

*Maternal Mortality Review Committee  
Report  
Nevada, 2018-2020  
(Nevada Revised Statutes 442.767)*

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*December 2020*



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Division of Public and Behavioral Health  
Department of Health and Human Services*

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## *Dedication*

The Nevada Division of Public and Behavioral Health (DPBH) notes with deepest sympathy and respect this report is dedicated to the memory of those who have died in pregnancy or within one year of pregnancy, and to their families and loved ones surviving an incalculable loss.

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## Background

The purpose of this report is to meet the duties of the Maternal Mortality Review Committee (MMRC) as outlined in [NRS 442.767](#) and provide insight into demographic characteristics and causes of death associated with pregnancy-associated deaths from December 2018 through 2020. This report includes two resources, the Office of Analytics of DHHS *Severe Maternal Morbidity Report, Nevada, December 2018 - 2020* and *Maternal Mortality Report, Nevada, December 2018 - 2020* which also provides data on pregnancy-related deaths from the Centers for Disease Control and Prevention (CDC) Pregnancy Maternal Surveillance System (PMSS). Both reports highlight Nevada disparity data on severe maternal morbidity and maternal mortality across race, ethnicity, geography, insurance status, education, age, as well as prenatal and delivery characteristics such as prenatal care initiation, adequacy of prenatal care, parity, method of delivery, plurality, and chronic disease. Differences in pregnancy-associated death rates, counts, disparities, geographic distribution, and causality are seen between 2018 and 2019 maternal mortality data and preliminary 2020 data, and PMSS pregnancy-related data reveal patterns of disparate burden, as well. Preliminary 2020 data must be read with caution and are subject to change, and PMSS time periods and type of mortality are different from the pregnancy-associated death data from 2018-2020 in the *Maternal Mortality Report, Nevada, December 2018 - 2020*.

Race and ethnicity disparity data in both reports are of particular concern in relation to differential burden of maternal mortality and severe maternal morbidity (SMM). Identification of disparities, including implicit bias and racism, is an initial crucial step in creating evidence-based interventions to reduce all contributing factors at the individual, societal and political levels. Ending all preventable maternal mortality and SMM in the state is a key goal of MMRC efforts.

## Establishment of the Nevada Maternal Mortality Review Committee

Assembly Bill 169 of the 80<sup>th</sup> Legislative Session established the Nevada MMRC granting additional authorities and protections for a statewide MMRC, codified in [Nevada Revised Statutes \(NRS\) 442.751 through NRS 442.774](#), inclusive. The MMRC was established within the Nevada Department of Health and Human Services (DHHS). The Committee is required to: (1) review incidents of maternal mortality and severe maternal morbidity (SMM) in Nevada; (2) disseminate findings and recommendations concerning maternal mortality and SMM to providers of health care, medical facilities, other interested persons and the public; (3) publish timely reports consisting of data relating to maternal mortality and SMM, descriptions of incidents reviewed by the Committee, and recommendations to reduce maternal mortality and SMM in Nevada. The Committee is entitled to any records deemed necessary to perform duties and to petition the district court for a subpoena to compel the production of such records and information acquired by. Records of the Committee are confidential and not subjected to subpoena. A call for interest was placed via the Maternal and Child Health Advisory Board and shared widely. The Director of DHHS appointed the statutorily required twelve MMRC members representing diverse expertise and geographic areas within Nevada.

The Nevada MMRC conducts ongoing, comprehensive, multidisciplinary reviews of maternal deaths to help determine factors contributing to maternal mortality and SMM and identify public health and clinical interventions to improve systems of care and prevent mortality and morbidity.

Outcomes expected include: timely, accurate, and standardized information available about deaths during pregnancy and the year after the end of pregnancy, including opportunities for prevention; increased awareness of the existence and recommendations of the MMRC among the public, clinicians, and policy makers; implementation of data-driven recommendations; widespread adoption of patient safety bundles and/or policies reflecting the highest standards of care; reduction in maternal mortality, SMM and related disparities; and improvement in population health for women of reproductive age (e.g., reductions in hypertension, coronary heart disease, substance use, and other chronic diseases).

## Maternal Mortality and SMM Incidents Reviewed

The Nevada MMRC convened four times in 2020, with the initial meeting being a Centers for Disease Control and Prevention (CDC) training and orientation to state and national maternal mortality and severe maternal morbidity data in February of 2020. Case abstraction takes roughly 20 hours per death review and can easily exceed this time period. Requested records can take time to be fulfilled and a single case may generate numerous records requests to capture as much information as possible to ensure a complete abstraction. The Committee reviewed five maternal mortality cases in 2020. Decision data are limited to ensure the identity of those whose deaths were reviewed are protected given the small sample size. As record requests become routine and are shared more quickly and abstraction and the MMRC case review process familiarity increases, efficiencies will be gained resulting in increased numbers of case reviews.

## MMRC Recommendations

MMRC recommendations to reduce maternal mortality and SMM in Nevada are expected to increase with additional maternal mortality incident review. At this point in time, the Committee has identified recommendations to improve care in Nevada and recommendations to improve the work of the Committee.

Two contributing factors to maternal mortality at the systems level which could have a large impact in preventing maternal mortality were identified by MMRC members. First, the Committee identified the need to provide adequate drug treatment options to pregnant women. The Committee recommends educating providers on Nevada's substance use disorder treatment options which already exist for pregnant women and removing barriers to care. The second relates to substance use in pregnancy and the identified need as a society to address the social determinants of health. At the provider level, the utility of recommending the use of a suicide screen in addition to the antepartum and postpartum depression screen was discussed. Finally, a recommendation for outreach promoting the importance of prenatal care and preventing delays in prenatal care was identified.

The Committee identified two recommendations to improve the function of the committee. First, the statutory language is a barrier to accessing Cancer Registry data. The Committee recommends considering legislative action to remove the barrier to receive these records for case abstraction. Second, the Committee identified the lack of family interviews and data regarding the social determinants of health as a barrier to making recommendations from the cases. The Committee recommends considering securing dedicated funding to ensure full data collection.

# *Maternal Mortality Nevada, December 2018-2020*

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*December 2020*



*Office of Analytics*

*Department of Health and Human Services*

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## Background

The Nevada Maternal Mortality Review Committee convened in 2020. The committee reviews all pregnancy-associated deaths (all deaths of women while pregnant or within one year of the end of pregnancy, due to any cause) and develops recommendations to prevent future deaths. The purpose of this report is to provide insight into demographic characteristics, cause of death, and drug overdose death associated with pregnancy-associated deaths from December 2018 to November 2020. This report also provides data on pregnancy-related deaths from Pregnancy Maternal Surveillance System (PMSS) during 2012 and 2017. PMSS is a national surveillance conducted by Centers for Disease Control and Prevention (CDC) to better understand the risk factors for and causes of pregnancy-related deaths in the United States.

## Methodology

### Data Sources

#### **Web-Enabled Vital Records Registry Systems (WEVRRS)**

Statewide births, deaths, and fetal births are collected by the Office of Vital Records, in the Division of Public and Behavioral Health. WEVRRS is a software utilized by physicians, registered nurses, midwives, informants or funeral directors, and other individuals to collect and consolidate birth and death-related information.

#### **Hospital Billing Data (Emergency Department Encounter and Hospital Inpatient Admissions)**

The hospital billing data provides health billing data for emergency department encounters and inpatient admissions for Nevada's non-federal hospitals. NRS 449.485 mandates all hospitals in Nevada report information as prescribed by the Director of the Department of Health and Human Services. The data are collected using a standard universal billing form. The data includes demographics such as age, gender, race/ethnicity, and uses International Classification of Diseases-9-Clinical Modification (ICD-9-CM) diagnoses codes and International Classification of Diseases-10-Clinical Modification (ICD-10-CM) diagnoses. ICD-10-CM diagnoses codes replaced ICD-9-CM diagnoses codes in the last quarter of 2015. Therefore, data prior to last quarter in 2015 may not be directly comparable to data thereafter. In addition, the data includes billed hospital charges, procedure codes, discharge status, and external cause of injury codes. The billing information is for billed charges and not the actual payment received by the hospital.

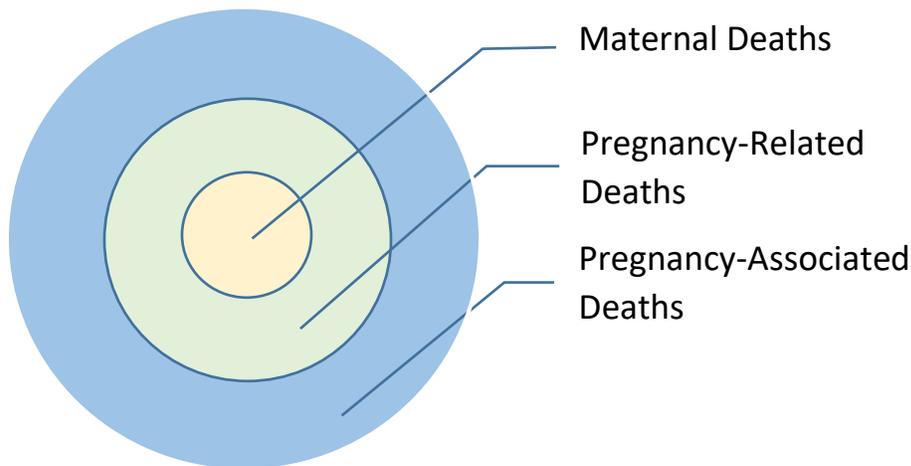
## Definitions

**Pregnancy-Associated Death** is the death of a woman while pregnant or within one year of the termination of pregnancy, regardless of the cause. Pregnancy-associated death ratio is the number of pregnancy-associated deaths per 100,000 live births.

**Pregnancy-Related Death** is the death of a woman 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. Pregnancy-related death ratio is the number of pregnancy-related deaths per 100,000 live births.

**Maternal Death** is the death of a woman while pregnant or within 42 days of the termination of pregnancy, regardless of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Figure 1. Relationship among Three Definitions



## Identification of Pregnancy-Associated Deaths

The methodology is based on Reference Guide for Pregnancy-Associated Death Identification which was developed by the Pregnancy-Associated Death Identification Workgroup, consisting of members from state departments of health and the Centers for Disease Control and Prevention (CDC)<sup>1</sup>.

### Identifying by Vital and Hospital Discharge Records Linkages

A death data set is created for a given year for all Nevada female residents ages 10-60 years. Two data sets (birth and fetal death records, delivery and postpartum emergency department encounter and hospital inpatient admission records) are created for the same given calendar year and previous calendar year. Death records of women ages 10-60 years are first linked with birth and fetal death records based on mother's social security number (SSN). Death records of women ages 10-60 years that are not linked using SSN are then matched to birth and fetal death records using mother's first name, mother's last name, and mother's date of birth. Non-matched death records are then linked with delivery and postpartum emergency department encounter and hospital inpatient admission records based on mother's SSN, mother's name, and date of birth. SAS software is used for the linkages.

### Identifying by Causes of Death Information

Some pregnancy-associated deaths, such as those occurred early during pregnancy, will not have birth or fetal death records to link. In order to identify pregnancy-associated deaths among those death records, we select death records of female ages 10-60 where the underlying causes of death were coded in A34 and O00-O99.9 (i.e. ICD-10 codes related to pregnancy) and/or the literal death cause field contains any of the following pregnancy-related terms: amniotic, chorioamnionitis, eclampsia, ectopic, intrauterine fetal demise, peripartum, peripartum cardiomyopathy, placental, postpartum, pregnancy, pregnant,

uterine hemorrhage, and uterine rupture. Selected pregnancy-associated deaths should be confirmed with additional data sources to avoid misclassification. Examples of additional confirmatory sources are provided in the section on Additional Data Sources.

### Identifying by Pregnancy Checkboxes on the Death Records

We also select death records of female ages 10-60 where the pregnancy checkbox on the death record checked as: pregnant at time of death, not pregnant but pregnant within 42 days of death, or not pregnant but pregnant 43 days to one year before death. Selected pregnancy-associated deaths should be confirmed with additional data sources to avoid misclassification. Examples of additional confirmatory sources are provided in the section on Additional Data Sources.

### Additional Data Sources

Additional data sources identified by the Pregnancy-Associated Death Identification Workgroup that can help confirm pregnancy for deaths which do not link to vital records and hospital discharge records, but have pregnancy indicated by causes of death information and/or pregnancy checkbox on the death record.

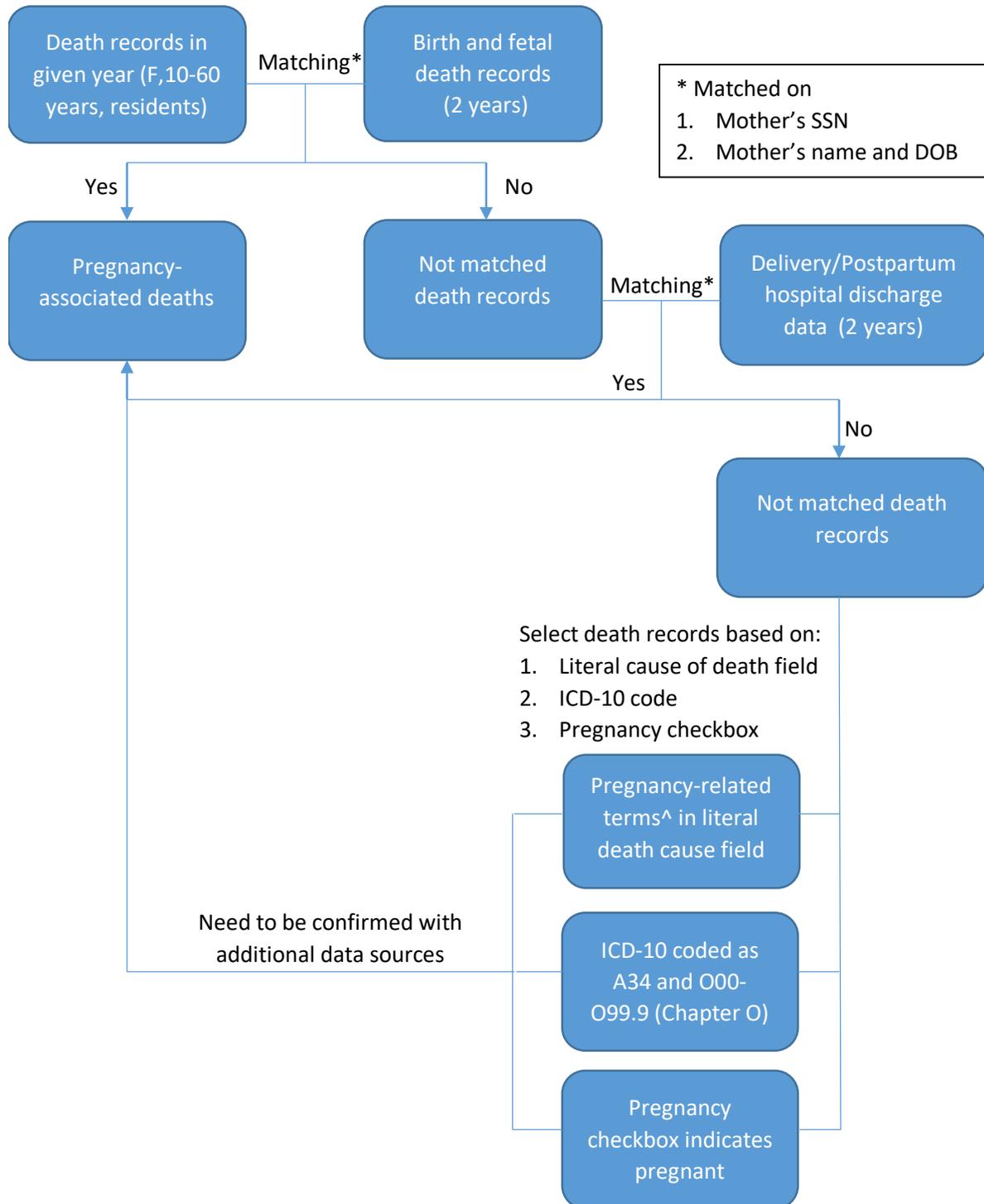
- Obituaries
- Social Media
- Media and News Reports
- Certifier Confirmation
- Autopsy Reports

### Analysis

The analyses in the report are for pregnancy-associated deaths for Nevada residents only. Pregnancy-associated death ratio was calculated as the number of pregnancy-associated deaths per 100,000 live births. Pregnancy-related death ratio was calculated as the number of pregnancy-related deaths per 100,000 live births.

The linkages and analyses were performed by using SAS 9.4.

