maternal mortality but there needs to be investment in improving blood donation. The committee suggests that the state should support a public awareness campaign to encourage blood donation.

Hospitals should be prepared for possible massive hemorrhages in pregnant and postpartum people, regardless of their size, as per the recommendations from The Joint Commission,[13] the AIM Patient Safety Bundle on Obstetric Hemorrhage[14], and the California Maternal Quality Care Collaborative (CMQCC)[15].

Hospitals should implement robust emergency simulation trainings.

Often maternal death and SMM arise quickly, and at least 5 (16%) pregnancy-related deaths had a delay in responsive care as a contributing factor where more timely responsiveness could have prevented the death. As an extension of the previous recommendation to increase access to timely and adequate hemorrhage management, hospitals and health systems should ensure they have plans and drills to mobilize teams within their own system and in neighboring systems in the event of maternal emergency.

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[13] https://www.jointcommission.org/resources/news-and-multimedia/newsletters/newsletters/quick-safety/quick-safety-issue-51-proactive-prevention-of-maternal-death-from-maternal-hemorrhage/

[14] https://saferbirth.org/psbs/obstetric-hemorrhage

[15] https://www.cmqcc.org/quality-improvement-toolkits/hemorrhage

Prioritize autopsies for maternal deaths.

Since the last report, the committee continues to recommend that women who suddenly die in pregnancy or newly postpartum without an obvious etiology undergo a complete autopsy so that the determining factors behind their death can be known. Frequently, for pregnant or postpartum people that die suddenly, the cause is determined to be "natural causes," with limited further investigation, complicating attempts to formulate recommendations for preventing further mortality. Current barriers include workforce capacity to complete autopsies and death investigations, especially in underserved areas.

The Washington state Maternal Mortality Review Panel in 2019 also found a need for standardization of the autopsy and reporting process for maternal deaths, resulting in the development of “Guidelines for Performance of an Autopsy in the Setting of a Potential Maternal Death in the State of Washington”, a resource that could be developed for Oregon as well.[16]

Improve range of and access to social service programs to address upstream social determinants of health, ensuring people entering pregnancy are in a better state of health.

Chronic disease, insecure housing, history of social stressors, adverse childhood experiences and many other upstream social determinants of health are frequently cited as contributing factors to many deaths.

Mental health conditions or substance use disorder was a factor in 15 (47%) pregnancy related deaths. Deaths with an underlying cause or contributing factor of mental health or substance use conditions were significantly more likely to be preventable deaths, 93% of these had at least some chance of preventing the fatality. Among deaths without mental health or substance use conditions only 47% were considered preventable. A study of pregnancy-related deaths due to mental

[16] Guidelines for Performance of an Autopsy in the Setting of a Potential Maternal Death in the State of Washington https://doh.wa.gov/sites/default/files/legacy/Documents/Pubs//350-030-MMRAutopsyGuidelines.pdf

health in 14 states similarly found that most deaths due to mental health conditions had a history of depression prior to the sentinel pregnancy.[17]

Decedents often had a complicated history of trauma prior to pregnancy. Many pregnancy-related cases had a history of significant social or emotional stressors: 10 (31%) cases had a documented history of childhood trauma while seven (22%) cases had a documented history of domestic violence.

While recent efforts have worked to improve access to physical and mental health care after the pregnancy, improving both mental and physical health resources before the pregnancy would prevent future mortality.

Chronic disease is also implicated in maternal mortality; twenty-four deaths (75%) had at least one documented pre-existing condition prior to the sentinel pregnancy. Improving women's health before, during and after pregnancy is a Healthy People 2030 goal.[18]

Ensuring that people are able to enter pregnancy in a state of good mental and physical health and have sufficient support will go a long way in preventing future pregnancy related deaths.

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[17] Trost, S. L., Beauregard, J. L., Smoots, A. N., Ko, J. Y., Haight, S. C., Moore Simas, T. A., Byatt, N., Madni, S. A., & Goodman, D. (2021). Preventing Pregnancy-Related Mental Health Deaths: Insights From 14 US Maternal Mortality Review Committees, 2008-17. *Health affairs (Project Hope)*, *40*(10), 1551–1559. https://doi.org/10.1377/hlthaff.2021.00615

[18] https://odphp.health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth

Appendix A: Executive Appointment Board Roster

Member Name	Committee Position	Term
Alivia M Feliciano Chair	Community Based Organization Representative (Communities of Color)	05/21/2022 - 05/20/2026
Mark W Tomlinson Vice-Chair	Maternal Fetal Medicine Physician	05/21/2023 - 05/20/2027
Silke Akerson	Licensed Direct Entry Midwife	10/25/2022 - 10/24/2026
Telia Anderson	Doula	10/25/2022 - 10/24/2026
Emily Baird	Member At Large	10/25/2022 - 10/24/2026
Sarah E Cole	Licensed Registered Labor and Delivery Nurse	05/21/2022 - 05/20/2026
Melissa Li	Medical Examiner	09/01/2023- 08/31/2027
Kendra Harding	Community Based Organization Representative (Mental Health)	10/25/2022 - 10/24/2026
Desha Reed-Holden	Member At Large	09/01/2023- 08/31/2027
Jackie Leung	Traditional Health Worker	05/21/2023 - 05/20/2027
Emily Yeast	Licensed Registered Nurse and Certified Midwife	09/01/2023- 08/31/2027
Willow Merchant	Member At Large	10/25/2022 - 10/24/2026
Jeanne S Savage	Family Medicine Physician	05/21/2022 - 05/20/2026
Wendy J Smith	OB/GYN Physician	10/25/2022 - 10/24/2026
Sabrina Villemenay	Public Health Expert	09/01/2023- 08/31/2027

Appendix B: Glossary

Pregnancy-Related Mortality Ratio: Number of pregnancy-related deaths per 100,000 live births.

Pregnancy-Associated, But Not Related Death: A death during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy. (CDC Maternal Mortality Review Committee Decisions Form v.22)

Pregnancy-Related Death: A death during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy. (CDC Maternal Mortality Review Committee Decisions Form v.22)

Preventability: A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors. (CDC Maternal Mortality Review Committee Decisions Form v.22)

Severe Maternal Morbidity: Unexpected outcomes during the delivery hospitalization that result in significant short- and long-term consequences to a person's health

Appendix C: Diagnoses and Procedures Included in SMM

- Acute Myocardial Infarction
- Acute Renal Failure
- Adult Respiratory Distress Syndrome
- Air and thrombotic embolism
- Amniotic Fluid Embolism
- Aneurysm
- Blood products transfusion (Only included if another SMM is present)
- Cardiac arrest/ventricular fibrillation
- Conversion of cardiac rhythm
- Disseminated intravascular coagulation
- Eclampsia
- Heart failure/arrest during surgery or procedure
- Hysterectomy
- Puerperal cerebrovascular disorders
- Pulmonary Edema/Acute Heart Failure
- Sepsis
- Severe anesthesia complications
- Shock
- Sickle cell disease with crisis
- Temporary tracheostomy
- Ventilation

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