Figure 2. Flow Chart of Identifying Pregnancy-Associated Deaths

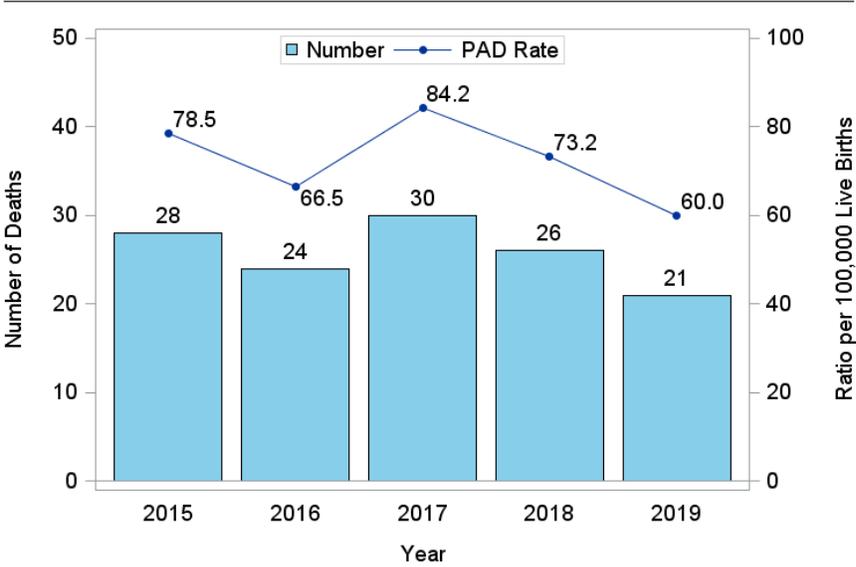


^ Pregnancy-related terms are amniotic, chorioamnionitis, eclampsia, ectopic, intrauterine fetal demise, peripartum, peripartum cardiomyopathy, placental, postpartum, pregnancy, pregnant, uterine hemorrhage, and uterine rupture.

# Data of December 2018 to December 2019

There were 129 pregnancy-associated deaths in Nevada from 2015 to 2019. There was no consistent increasing or decreasing trend in pregnancy-associated death ratio, with the highest ratio in 2017, at 84.2 per 100,000 live births. The sections below explain the demographics, underlying cause of death, and drug overdose death associated with pregnancy-associated deaths from December 2018 to December 2019. There were total 22 pregnancy-associated deaths from December 2018 to December 2019, with pregnancy-associated death ratio at 57.9 per 100,000 live births.

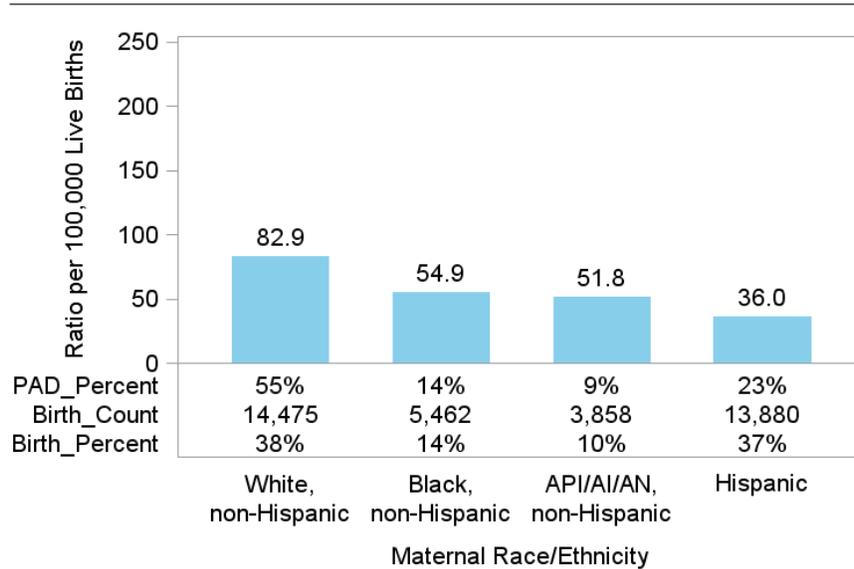
**Figure 3. Pregnancy-Associated Death Ratio per 100,000 Live Births and Number of Deaths, Nevada, 2015 - 2019**



## Demographics

Figure 4 shows that White, non-Hispanic women had highest pregnancy-associated death ratio at 82.9 per 100, 000 live births and 55% of the pregnancy-associated deaths occurred among White, non-Hispanic women. Hispanic women had lowest ratio at 36.0 per 100,000 live births, accounting for 23% of all deaths. Thirty-eight percent of women who gave births during December 2018 through 2019 were White, non-Hispanic, and 37% were Hispanic women.

**Figure 4. Pregnancy-Associated Death Ratio and Percent by Race/Ethnicity Nevada, December 2018 - December 2019**



In Figure 5, women aged 40 and older had the highest pregnancy-associated death ratio at 147.6 per 100,000 live births, followed by ratio of women aged 20 and under at 109.9 per 100,000 live births and ratio of women aged 35-39 at 108.7 per 100,000 live births. Seventy-three percent of the deaths occurred among women aged 25 to 39. Thirty percent of births during December 2018 through 2019 were given by women aged 25 to 29, and 27% of births were given by women aged 30 to 34.

**Figure 5. Pregnancy-Associated Death Ratio and Percent by Maternal Age Nevada, December 2018 - December 2019**

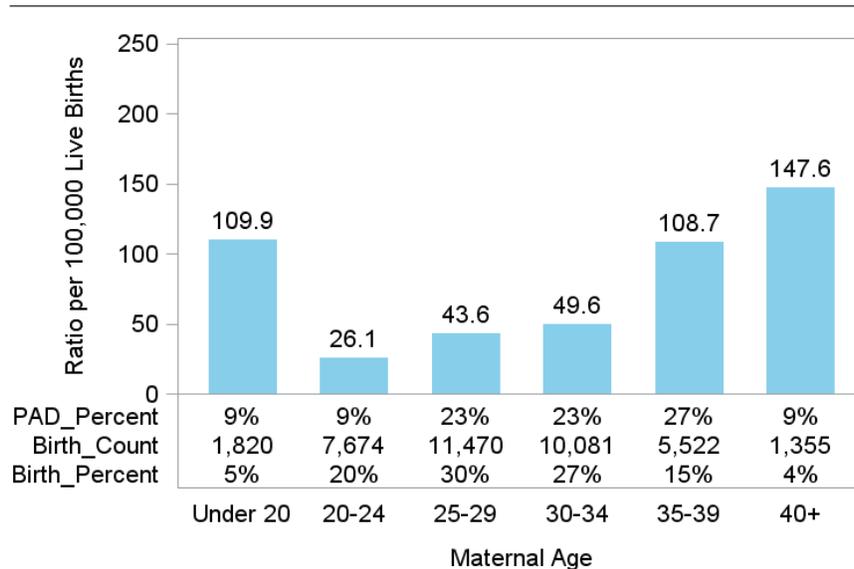


Figure 6 illustrates pregnancy-associated death ratio for each race and ethnicity within age groups of under 25, 25-34, and 35 and older. For women aged under 25 and 25 to 34 White, non-Hispanic had the highest ratio, at 107.3 per 100,000 live births and 67.8 per 100,000 live births, respectively. For women

35 and older Hispanic had the highest ratio at 140.1 per 100,000 live births, followed by Black, non-Hispanic at 128.7 per 100,000 live births.

**Figure 6. Pregnancy-Associated Death Ratio by Maternal Age and Race/Ethnicity, Nevada, December 2018 - December 2019**

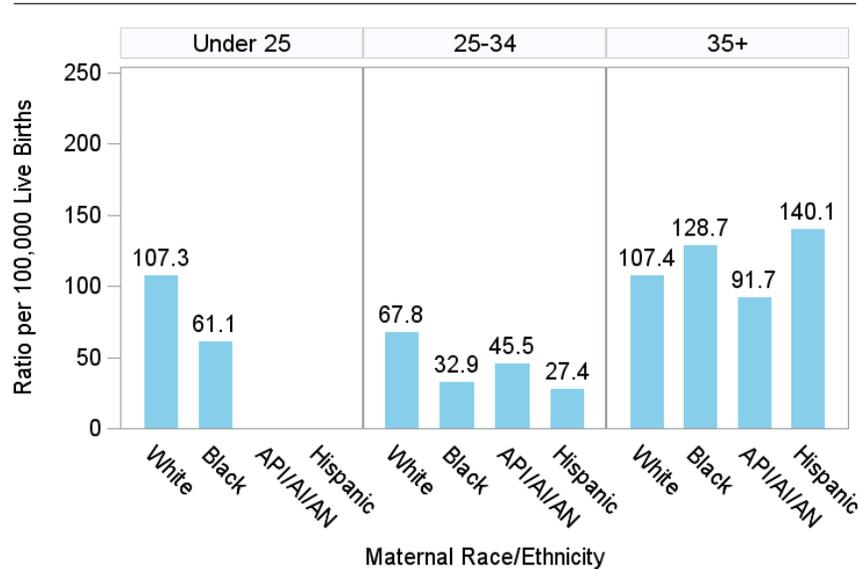


Figure 7 shows that most of the pregnancy-associated deaths (82%) occurred in Clark County. Also, Clark County had the highest pregnancy-associated death ratio at 63.2 per 100,000 live births. Seventy-five percent of the births during December through 2019 occurred in Clark County.

**Figure 7. Pregnancy-Associated Death Ratio and Percent by County of Residence, Nevada, December 2018 - December 2019**

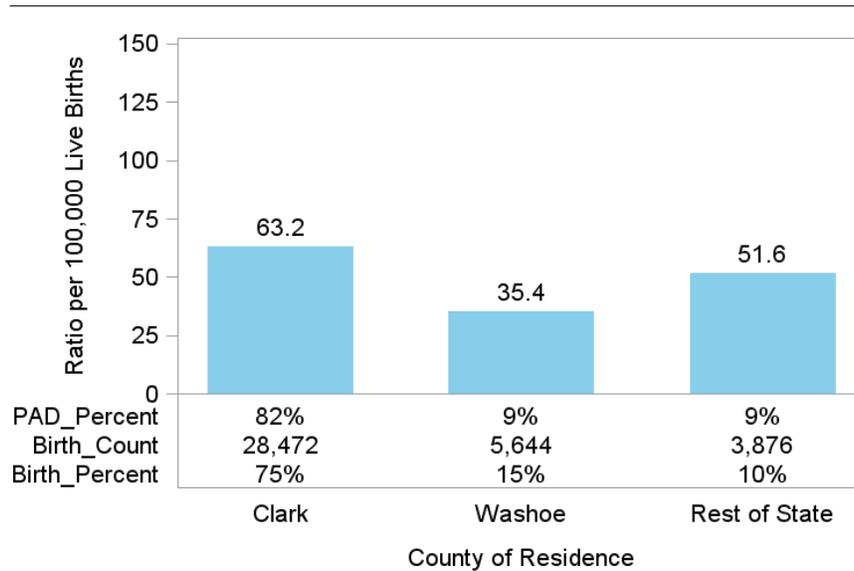
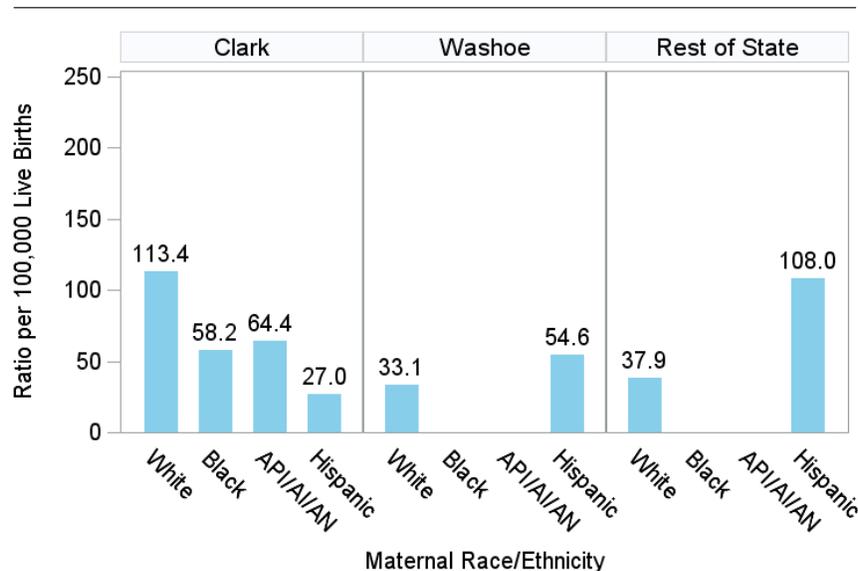


Figure 8 illustrates pregnancy-associated ratio for each race and ethnicity group within Clark County, Washoe County and Rest of State. In Clark County White, non-Hispanic women had the highest ratio at

113.4 per 100,000 live births. While in Washoe County and Rest of State, Hispanic women had the highest ratio at 54.6 per 100,000 live births and 108.0 per 100,000 live births respectively.

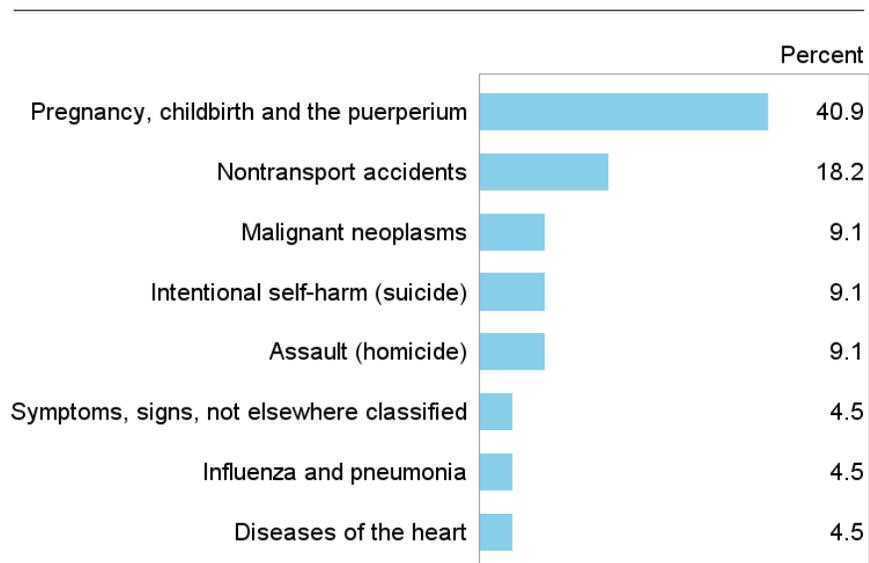
**Figure 8. Pregnancy-Associated Death Ratio by Residence County and Race/Ethnicity, Nevada, December 2018 - December 2019**



## Underlying Cause of Pregnancy-Associated Deaths

During December 2018 and December 2019, the most common underlying death cause was pregnancy, childbirth and the puerperium, accounting for 40.9% of all pregnancy-associated deaths. The second most common death cause was nontransport accidents, accounting for 18.2% of all deaths. All nontransport accidents deaths were due to unintentional drug overdose.

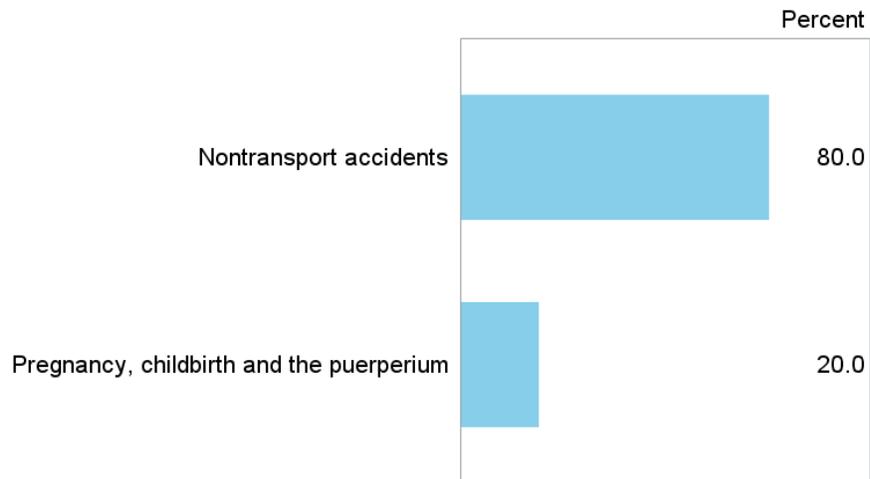
**Figure 9. Underlying Cause of Death of Pregnancy-Associated Deaths Nevada, December 2018 - December 2019**



## Drug Overdose Deaths

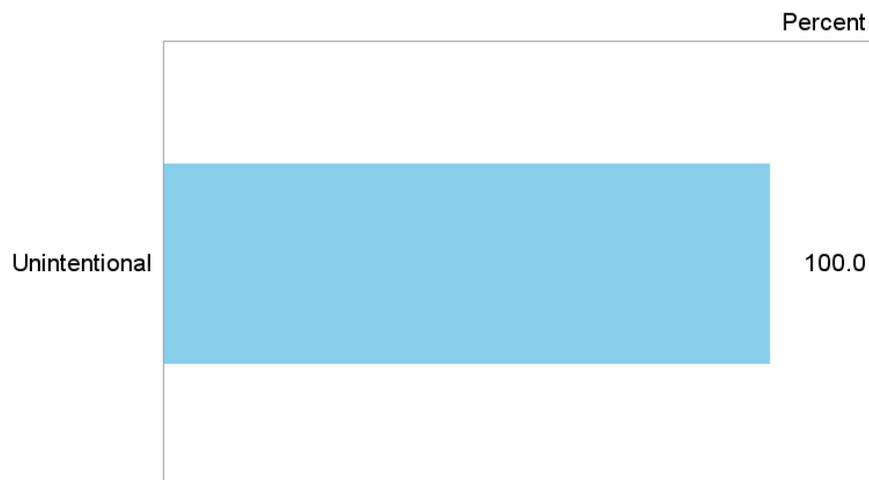
Drug overdose deaths were identified using underlying and contributing ICD-10 cause-of-death codes: X40-X44 (unintentional), X60-X64 (suicide), X85 (homicide), and Y10-Y14 (undetermined). Figure 10 shows 80% of drug overdose deaths had nontransport accidents as underlying death cause. Figure 11 shows that all drug overdose deaths were unintentional deaths.

**Figure 10. Drug Overdose Deaths by Underlying Cause of Death, Nevada, December 2018 - December 2019**



*Drug overdose deaths are identified using underlying and contributing ICD-10 cause-of-death codes: X40-X44(unintentional), X60-X64(suicide), X85(homicide), and Y10-Y14(undetermined).*

**Figure 11. Drug Overdose Deaths by Intention, Nevada, December 2018 - December 2019**



*Drug overdose deaths are identified using underlying and contributing ICD-10 cause-of-death codes: X40-X44(unintentional), X60-X64(suicide), X85(homicide), and Y10-Y14(undetermined).*

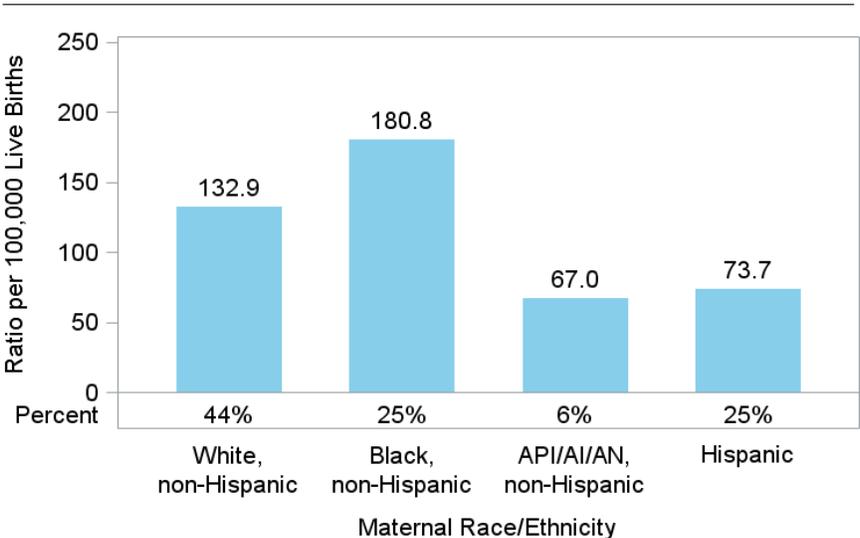
# Data of 2020

There were 32 pregnancy-associated deaths in 2020, with ratio at 107.4 per 100,000 live births. The sections below explain the demographics, underlying cause of death, and drug overdose death that are associated with pregnancy-associated deaths in 2020. Data for 2020 are preliminary and subject to changes.

## Demographics

Figure 12 shows that Black, non-Hispanic women had highest pregnancy-associated death ratio at 180.8 per 100,000 live births and 25% of the pregnancy-associated deaths occurred among Black, non-Hispanic women. Asian/Pacific Islander/American Indian/American Native (API/AI/AN), non-Hispanic women had lowest death ratio at 67.0 per 100,000 live births, accounting for 6% of all deaths.

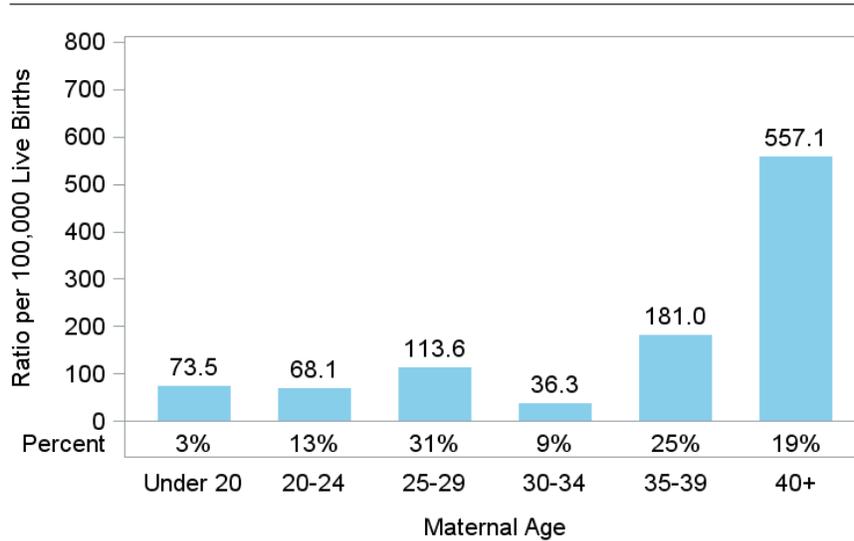
**Figure 12. Pregnancy-Associated Death Ratio and Percent by Race/Ethnicity Nevada, 2020**



*2020 data are preliminary and subject to changes.*

In Figure 13, women aged 40 and older had the highest pregnancy-associated death ratio at 557.1 per 100,000 live births, followed by women aged 35-39 at a ratio of 181.0 per 100,000 live births. Forty-four percent of the deaths occurred among women aged 35 and older.

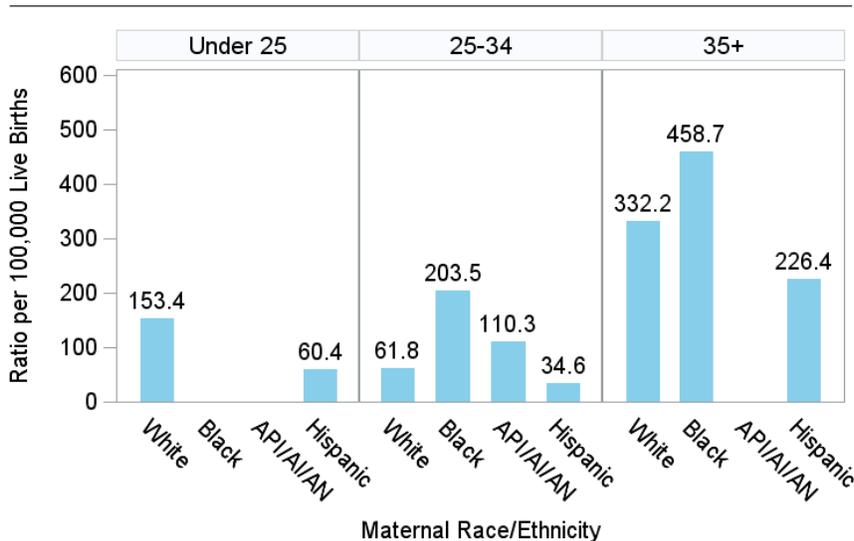
**Figure 13. Pregnancy-Associated Death Ratio and Percent by Maternal Age Nevada, 2020**



2020 data are preliminary and subject to changes.

Figure 14 illustrates pregnancy-associated death ratio for each race and ethnicity within age groups of under 25, 25-34, and 35 and older. For women aged 25 to 34, and 35 and older, Black non-Hispanic had the highest death ratio, at 203.5 per 100,000 live births and 458.7 per 100,000 live births, respectively. For women 25 and under White non-Hispanic women had the highest death ratio at 153.4 per 100,000 live births.

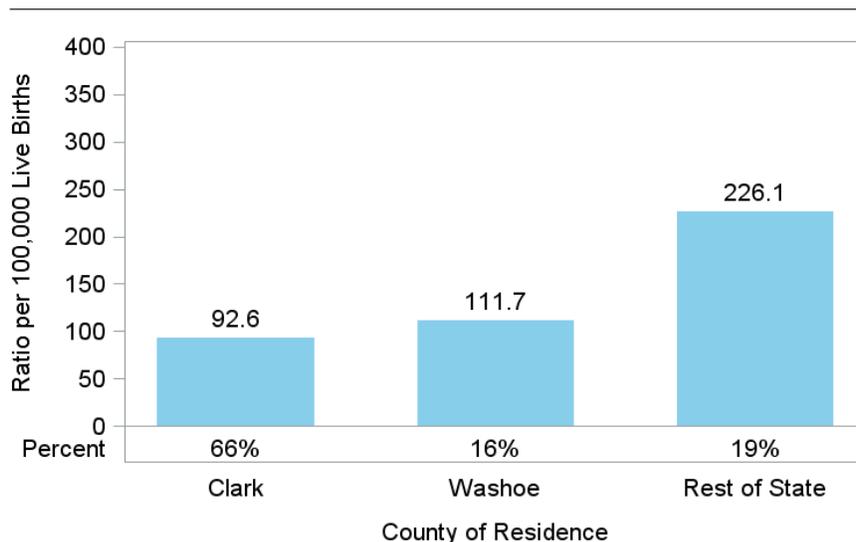
**Figure 14. Pregnancy-Associated Death Ratio by Maternal Age and Race/Ethnicity, Nevada, 2020**



2020 data are preliminary and subject to changes.

Figure 15 shows that 66% of pregnancy-associated deaths occurred in Clark County. The Rest of State had the highest pregnancy-associated death ratio at 226.1 per 100,000 live births.

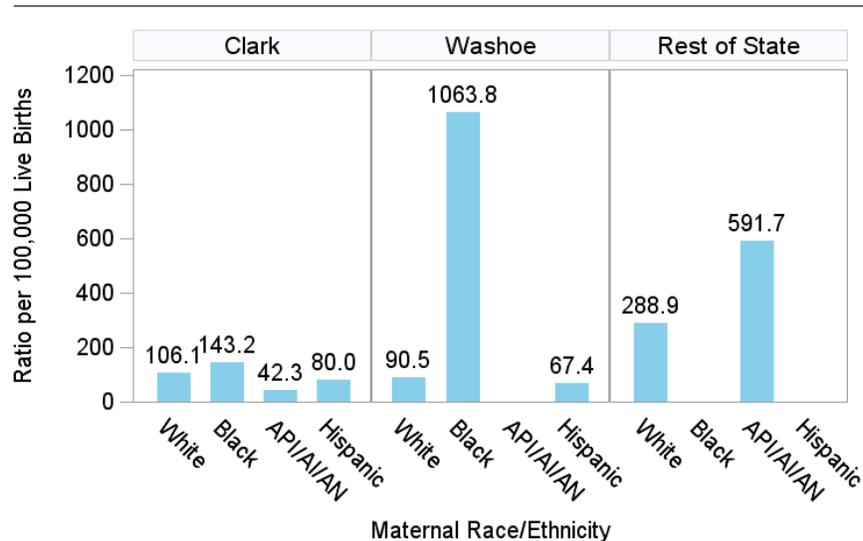
**Figure 15. Pregnancy-Associated Death Ratio by County of Residence Nevada, 2020**



2020 data are preliminary and subject to changes.

Figure 16 illustrates pregnancy-associated death ratio for each race and ethnicity group within Clark County, Washoe County and Rest of State. In Clark County and Washoe County Black, non-Hispanic women had the highest ratio at 143.2 per 100,000 live births and 1,063.8 per 100,000 live births, respectively. In Rest of State, Asian/Pacific Islander/American Indian/American Native (API/AI/AN), non-Hispanic had the highest ratio at 591.7 per 100,000 live births.

**Figure 16. Pregnancy-Associated Death Ratio by Residence County and Race/Ethnicity, Nevada, 2020**

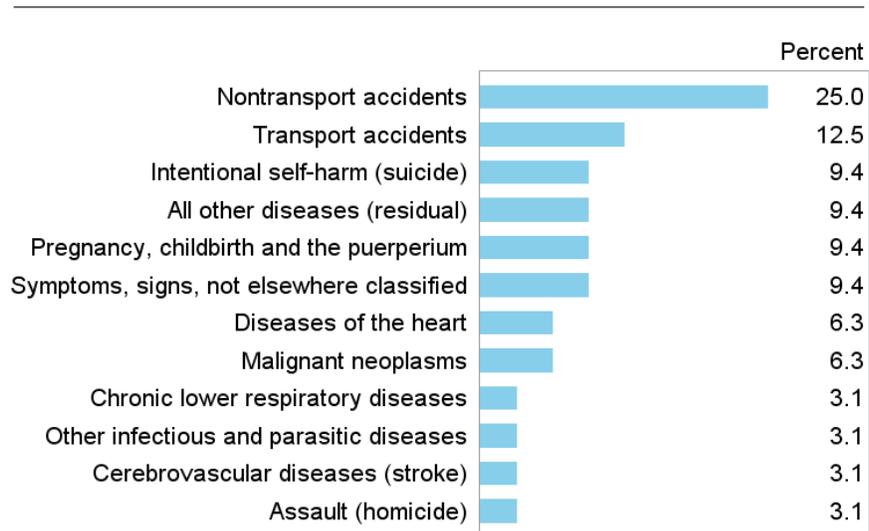


2020 data are preliminary and subject to changes.

## Underlying Cause of Pregnancy-Associated Deaths

In 2020, the most common single death cause was nontransport accidents, accounting for 25.0% of all pregnancy-associated deaths. The second most common death cause was transport accidents, accounting for 12.5% of all deaths. All nontransport accidents deaths were due to unintentional drug overdose.

**Figure 17. Underlying Causes of Death of Pregnancy-Associated Deaths Nevada, 2020**

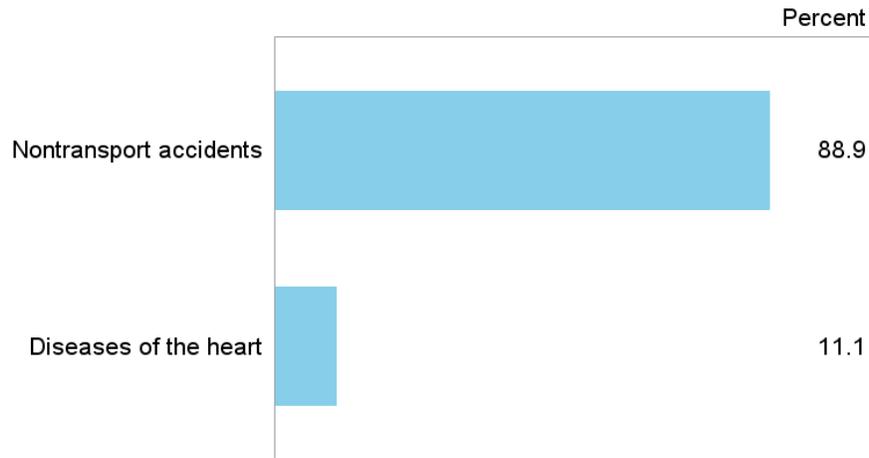


*2020 data are preliminary and subject to changes.*

## Drug Overdose Deaths

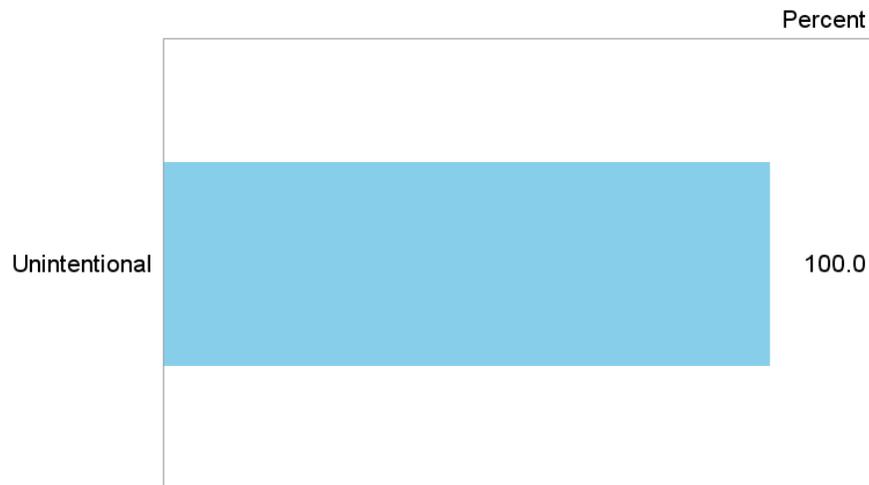
Drug overdose deaths were identified using underlying and contributing ICD-10 cause-of-death codes: X40-X44 (unintentional), X60-X64 (suicide), X85 (homicide), and Y10-Y14 (undetermined). Figure 18 shows 88.9% of drug overdose deaths had nontransport accidents as underlying death cause. Figure 19 shows that all drug overdose deaths were unintentional deaths.

**Figure 18. Drug Overdose Deaths by Underlying Cause of Death, Nevada, 2020**



Drug overdose deaths are identified using underlying and contributing ICD-10 cause-of-death codes: X40-X44(unintentional), X60-X64(suicide), X85(homicide), and Y10-Y14(undetermined). 2020 data are preliminary and subject to changes.

**Figure 19. Drug Overdose Deaths by Intention, Nevada, 2020**

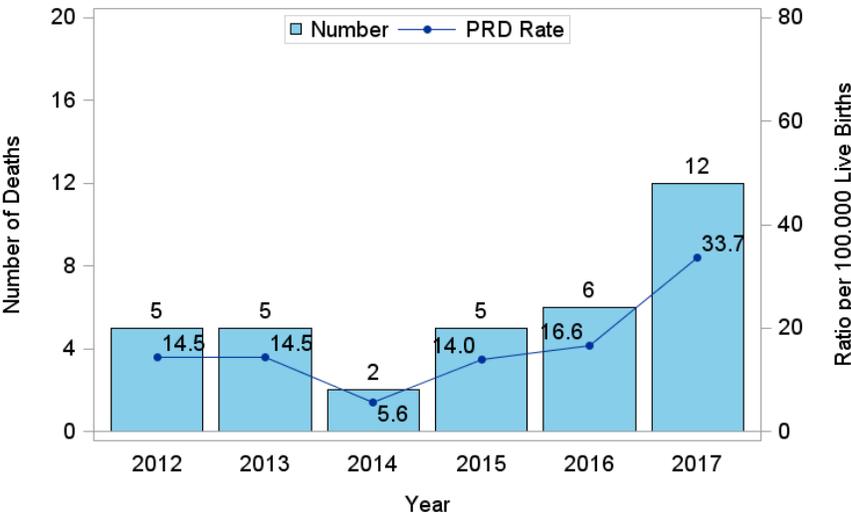


Drug overdose deaths are identified using underlying and contributing ICD-10 cause-of-death codes: X40-X44(unintentional), X60-X64(suicide), X85(homicide), and Y10-Y14(undetermined). 2020 data are preliminary and subject to changes.

# Pregnancy-Related Deaths from Pregnancy Mortality Surveillance System (PMSS)

There were 35 pregnancy-related deaths for Nevada residents from 2012 to 2017 according to data from Pregnancy Mortality Surveillance System. There was no consistent increasing or decreasing trend in pregnancy-related death ratio, with the highest ratio in 2017, at 33.7 per 100,000 live births. There were 18 pregnancy-related deaths, with ratio at 25.1 per 100,000 live births from 2016 to 2017. The sections below explain the demographics and cause of death that associated with pregnancy-related deaths from 2016 to 2017.

**Figure 20. Pregnancy-Related Death Ratio per 100,000 Live Births and Number of Deaths, Nevada, 2012 - 2017**

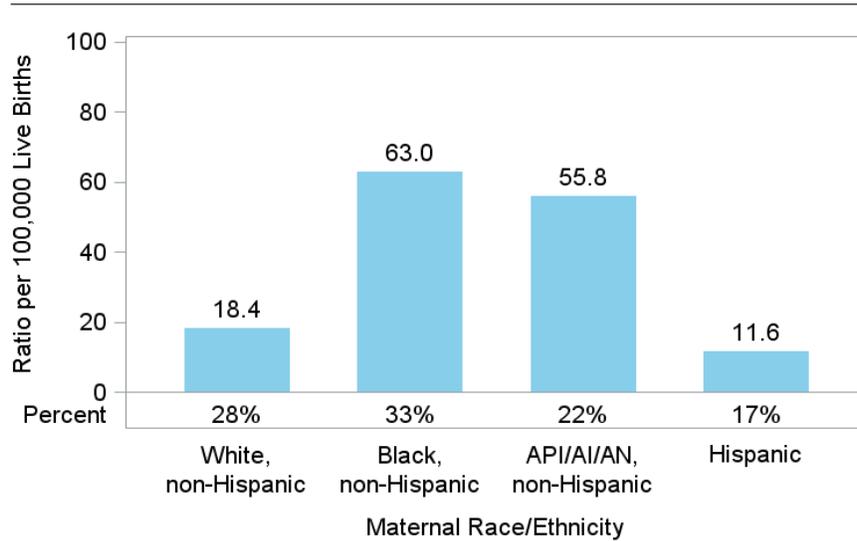


Data Source: Pregnancy Mortality Surveillance System (PMSS).

## Demographics

Figure 21 shows that Black, non-Hispanic women had highest pregnancy-related death ratio at 63.0 per 100,000 live births and 33% of the pregnancy-related deaths occurred among Black, non-Hispanic women. Hispanic women had lowest death ratio at 11.6 per 100,000 live births, accounting for 17% of all deaths.

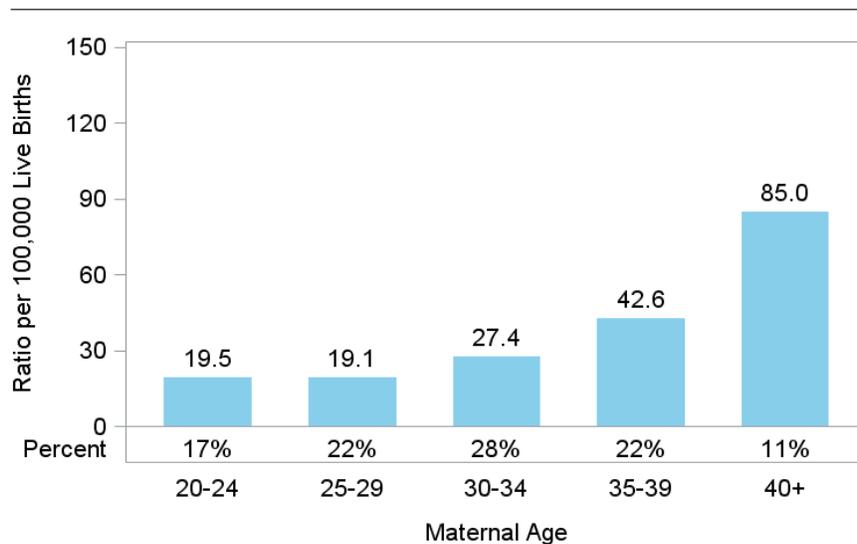
**Figure 21. Pregnancy-Related Death Ratio and Percent by Race/Ethnicity Nevada, 2016 - 2017**



Data Source: Pregnancy Mortality Surveillance System (PMSS).

In Figure 22, women aged 40 and older had the highest pregnancy-related death ratio at 85.0 per 100,000 live births, followed by women aged 35-39 at a ratio of 42.6 per 100,000 live births. Thirty-three percent of the deaths occurred among women aged 35 and older.

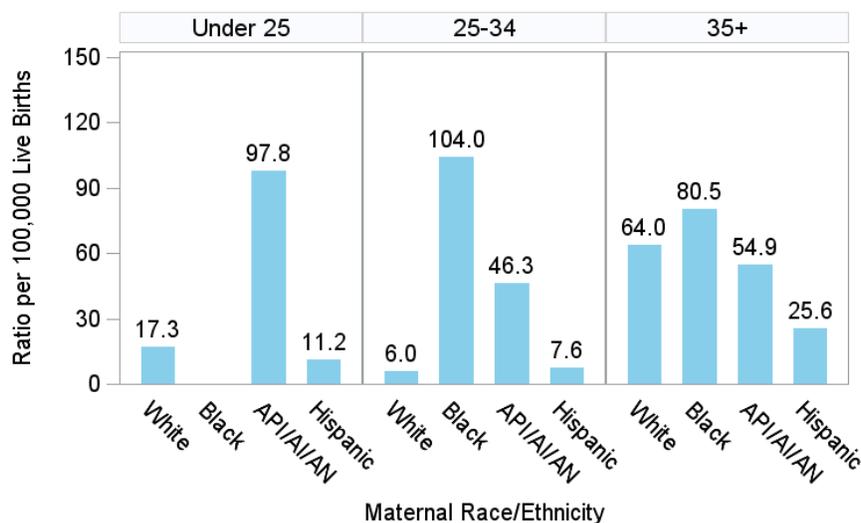
**Figure 22. Pregnancy-Related Death Ratio and Percent by Maternal Age Nevada, 2016 - 2017**



Data Source: Pregnancy Mortality Surveillance System (PMSS).

Figure 23 illustrates pregnancy-related death ratio for each race and ethnicity within age groups of under 25, 25-34, and 35 and older. For women aged 25 to 34, and 35 and older Black non-Hispanic had the highest death ratio, at 104.0 per 100,000 live births and 80.5 per 100,000 live births, respectively. For women 25 and under Asian/Pacific Islander/American Indian/American Native, non-Hispanic women had the highest death ratio at 97.8 per 100,000 live births.

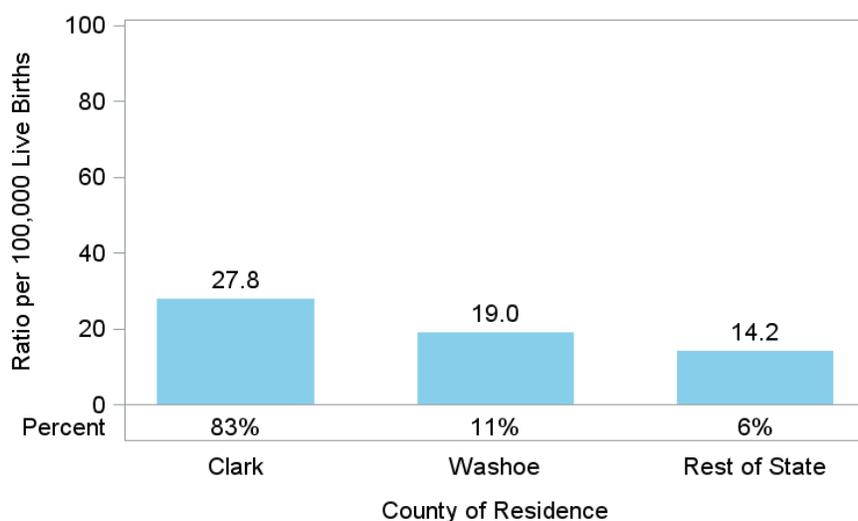
**Figure 23. Pregnancy-Related Death Ratio by Maternal Age and Race/Ethnicity, Nevada, 2016 - 2017**



Data Source: Pregnancy Mortality Surveillance System (PMSS).

Figure 24 shows that Clark County had the highest pregnancy-related death ratio at 27.8 per 100,000 live births, accounting for 83% of all pregnancy-related deaths.

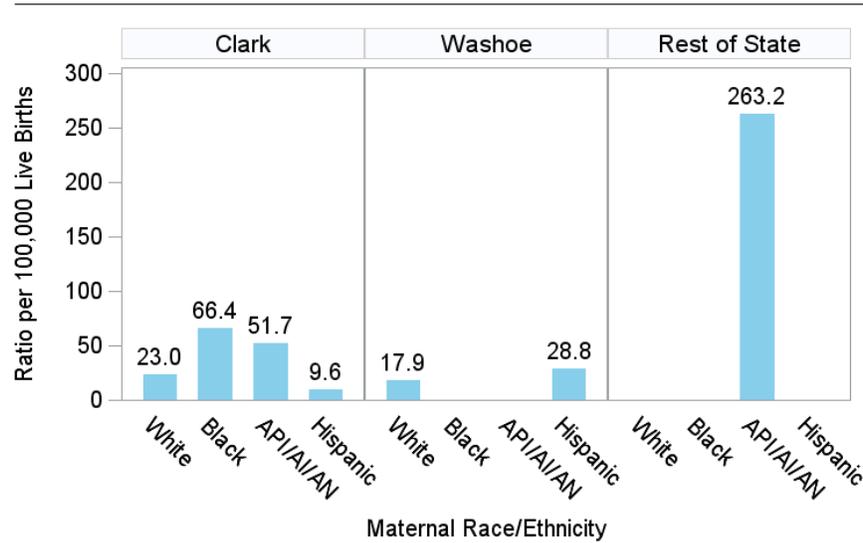
**Figure 24. Pregnancy-Related Death Ratio by County of Residence Nevada, 2016 -2017**



Data Source: Pregnancy Mortality Surveillance System (PMSS).

Figure 25 illustrates pregnancy-related death ratio for each race and ethnicity group within Clark County, Washoe County and Rest of State. In Clark County Black, non-Hispanic women had the highest ratio at 66.4 per 100,000 live births. While in Washoe County Hispanic women had the highest ratio at 28.8 per 100,000 live births. In Rest of State, Asian/Pacific Islander/American Indian/American Native, non-Hispanic women had the highest ratio at 263.2 per 100,000 live births.

**Figure 25. Pregnancy-Related Death Ratio by Residence County and Race/Ethnicity, Nevada, 2020**

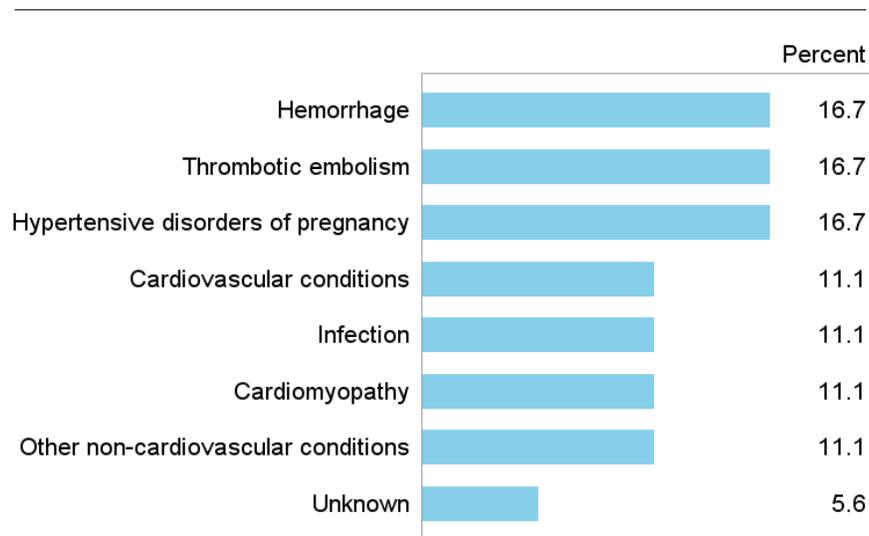


Data Source: Pregnancy Mortality Surveillance System (PMSS).

## Cause of Pregnancy-Related Deaths

During 2016 and 2017, the most common death causes of pregnancy-related deaths were hemorrhage, thrombotic embolism, and hypertensive disorders of pregnancy, each accounting for 16.7% of all pregnancy-related deaths.

**Figure 26. Cause of Death of Pregnancy-Related Deaths, Nevada, 2016 - 2017**



Data Source: Pregnancy Mortality Surveillance System (PMSS).

## References

1. Centers for Disease Control and Prevention (CDC). "Reference Guide for Pregnancy-Associated Death Identification."

# *Severe Maternal Morbidity Nevada, December 2018-2020*

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*December 2020*



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# Background

Maternal morbidity is a continuum from mild adverse effects to life-threatening events or maternal death (Figure 1).<sup>1</sup> Severe Maternal Morbidity (SMM) refers to conditions and diagnoses that indicate potentially life-threatening maternal complication, including unexpected outcomes of labor and delivery resulting in significant short- or long-term consequences to a woman’s health.<sup>2</sup> SMM relates to higher risks of adverse pregnancy outcomes like preterm birth and infant death. With a high rate of preventability, SMM can be considered a near miss for maternal mortality because in some cases, without identification and treatment, conditions could lead to maternal death. Identifying SMM is important for preventing injuries leading to mortality and for highlighting opportunities to avoid repeat injuries.

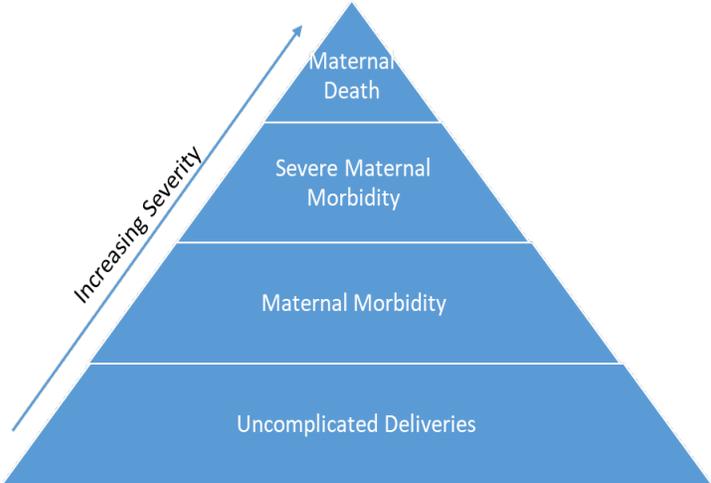


Figure 1. Continuum of Maternal Morbidity Showing Variation in Severity

The Health Resources Services Administration (HRSA) reports that SMM has increased by about 75% over the past decade<sup>3</sup>, while the Centers for Disease Control and Prevention (CDC) reports that it has been steadily increasing in recent years and affected more than 50,000 women in the United States in 2014.<sup>4</sup> The overall rate of SMM per 10,000 deliveries increased almost 200% over the years, from 49.5 in 1993 to 144.0 in 2014.<sup>4</sup> This increase has been mostly driven by blood transfusion.<sup>4</sup> A blood transfusion in this context refers to the procedure in which women are given donated blood around their delivery hospitalization. The rate of blood transfusions per 10,000 deliveries increased from 24.5 in 1993 to 122.3 in 2014.<sup>4</sup> After excluding blood transfusions, the rate of SMM per 10,000 deliveries increased by about 20% over time, from 28.6 in 1993 to 35.0 in 2014.<sup>4</sup>

# Methodology

## Data Sources

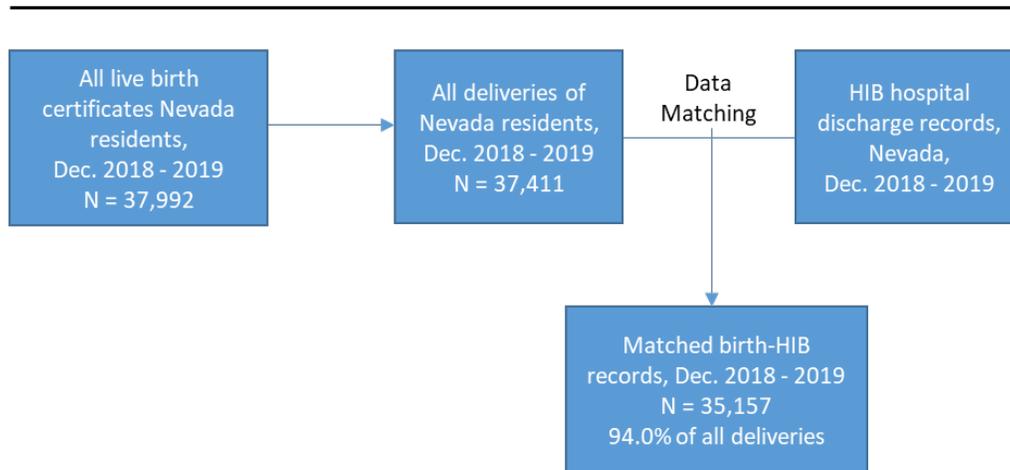
Nevada Electronic Birth Registry: Nevada Department of Health and Human Services, Division of Public and Behavioral Health, Office of Vital Records uses Web-enabled Vital Records Registry System (WEVRRS) to collect information on all live births in Nevada and issues birth certificates. The birth certificate contains demographic information, such as mother's age, race/ethnicity, and education, as well as information about the pregnancy, such as number of previous live birth (parity), prenatal care, and complications of labor and delivery.

Hospital Inpatient Billing (HIB) Data: The Hospital Inpatient Billing data provides health billing data for patients discharged from Nevada's non-federal hospitals. NRS 449.485 mandates all hospitals in Nevada report information as prescribed by the Director of the Department of Health and Human Services. The data are collected using a standard universal billing form. For patients who were admitted for at least 24 hours as an inpatient, but do not include patients who were discharged from the emergency room. The data includes demographics such as age, gender, race/ethnicity and uses the International Classification of Diseases-10-Clinical Modification (ICD-10-CM) diagnoses codes (up to 33 diagnoses respectively). In addition, the data includes billed hospital charges, procedure codes, length of hospital stay, and discharge status. The billing data information is for billed charges and not the actual payment received by the hospital.

## Data Matching

Nevada birth certificates were matched with the mother's delivery hospitalization record from Hospital Inpatient Billing (HIB) data. Multiple births (e.g. twins, triplets) were counted as one delivery, (only one birth certificate was matched per hospital discharge record, even when there was a multiple birth). The total number of live births to Nevada residents was 37,992 from December 2018 to December 2019. The total number of all live deliveries was 37,411, comprising all records from singleton births and one record per multiple births. Approximately 94% of all live deliveries were matched with a hospital discharge record. All analyses are based on matched data (n=35,157). Birth certificates and hospital discharge records were matched on mother's social security number, name, birth date, medical record number, and the facility of the delivery hospitalization. Non-matched birth certificates may be due to home births, missing social security number, misspelled names, etc.

Figure 2. Data Matching Process for Birth Certificates and HIB Records, Nevada, December 2018 - December 2019



## Identification of Severe Maternal Morbidity (SMM)

SMM events were identified during delivery hospitalizations using an algorithm developed by researchers at the CDC.<sup>5</sup> The algorithm used ICD-9/10-CM codes to identify 25 indicators of SMM that represent either serious complications of pregnancy or delivery, such as disseminated intravascular coagulation or eclampsia, or procedures used to manage serious conditions, such as blood transfusion or hysterectomy. The Alliance for Innovation on Maternal Health (AIM) methods were used to identify pregnancy deliveries and ICD-9 were converted to ICD-10 to identify SMM indicators. Four out of 25 ICD-9 indicators did not have corresponding ICD-10 codes. Of the 21 indicators remaining, 16 were identified using ICD-10 diagnosis codes and five were identified using ICD-10 procedure codes. A complete list of conditions and ICD-10 codes is listed in Appendix A.

To ensure that only the most severe cases of these 21 indicators during delivery hospitalizations were captured, these indicators were classified as SMM only if they additionally met one of the following criteria:

- The mother's length of stay was equal to or greater than the 90<sup>th</sup> percentile by delivery method.
- The mother was transferred before or after delivery to a different facility.
- The mother died during delivery hospitalization.
- At least one of the five procedure indicators was present.

## Analysis

All SMM rates were calculated per 10,000 live deliveries that successfully matched with a HIB record. Chi-square tests and bivariate logistic regression were used to test the significance of the association between maternal characteristics and SMM. The analyses in the report includes blood transfusion in the calculation of SMM unless otherwise noted. P-values less than 0.05 were deemed statistically significant.

Records with missing data on a variable of interest were not represented in the graph of SMM but are represented in the tables.

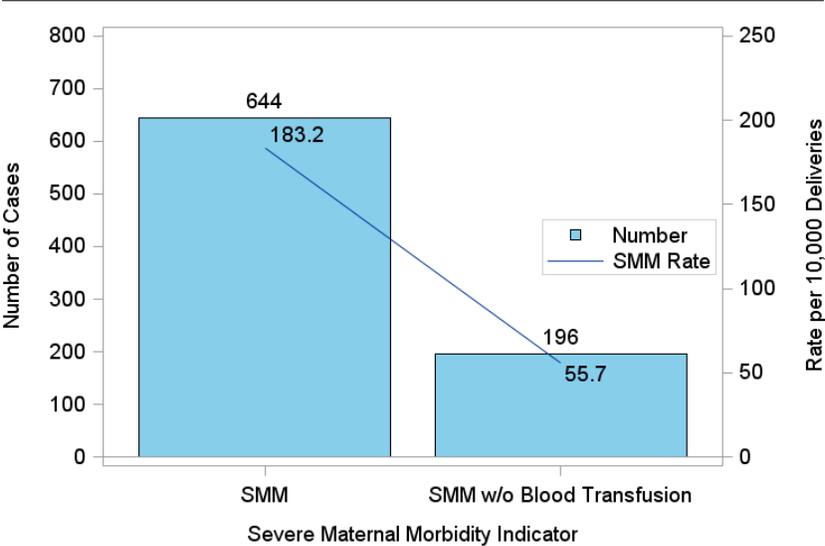
All analyses were conducted using SAS 9.4.

# Data of December 2018 to December 2019

## Leading Indicators

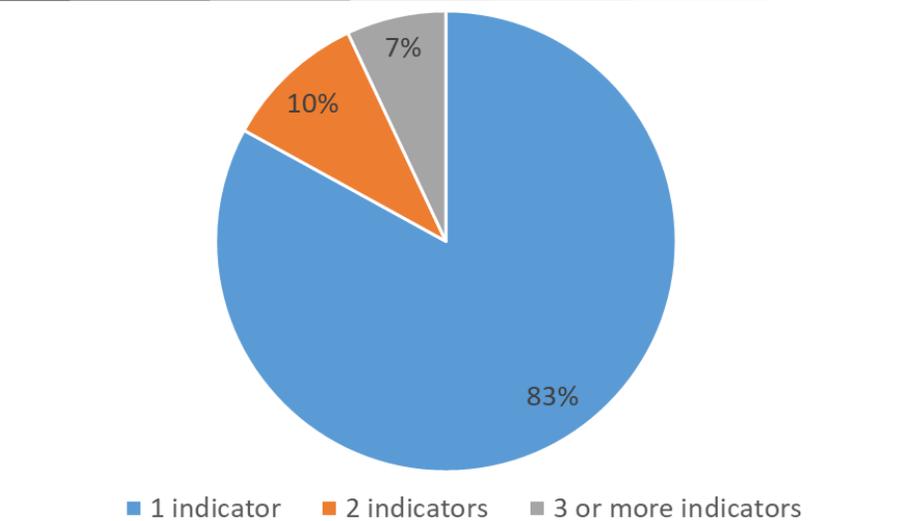
There were a total of 644 cases of SMM from December 2018 to December 2019 with rate of 183.2 per 10,000 deliveries. If blood transfusion was not included in the calculation, SMM cases dropped to 196 and rate dropped to 55.7 per 10,000 deliveries. The analyses in the report includes blood transfusion in the calculation of SMM unless otherwise noted.

**Figure 3. Severe Maternal Morbidity Rate per 10,000 Deliveries and Number of Cases, Nevada, December 2018 - December 2019**



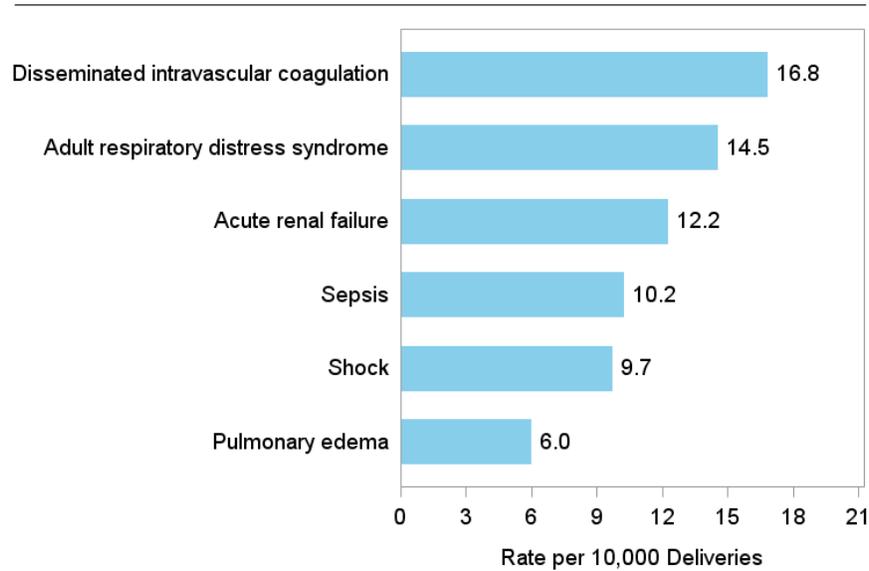
The majority of deliveries with SMM (83%) had one indicator (out of a total of 21 SMM indicators), ten percent of deliveries had two indicators and seven percent had three or more indicators present.

**Figure 4. Distribution of Severe Maternal Morbidity Indicators, Nevada, December 2018 - December 2019**



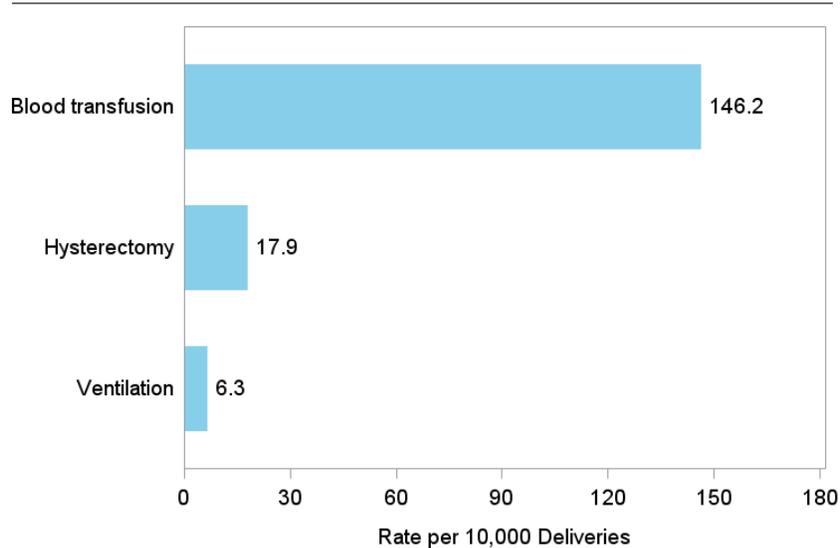
The leading diagnosis-based indicators of SMM were disseminated intravascular coagulation (16.8 per 10,000 deliveries), adult respiratory distress syndrome (14.5 per 10,000 deliveries), acute renal failure (12.2 per 10,000 deliveries), sepsis (10.2 per 10,000 deliveries), shock (9.7 per 10,000 deliveries) and pulmonary edema (6.0 per 10,000 deliveries). See Table 1 and Appendix A for a complete list and description of SMM indicators.

**Figure 5. Leading Diagnosis-Based Indicators of Severe Maternal Morbidity, Nevada, December 2018 - December 2019**



Leading procedure-based indicators of SMM were blood transfusion (146.2 per 10,000 deliveries), hysterectomy (17.9 per 10,000 deliveries) and ventilation (6.3 per 10,000 deliveries). See Table 1 and Appendix A for a complete list and description of SMM indicators.

**Figure 6. Leading Procedure-Based Indicators of Severe Maternal Morbidity, Nevada, December 2018 - December 2019**



**Table 1. Rate of Severe Maternal Morbidity Indicators per 10,000 Deliveries, Nevada, December 2018 – December 2019**

<b>SMM Indicator</b>	<b>Rate per 10,000 Deliveries</b>
<b>Diagnosis-based Indicators</b>	
Disseminated intravascular coagulation	16.8
Adult respiratory distress syndrome	14.5
Acute renal failure	12.2
Sepsis	10.2
Shock	9.7
Pulmonary edema	6.0
Eclampsia	5.1
Puerperal cerebrovascular disorders	4.3
Thrombotic embolism	3.1
Cardiac arrest/ventricular fibrillation	1.4
Acute myocardial infarction	0.3
Complications during procedure or surgery	0.3
Amniotic fluid embolism	0.3
Severe anesthesia complications	0.3
Sickle cell anemia with crisis	0.3
Intracranial injuries*	-
Internal injuries of the thorax, abdomen, and pelvis*	-
Heart failure during procedure or surgery	-
<b>Procedure-based Indicators</b>	
Blood transfusion	146.2
Hysterectomy	17.9
Ventilation	6.3
Conversion of cardiac rhythm	1.4
Temporary Tracheostomy	0.3
Cardio monitoring*	-
Operations on the heart and pericardium*	-
<b>SMM Rate Overall</b>	<b>183.2</b>

\* 4 indicators were not carried over to ICD-10 codes system.

## Maternal Demographic Characteristics

**Table 2. Severe Maternal Morbidity by Maternal Demographics, Nevada, December 2018 - December 2019**

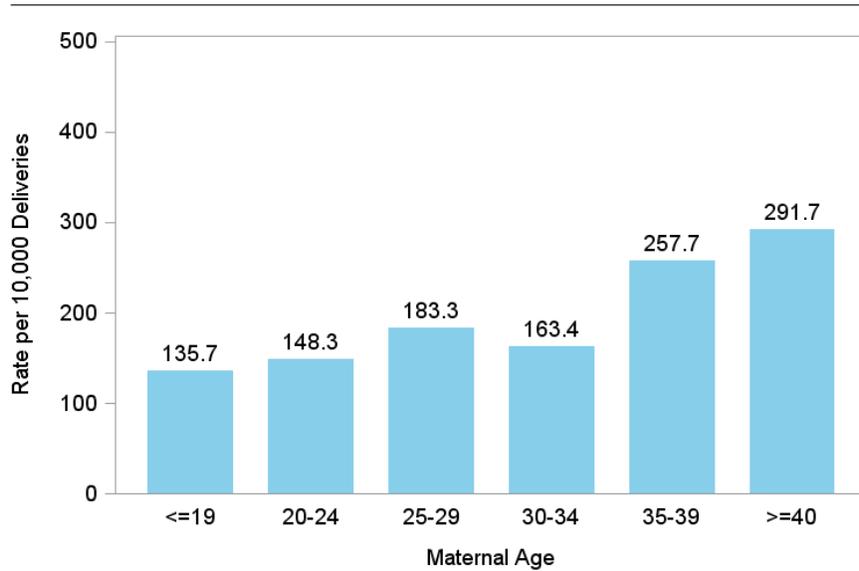
	SMM Cases	Rate per 10,000 Deliveries	Total Deliveries	Percent of Total Deliveries	Percent of SMM Cases	Chi-Square P-value
<b>Maternal Age</b>						
<=19	24	135.7	1,768	5.0%	3.7%	<.0001
20-24	106	148.3	7,148	20.3%	16.5%	
25-29	194	183.3	10,582	30.1%	30.1%	
30-34	152	163.4	9,302	26.5%	23.6%	
35-39	132	257.7	5,122	14.6%	20.5%	
>=40	36	291.7	1,234	3.5%	5.6%	
Unknown	0	0	1	0.0%	0.0%	
<b>Race/Ethnicity</b>						
White non-Hispanic	171	133.6	12,802	36.4%	26.6%	<.0001
Black non-Hispanic	140	271.1	5,165	14.7%	21.7%	
AI/AN non-Hispanic	7	231.0	303	0.9%	1.1%	
API non-Hispanic	81	245.2	3,304	9.4%	12.6%	
Hispanic	235	176.3	13,328	37.9%	36.5%	
Other	2	229.9	87	0.2%	0.3%	
Unknown	8	476.2	168	0.5%	1.2%	
<b>Education</b>						
Less than High School	106	199.2	5,321	15.1%	16.5%	0.0035
High School Graduate	242	210.6	11,490	32.7%	37.6%	
Some College	163	164.9	9,882	28.1%	25.3%	
College Graduate or Higher	103	144.0	7,153	20.3%	16.0%	
Unknown	30	228.8	1,311	3.7%	4.7%	
<b>Insurance<sup>^</sup></b>						
Medicaid	340	212.1	16,033	45.6%	52.8%	0.0008
Other Government	14	254.1	551	1.6%	2.2%	
Private	264	155.2	17,014	48.4%	41.0%	
Self-pay	20	190.7	1,049	3.0%	3.1%	
Other	4	85.5	468	1.3%	0.6%	
Unknown	2	476.2	42	0.1%	0.3%	

<sup>^</sup> Health insurance status indicates the primary payer for the delivery as recorded on hospital discharge form.

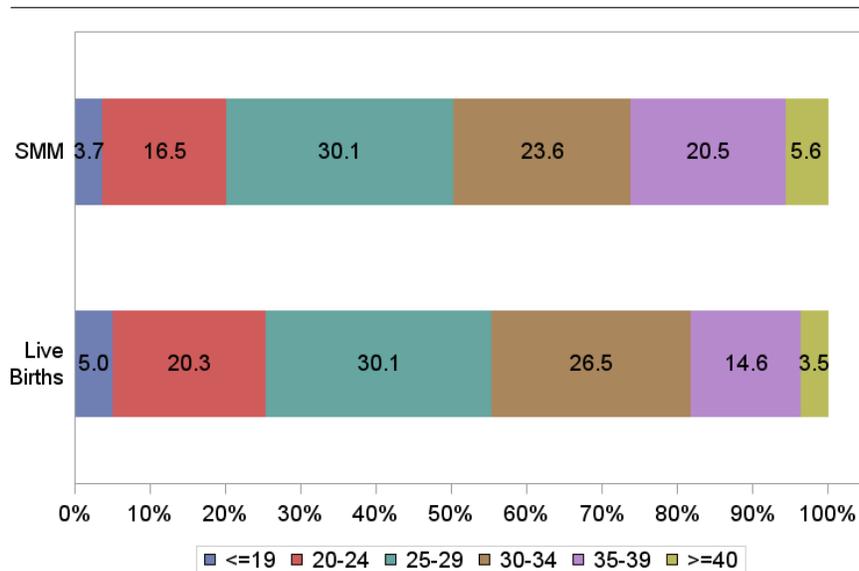
When considering the SMM rate including blood transfusions, the SMM is significantly associated with maternal age ( $p = <.0001$ ), maternal race and ethnicity ( $p = <.0001$ ), maternal education ( $p = 0.0035$ ), and health insurance status ( $p = 0.0008$ ).

Maternal age was a significant risk factor of SMM with blood transfusion ( $p = <.0001$ ), (Tables 2). Women aged 35 to 39 accounted for 14.6% of all deliveries but 20.5% of all SMM cases, (Table 2). Women 40 and older accounted for 3.5% of all deliveries but 5.6% of all SMM cases, (Table 2). SMM rates among women 40 and older (291.7 per 10,000 deliveries) and women 35 to 39 years old (257.7 per 10,000 deliveries) were higher than that of women 25 to 29 years old (183.3 per 10,000 deliveries).

**Figure 7. Severe Maternal Morbidity by Maternal Age, Nevada, December 2018 - December 2019**

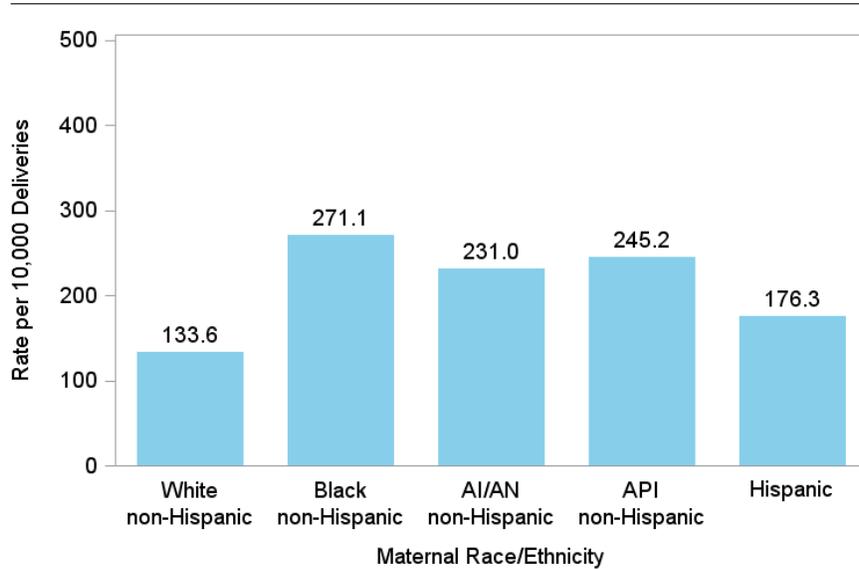


**Figure 8. Distribution of Live Births and Severe Maternal Morbidity by Maternal Age, Nevada, December 2018 - December 2019**

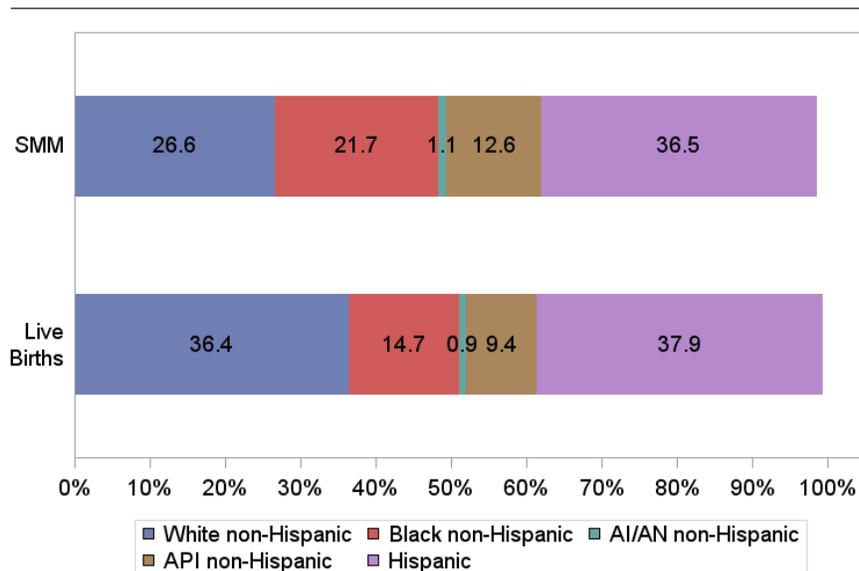


Mother's race/ethnicity is significantly associated with SMM rates with blood transfusion, with  $P = <.0001$ , (Table 2). The SMM rate among Black non-Hispanic women (271.1 per 10,000 deliveries) was higher than that of White non-Hispanic women (133.6 per 10,000 deliveries). Black non-Hispanic women accounted for 14.7% of all deliveries but 21.7% of SMM cases (Table 2). Asian Pacific Islander (API) non-Hispanic (245.2 per 10,000 deliveries) and Hispanic (176.3 per 10,000 deliveries) women also had higher SMM rate than White non-Hispanic women (133.6 per 10,000 deliveries).

**Figure 9. Severe Maternal Morbidity by Maternal Race/Ethnicity, Nevada, December 2018 - December 2019**

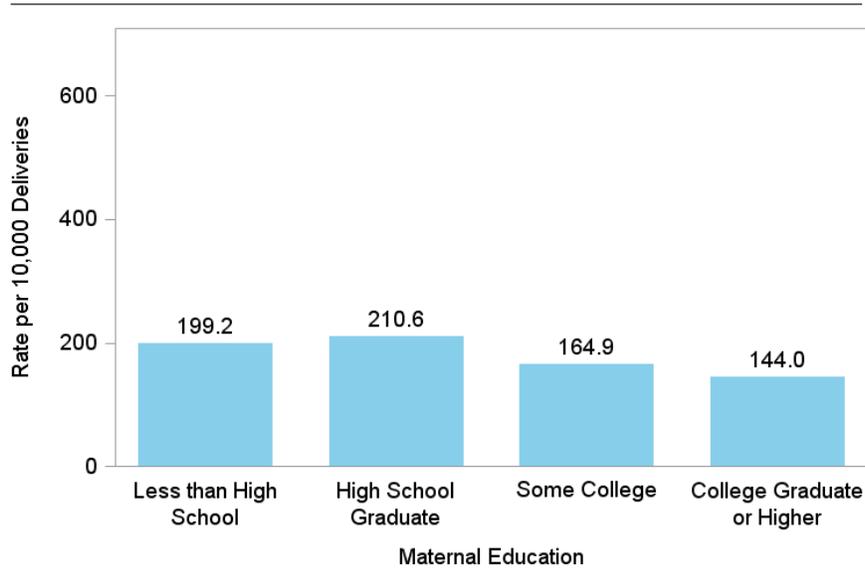


**Figure 10. Distribution of Live Births and Severe Maternal Morbidity by Maternal Race/Ethnicity, Nevada, December 2018 - December 2019**



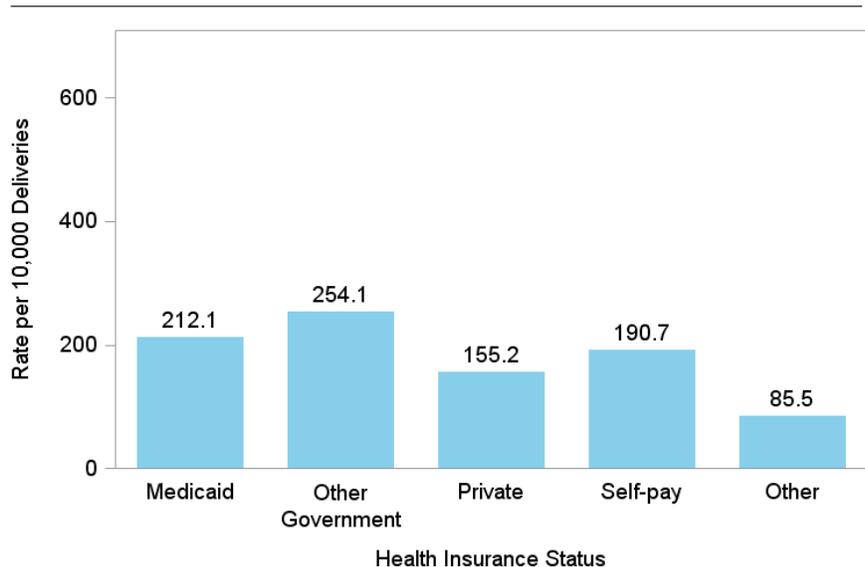
Maternal education is also significantly associated with SMM with blood transfusion ( $p = 0.0035$ ), (Table2). The SMM rates among women with education of some college (164.9 per 10,000 deliveries) or college graduate or higher (144.0 per 10,000 deliveries) were lower than that of women who were high school graduates (210.6 per 10,000 deliveries).

**Figure 11. Severe Maternal Morbidity by Maternal Education, Nevada, December 2018 - December 2019**



Health insurance status is another significant factor associated with SMM with blood transfusion. SMM rate among women with Medicaid insurance (212.1 per 10,000 deliveries) was higher than that of women with private insurance (155.2 per 10,000 deliveries). There was no significant difference of SMM rates among women with other government insurance and women with private insurance.

**Figure 12. Severe Maternal Morbidity by Health Insurance Status, Nevada, December 2018 - December 2019**



## Prenatal and Delivery Characteristics

**Table 3. Severe Maternal Morbidity by Prenatal and Delivery Characteristics, Nevada, December 2018 – December 2019**

	SMM Cases	Rate per 10,000 Deliveries	Total Deliveries	Percent of Total Deliveries	Percent of SMM Cases	Chi-Square P-value
<b>Prenatal Care Initiation</b>						
No Care	74	376.2	1,967	5.6%	11.5%	<.0001
First Trimester	389	158.8	24,502	69.7%	60.4%	
Second Trimester	84	160.9	5,222	14.9%	13.0%	
Third Trimester	30	269.1	1,115	3.2%	4.7%	
Unknown Start Date	12	215.1	558	1.6%	1.9%	
Unknown	55	306.7	1,793	5.1%	8.5%	
<b>Adequacy of Prenatal Care</b>						
Inadequate	69	181.7	3,797	10.8%	10.7%	<.0001
Intermediate	48	166.0	2,891	8.2%	7.5%	
Adequate	153	121.4	12,601	35.8%	23.8%	
Adequate Plus	233	202.5	11,508	32.7%	36.2%	
Data Missing/Unknown	141	323.4	4,360	12.4%	21.9%	
<b>Parity</b>						
0 Previous Live Births	229	172.5	13,278	37.8%	35.6%	<.0001
1 Previous Live Births	143	139.6	10,243	29.1%	22.2%	
2+ Previous Live Births	271	233.1	11,627	33.1%	42.1%	
Unknown	1	1,111.1	9	0.0%	0.2%	
<b>Method of Delivery*</b>						
Repeat Cesarean	201	363.1	5,535	15.7%	31.2%	<.0001
Primary Cesarean	224	363.5	6,163	17.5%	34.8%	
Vaginal	219	93.4	23,459	66.7%	34.0%	
<b>Plurality</b>						
Singleton Birth	612	176.7	34,626	98.5%	95.0%	<.0001
Multiple Birth	32	602.6	531	1.5%	5.0%	
<b>Pre-Pregnancy BMI~</b>						
Underweight (<18.5)	25	191.9	1,303	3.7%	3.9%	0.5212
Normal Weight (18.5- 24.9)	234	164.9	14,194	40.4%	36.3%	
Overweight (25.0 - 29.9)	164	181.5	9,038	25.7%	25.5%	
Class I (30.0 - 34.9)	88	170.3	5,166	14.7%	13.7%	
Class II (35.0 - 39.9)	45	179.6	2,506	7.1%	7.0%	
Class III (>=40)	38	229.2	1,658	4.7%	5.9%	
Unknown	50	387.0	1,292	3.7%	7.8%	
<b>Chronic Disease^</b>						
No Chronic Disease	602	175.8	34,236	97.4%	93.5%	<.0001
Any Chronic Disease	42	456.0	921	2.6%	6.5%	

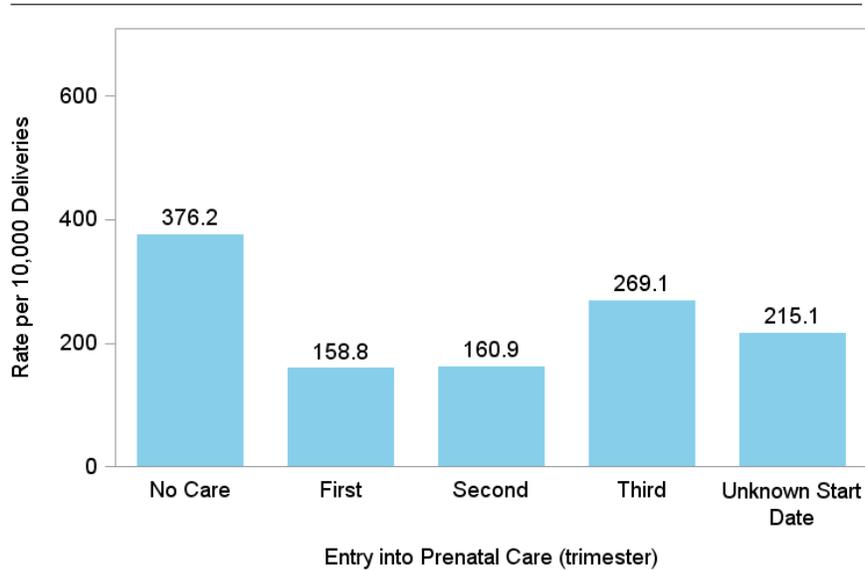
\* Method of delivery was identified from hospital discharge data using ICD-10 codes.

~ Pre-pregnancy BMI was calculated using formula (weight (lb.) / height (in)^2) x 703 with mother's weight and height as recorded on birth certificate.

^ Any chronic disease includes deliveries to women with chronic hypertension, pre-existing diabetes or chronic heart disease as recorded on birth certificate.

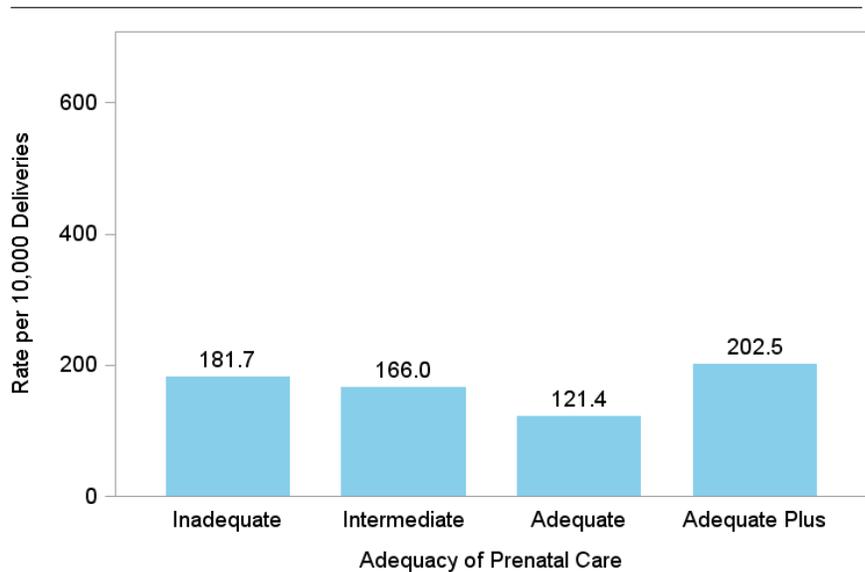
Women who received no prenatal care (376.2 per 10,000 deliveries) or entered prenatal care in third trimester (269.1 per 10,000 deliveries) had higher SMM rate than women who received prenatal care in first trimester (158.8 per 10,000 deliveries).

**Figure 13. Severe Maternal Morbidity by Time of Entry to Prenatal Care, Nevada, December 2018 - December 2019**



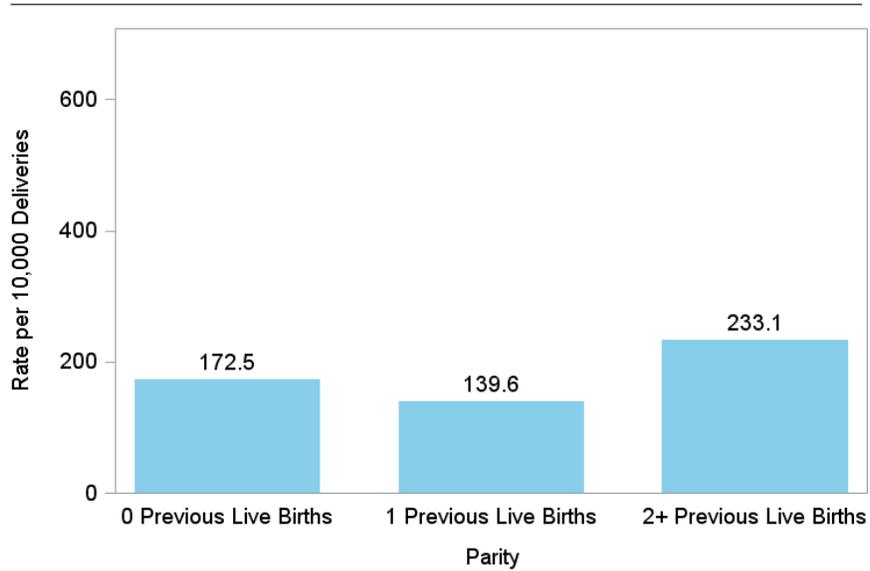
Women with inadequate and adequate plus prenatal care had highest SMM rates (181.7 and 202.5 per 10,000 deliveries, respectively) than women with adequate prenatal care (121.4 per 10,000 deliveries).

**Figure 14. Severe Maternal Morbidity by Adequacy of Prenatal Care, Nevada, December 2018 - December 2019**



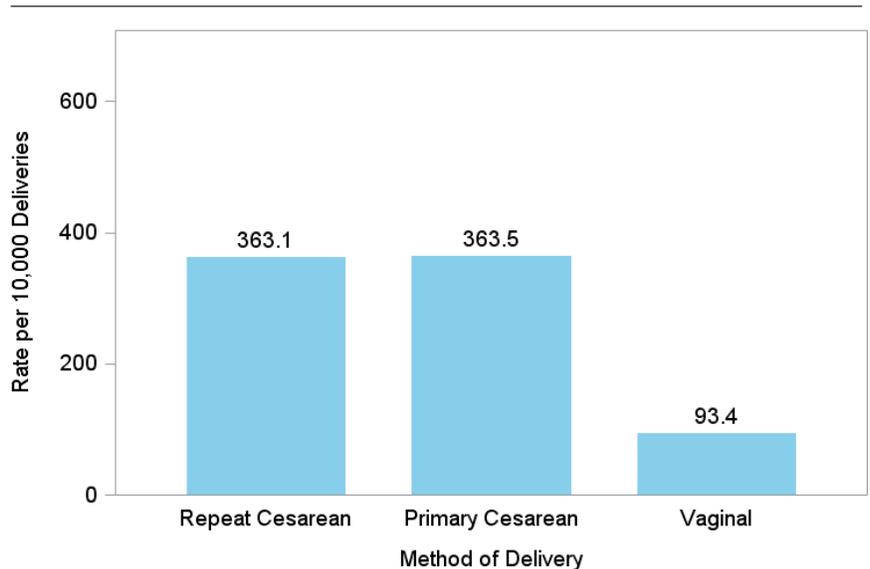
Women with zero previous live birth (172.5 per 10,000 deliveries) had higher SMM rates than women with one previous live birth (139.6 per 10,000 deliveries), but lower SMM rates than women with two or more previous live births (233.1 per 10,000 deliveries).

**Figure 15. Severe Maternal Morbidity by Parity, Nevada, December 2018 - December 2019**



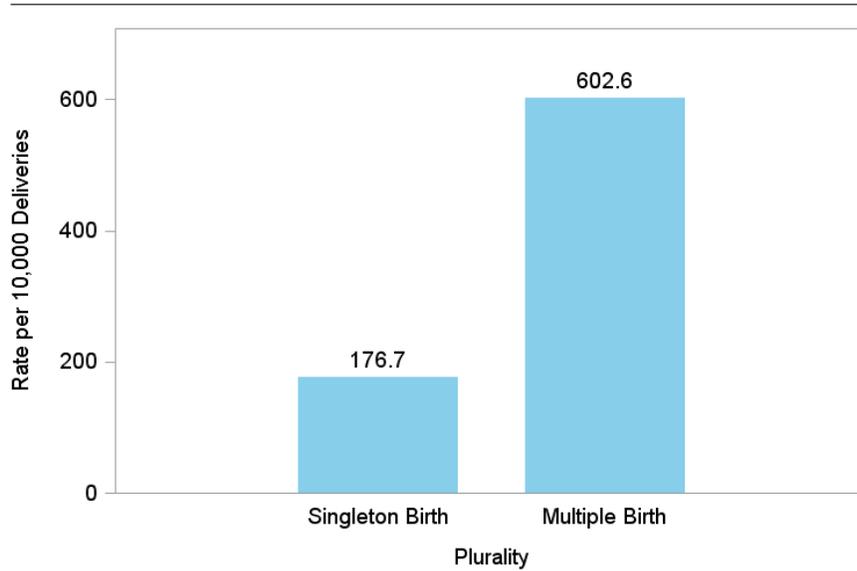
Cesarean deliveries accounted for 33.2% of all live deliveries but 66.0% of SMM cases (Table 3). The SMM rate was higher among women with a repeated or primary cesarean (363.1 and 363.5 per 10,000 deliveries, respectively), compared to women with vaginal birth (93.4 per 10,000 deliveries). Results should be interpreted with caution, since it was difficult to differentiate between morbidity caused by cesarean delivery versus morbidity requiring a cesarean delivery.

**Figure 16. Severe Maternal Morbidity by Delivery Type, Nevada, December 2018 - December 2019**



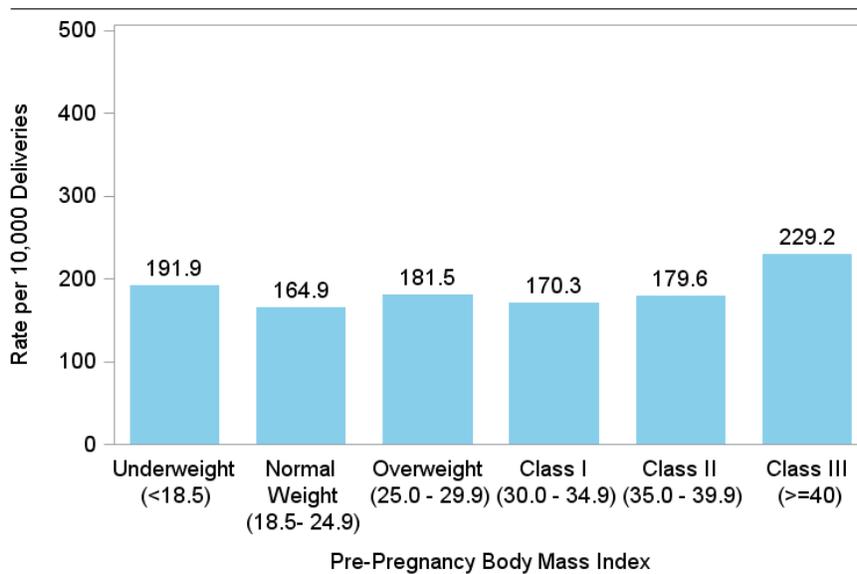
Multiple births accounted for 1.5% of all deliveries but 5.0% of SMM cases (Table 3). The SMM rate was over three times higher among women with multiple birth deliveries as among women with singleton births (602.6 versus 176.7 per 10,000 deliveries, respectively).

**Figure 17. Severe Maternal Morbidity by Plurality, Nevada, December 2018 - December 2019**



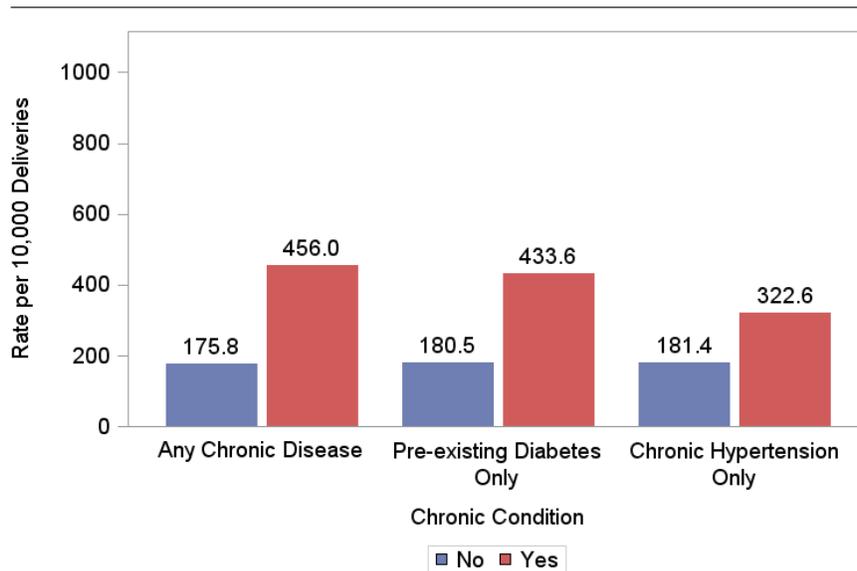
Pre-pregnancy body mass index was not significantly associated with SMM rate with blood transfusion ( $p = 0.5212$ , Table 3).

**Figure 18. Severe Maternal Morbidity by Pre-Pregnancy Body Mass Index, Nevada, December 2018 - December 2019**



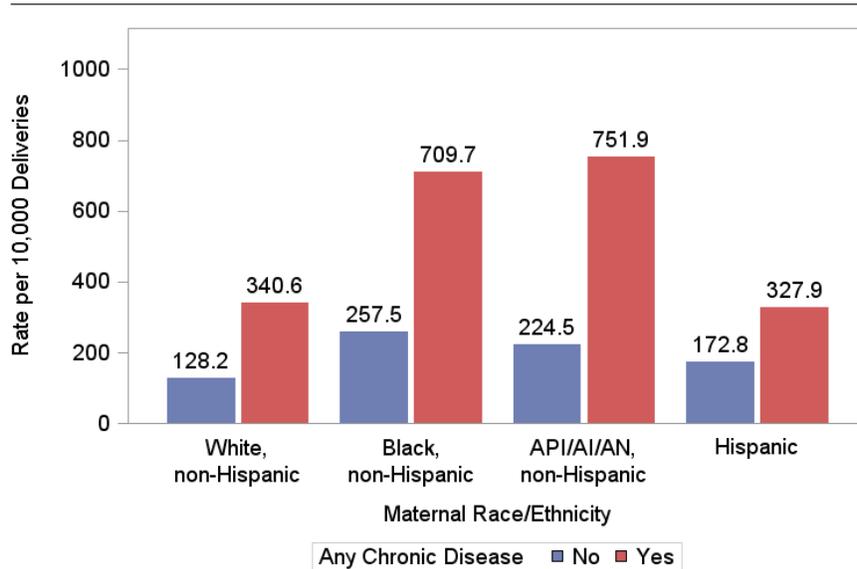
Women with pre-existing diabetes, chronic heart disease, or chronic hypertension were more than two times as likely to have SMM as women with none of these chronic conditions (456.0 versus 175.8 per 10,000 deliveries, respectively). Women with pre-existing diabetes only were more than two times as likely to have SMM as women without pre-existing diabetes (433.6 versus 180.5 per 10,000 deliveries, respectively). Women with chronic hypertension only were more than one time as likely to have SMM as women without chronic hypertension (322.6 versus 181.4 per 10,000 deliveries, respectively). When considering chronic heart disease independent from the other chronic diseases listed here, no significant association was found.

**Figure 19. Severe Maternal Morbidity by Chronic Condition, Nevada, December 2018 - December 2019**



Asian/Pacific Islander/American Indian/American Native (API/AI/AN), non-Hispanic women with any chronic disease (pre-existing diabetes, chronic heart disease, or chronic hypertension) were more than three times as likely to have SMM as API/AI/AN, non-Hispanic women with none of three chronic diseases (751.9 versus 224.5 per 10,000 deliveries, respectively). White, non-Hispanic or Black, non-Hispanic women with any chronic disease were more than two times as likely to have SMM as White, non-Hispanic or Black, non-Hispanic women without any chronic disease (340.6 versus 128.2 per 10,000 deliveries, respectively for White, non-Hispanic, and 709.7 versus 257.5 per 10,000 deliveries, respectively for Black, non-Hispanic). Hispanic women with any chronic disease were almost two times as likely to have SMM as Hispanic women without any chronic disease (327.9 versus 172.8 per 10,000 deliveries, respectively).

**Figure 20. Severe Maternal Morbidity by Any Chronic Disease and Maternal Race/Ethnicity, Nevada, December 2018 - December 2019**



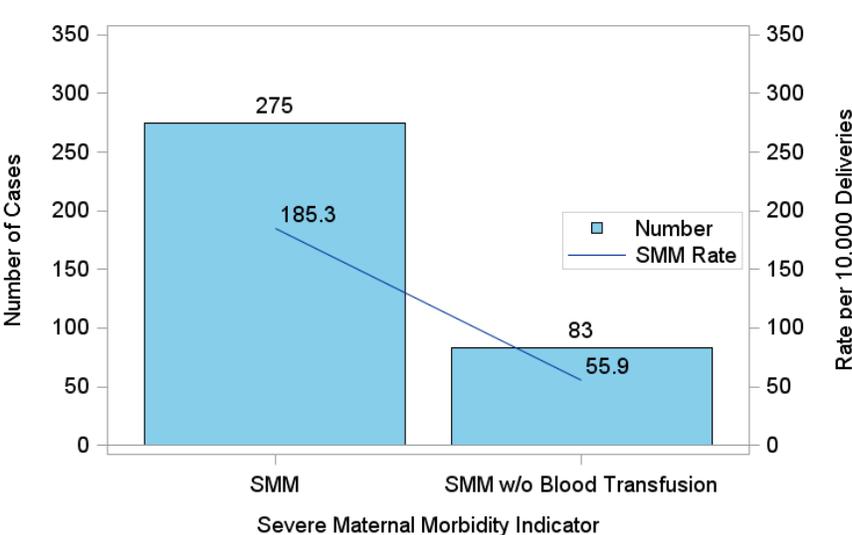
## Conclusions

The SMM rate for Nevada was 183.2 per 10,000 deliveries from December 2018 to December 2019. The leading indicators included blood transfusion, hysterectomy, disseminated intravascular coagulation, adult respiratory distress syndrome, acute renal failure, and sepsis. Mother’s age, race/ethnicity, education, and health insurance status are risk factors of SMM. Women aged 40 and older had the highest SMM rate. Black non-Hispanic women had a higher SMM rate than White non-Hispanic women. Women with college or higher degree had lowest SMM rate. SMM rate among women with Medicaid insurance was higher than that of women with private insurance. Prenatal and delivery characteristics such as prenatal care initiation, adequacy of prenatal care, parity, method of delivery, plurality, and chronic disease are all risk factors of SMM. Women with no prenatal care or entered prenatal care in third trimester had higher SMM rates than that of women entered prenatal care in first trimester. Women with inadequate and adequate plus prenatal care had higher SMM rates than women with adequate prenatal care. Women without previous live birth had higher SMM rates than women with one previous live, but lower SMM rates than women with two or more previous live births. Cesarean births had higher SMM rate than vaginal births. Women with multiple births are at higher risk to have SMM than women with single births. Women with an underlying chronic condition such as hypertension, diabetes or heart disease were more than two times as likely to have SMM as women with no chronic conditions.

# Data of 2020

There was a total of 275 cases of SMM in 2020 with rate of 185.3 per 10,000 deliveries. If blood transfusion was not included in the calculation, SMM cases dropped to 83 and rate dropped to 55.9 per 10,000 deliveries. In 2020 data are of the first two quarters of the year and are preliminary and subject to changes.

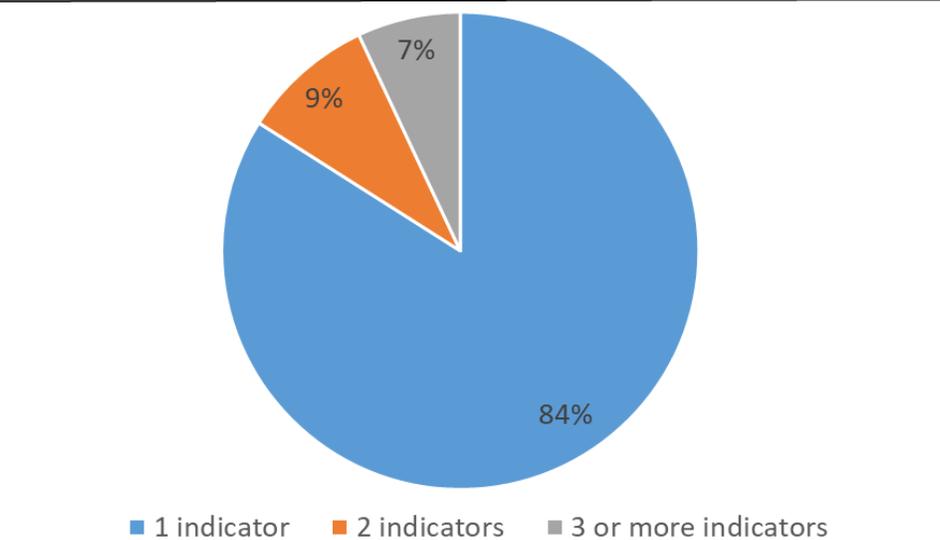
**Figure 21. Severe Maternal Morbidity Rate per 10,000 Deliveries and Number of Cases, Nevada, 2020**



*2020 data are preliminary and subject to changes.*

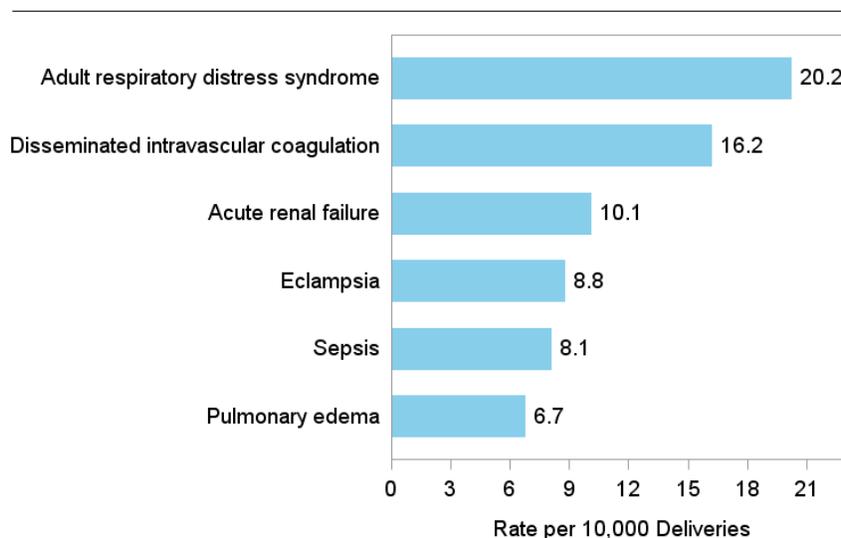
The majority of deliveries with SMM (84%) had one indicator (out of a total of 21 SMM indicators), nine percent of deliveries had two indicators and seven percent had three or more indicators present.

**Figure 22. Distribution of Severe Maternal Morbidity Indicators, Nevada, 2020**



The leading diagnosis-based indicators of SMM were adult respiratory distress syndrome (20.2 per 10,000 deliveries), disseminated intravascular coagulation (16.2 per 10,000 deliveries), acute renal failure (10.1 per 10,000 deliveries), eclampsia (8.8 per 10,000 deliveries), sepsis (8.1 per 10,000 deliveries) and pulmonary edema (6.7 per 10,000 deliveries). See Table 4 and Appendix A for a complete list and description of SMM indicators. Around 27% of adult respiratory distress syndrome cases were confirmed COVID-19 cases in 2020.<sup>6</sup>

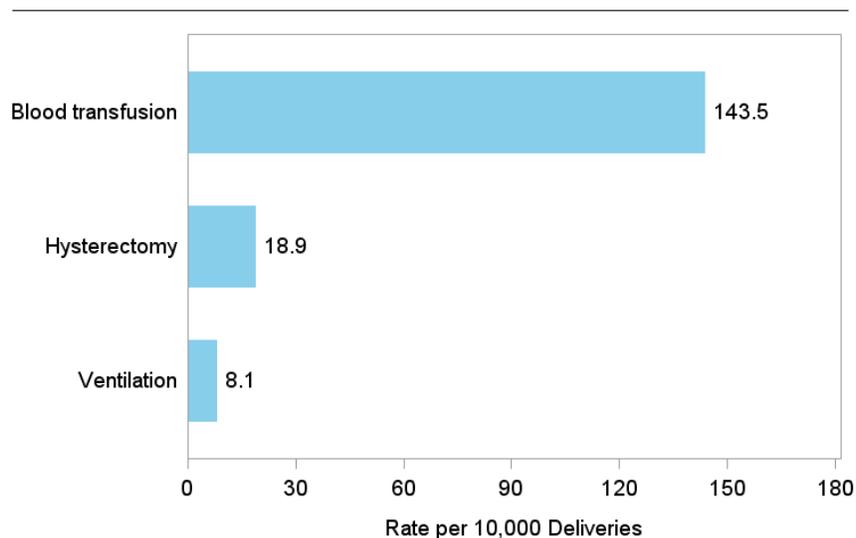
**Figure 23. Leading Diagnosis-Based Indicators of Severe Maternal Morbidity, Nevada, 2020**



*2020 data are preliminary and subject to changes.*

Leading procedure-based indicators of SMM were blood transfusion (143.5 per 10,000 deliveries), hysterectomy (18.9 per 10,000 deliveries) and ventilation (8.1 per 10,000 deliveries). See Table 4 and Appendix A for a complete list and description of SMM indicators.

**Figure 24. Leading Procedure-Based Indicators of Severe Maternal Morbidity, Nevada, 2020**



*2020 data are preliminary and subject to changes.*

**Table 4. Rate of Severe Maternal Morbidity Indicators per 10,000 Deliveries, Nevada, 2020\*\***

<b>SMM Indicator</b>	<b>Rate per 10,000 Deliveries</b>
<b>Diagnosis-based Indicators</b>	
Adult respiratory distress syndrome	20.2
Disseminated intravascular coagulation	16.2
Acute renal failure	10.1
Eclampsia	8.8
Sepsis	8.1
Pulmonary edema	6.7
Shock	6.1
Thrombotic embolism	4.7
Puerperal cerebrovascular disorders	2.0
Sickle cell anemia with crisis	2.0
Acute myocardial infarction	0.7
Amniotic fluid embolism	-
Cardiac arrest/ventricular fibrillation	-
Complications during procedure or surgery	-
Intracranial injuries*	-
Internal injuries of the thorax, abdomen, and pelvis*	-
Heart failure during procedure or surgery	-
Severe anesthesia complications	-
<b>Procedure-based Indicators</b>	
Blood transfusion	143.5
Hysterectomy	18.9
Ventilation	8.1
Temporary Tracheostomy	0.7
Conversion of cardiac rhythm	-
Cardio monitoring*	-
Operations on the heart and pericardium*	-
<b>SMM Rate Overall</b>	<b>185.3</b>

\* 4 indicators were not carried over to ICD-10 codes system.

\*\* 2020 data are preliminary and subject to changes.

**Table 5. Severe Maternal Morbidity by Maternal Demographics, Nevada, 2020\***

	SMM Cases	Rate per 10,000 Deliveries	Total Deliveries	Percent of Total Deliveries	Percent of SMM Cases	Chi-Square P-value
<b>Maternal Age</b>						
<=19	13	183.4	709	4.8%	4.7%	0.4774
20-24	46	153.0	3,007	20.3%	16.7%	
25-29	85	195.6	4,346	29.3%	30.9%	
30-34	73	177.6	4,110	27.7%	26.5%	
35-39	44	204.8	2,148	14.5%	16.0%	
>=40	14	267.7	523	3.5%	5.1%	
Unknown	0	0.0	0	0.0%	0.0%	
<b>Race/Ethnicity</b>						
White non-Hispanic	77	148.8	5,175	34.9%	28.0%	0.0081
Black non-Hispanic	62	280.2	2,213	14.9%	22.5%	
AI/AN non-Hispanic	2	163.9	122	0.8%	0.7%	
API non-Hispanic	27	198.7	1,359	9.2%	9.8%	
Hispanic	96	179.4	5,351	36.1%	34.9%	
Other	0	0.0	31	0.2%	0.0%	
Unknown	11	185.8	592	4.0%	4.0%	
<b>Education</b>						
Less than High School	47	228.3	2,059	13.9%	17.1%	0.2238
High School Graduate	88	180.2	4,883	32.9%	32.0%	
Some College	69	165.5	4,170	28.1%	25.1%	
College Graduate or Higher	49	154.6	3,170	21.4%	17.8%	
Unknown	22	392.2	561	3.8%	8.0%	
<b>Insurance<sup>^</sup></b>						
Medicaid	141	210.5	6,697	45.1%	51.3%	0.0177
Other Government	9	357.1	252	1.7%	3.3%	
Private	117	158.0	7,407	49.9%	42.5%	
Self-pay	8	219.2	365	2.5%	2.9%	
Other	0	0.0	119	0.8%	0.0%	
Unknown	0	0.0	3	0.0%	0.0%	

<sup>^</sup> Health insurance status indicates the primary payer for the delivery as recorded on hospital discharge form.

<sup>‡</sup> 2020 data are preliminary and subject to changes.

When considering the SMM rate including blood transfusions, the SMM is significantly associated with maternal race and ethnicity ( $p = 0.0081$ ), and health insurance status ( $p = 0.0177$ ).

**Table 6. Severe Maternal Morbidity by Prenatal and Delivery Characteristics, Nevada, 2020\*\***

	SMM Cases	Rate per 10,000 Deliveries	Total Deliveries	Percent of Total Deliveries	Percent of SMM Cases	Chi-Square P-value
<b>Prenatal Care Initiation</b>						
No Care	0	0.0	0	0.0%	0.0%	0.3951
First Trimester	176	160.5	10,967	73.9%	64.0%	
Second Trimester	44	208.3	2,112	14.2%	16.0%	
Third Trimester	10	212.8	470	3.2%	3.6%	
Unknown Start Date	2	181.8	110	0.7%	0.7%	
Unknown	43	363.2	1,184	8.0%	15.6%	
<b>Adequacy of Prenatal Care</b>						
Inadequate	27	180.2	1,498	10.1%	9.8%	0.0204
Intermediate	16	139.9	1,144	7.7%	5.8%	
Adequate	81	137.4	5,895	39.7%	29.5%	
Adequate Plus	106	212.2	4,995	33.7%	38.5%	
Data Missing/Unknown	45	343.2	1,311	8.8%	16.4%	
<b>Parity</b>						
0 Previous Live Births	113	197.0	5,735	38.6%	41.1%	<.0001
1 Previous Live Births	47	109.6	4,287	28.9%	17.1%	
2+ Previous Live Births	114	237.5	4,800	32.3%	41.5%	
Unknown	1	476.2	21	0.1%	0.4%	
<b>Method of Delivery*</b>						
Repeat Cesarean	77	318.1	2,421	16.3%	28.0%	<.0001
Primary Cesarean	101	411.9	2,452	16.5%	36.7%	
Vaginal	97	97.3	9,970	67.2%	35.3%	
<b>Plurality</b>						
Singleton Birth	256	175.3	14,605	98.4%	93.1%	<.0001
Multiple Birth	19	798.3	238	1.6%	6.9%	
<b>Pre-Pregnancy BMI~</b>						
Underweight (<18.5)	11	212.8	517	3.5%	4.0%	0.5798
Normal Weight (18.5- 24.9)	97	164.6	5,894	39.7%	35.3%	
Overweight (25.0 - 29.9)	66	171.3	3,853	26.0%	24.0%	
Class I (30.0 - 34.9)	48	206.2	2,328	15.7%	17.5%	
Class II (35.0 - 39.9)	24	227.5	1,055	7.1%	8.7%	
Class III (>=40)	11	154.7	711	4.8%	4.0%	
Unknown	18	371.1	485	3.3%	6.5%	
<b>Chronic Disease^</b>						
No Chronic Disease	258	179.1	14,407	97.1%	93.8%	0.0013
Any Chronic Disease	17	389.9	436	2.9%	6.2%	

\* Method of delivery was identified from hospital discharge data using ICD-10 codes.

~ Pre-pregnancy BMI was calculated using formula (weight (lb.) / height (in)^2)x 703 with mother's weight and height as recorded on birth certificate.

^ Any chronic disease includes deliveries to women with chronic hypertension, pre-existing diabetes or chronic heart disease as recorded on birth certificate.

\*\* 2020 data are preliminary and subject to changes.

When considering the SMM rate including blood transfusions, the SMM is significantly associated with adequacy of prenatal care (p = 0.0204), parity (p = <.0001), method of delivery (p = <.0001), plurality (p = <.0001), and maternal chronic disease status (p = 0.0013).

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## Appendix A. Complete List of SMM Indicators and Associated ICD-10-CM Code

Classification	Severe Maternal Morbidity Indicator	ICD-10/Procedure Codes
Diagnosis	Acute myocardial infarction	121.xx, 122.x
	Aneurysm	171.xx, 179.0
	Acute renal failure	N17.x, O90.4
	Adult respiratory distress syndrome	J80, J95.1, J95.2, J95.3, J95.82x, J96.0x, J96.2x, R09.2
	Amniotic fluid embolism	O88.1x
	Cardiac arrest/ventricular fibrillation	I46.x, I49.0x
	Disseminated intravascular coagulation	D65, D68.8, D68.9, O72.3
	Eclampsia	O15.x
	Heart failure/arrest during surgery or procedure	I97.12x, I97.13x, I97.710, I97.711
	Puerperal cerebrovascular disorders	I60.xx-I68.xx, O22.51, O22.52, O22.53, I97.81x, I97.82x, O873
	Pulmonary edema/Acute heart failure	J81.0, I50.1, I50.20, I50.21, I50.23, I50.30, I50.31, I50.33, I50.40, I50.41, I50.43, I50.9
	Severe anesthesia complications	O74.0, O74.1, O74.2, O74.3, O89.0x, O89.1, O89.2
	Sepsis	O85, O86.04, T80.211A, T81.4XXA, R65.20, A40.x, A41.x, A32.7
	Shock	O75.1, R57.x, R65.21, T78.2XXA, T88.2XXA, T88.6 XXA, T81.10XA, T81.11XA, T81.19XA
	Sickle cell disease with crisis	D57.0x, D57.21x, D57.41x, D57.81x
Air and thrombotic embolism	I26.x, O88.0x, O88.2x, O88.3x, O88.8x	
Procedure	Conversion of cardiac rhythm	5A2204Z, 5A12012
	Blood transfusion	30230H0, 30230K0, 30230L0, 30230M0, 30230N0, 30230P0, 30230R0, 30230T0, 30230H1, 30230K1, 30230L1, 30230M1, 30230N1, 30230P1, 30230R1, 30230T1, 30233H0, 30233K0, 30233L0, 30233M0, 30233N0, 30233P0, 30233R0, 30233T0, 30233H1, 30233K1, 30233L1, 30233M1, 30233N1, 30233P1, 30233R1, 30233T1, 30240H0, 30240K0, 30240L0, 30240M0, 30240N0, 30240P0, 30240R0, 30240T0, 30240H1, 30240K1, 30240L1, 30240M1, 30240N1, 30240P1, 30240R1, 30240T1, 30243H0, 30243K0, 30243L0, 30243M0, 30243N0, 30243P0, 30243R0, 30243T0, 30243H1, 30243K1, 30243L1, 30243M1, 30243N1, 30243P1, 30243R1, 30243T1
	Hysterectomy	0UT90ZZ, 0UT94ZZ, 0UT97ZZ, 0UT98ZZ, 0UT9FZZ, 0UT9OZL
	Temporary tracheostomy	0B110Z4, 0B110F4, 0B113Z4, 0B113F4, 0B114Z4, 0B114F4
Ventilation	5A1935Z, 5A1945Z, 5A1955Z	