

Maternal Mortality and Severe Maternal Morbidity Nevada, 2020-2021

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*Office of Analytics
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Acknowledgements

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Background

The Nevada Maternal Mortality Review Committee convened in 2020. The committee reviews all pregnancy-associated deaths (all deaths while pregnant or within one year of the end of pregnancy, due to any cause) and develops recommendations to prevent future deaths. Nevada Revised Statutes (NRS) 442.767 states that the Department of Health and Human Services compile and publish a biannual report on or before December 31 of each even-numbered year consisting of data concerning maternal mortality and severe maternal morbidity in this State for the year 2020 through 2021, for which the complete, final data is available. ¹

Maternal mortality is defined as deaths due to complications from pregnancy or childbirth. This report provides insight into demographic characteristics, cause of death, and drug overdose death associated with pregnancy-associated deaths from January 2020 to December 2021. This report also provides data on pregnancy-related deaths from Pregnancy Maternal Surveillance System (PMSS) during 2012 through 2017. PMSS is a national surveillance program conducted by the Centers for Disease Control and Prevention (CDC) to understand better the risk factors for and causes of pregnancy-related deaths in the United States. The Nevada Department of Health and Human Services Office of Analytics annually provides a list of pregnancy-associated deaths to the CDC. Medically trained epidemiologists at the CDC review and analyze the cases provided, determine which cases meet the CDC's definition of pregnancy-related mortality and send a list of cases back to the Office of Analytics. At the time of this report, 2017 data was the latest year available which is included in this report.

For more information on PMSS, please visit [CDC PMSS](#).

Maternal morbidity is a continuum from mild adverse effects to life-threatening events or death.² Severe Maternal Morbidity (SMM) refers to conditions and diagnoses which indicate potentially life-threatening maternal complications. SMM includes unexpected outcomes of labor and delivery resulting in significant short- or long-term consequences to health. ³ SMM relates to higher risks of adverse pregnancy outcomes like preterm birth and infant death. SMM is associated with a high rate of preventability. SMM can be considered a near miss for maternal mortality because, without identification and treatment, the conditions would lead to maternal death in some cases. Identifying SMM is important for preventing injuries leading to mortality and highlighting opportunities to avoid repeat injuries. This report includes the Office of Analytics of DHHS Severe Maternal Morbidity Report, Nevada, January 2020 to December 2021. This reports highlights Nevada disparity data on severe maternal morbidity 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.

This report is divided into a section for MM, a section for SMM, and a plan for maternal mortality prevention via recommendations of the Nevada Maternal Mortality Review Committee and the Nevada Office of Minority Health and Equity Advisory Board.

Maternal Mortality

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.

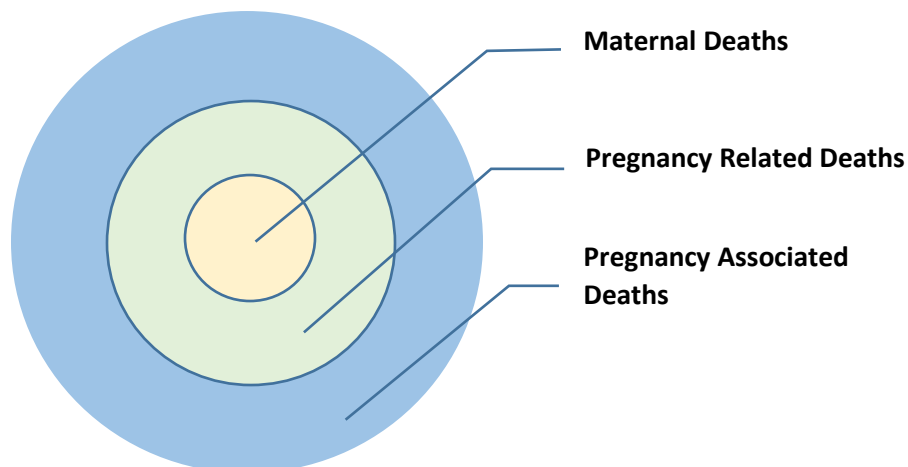
Definitions

Pregnancy-Associated Death is the death of a person 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 person 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 person 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)⁴.

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 people ages 10-60 years are first linked with birth and fetal death records based on mother's social security number (SSN). Death records of people 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.

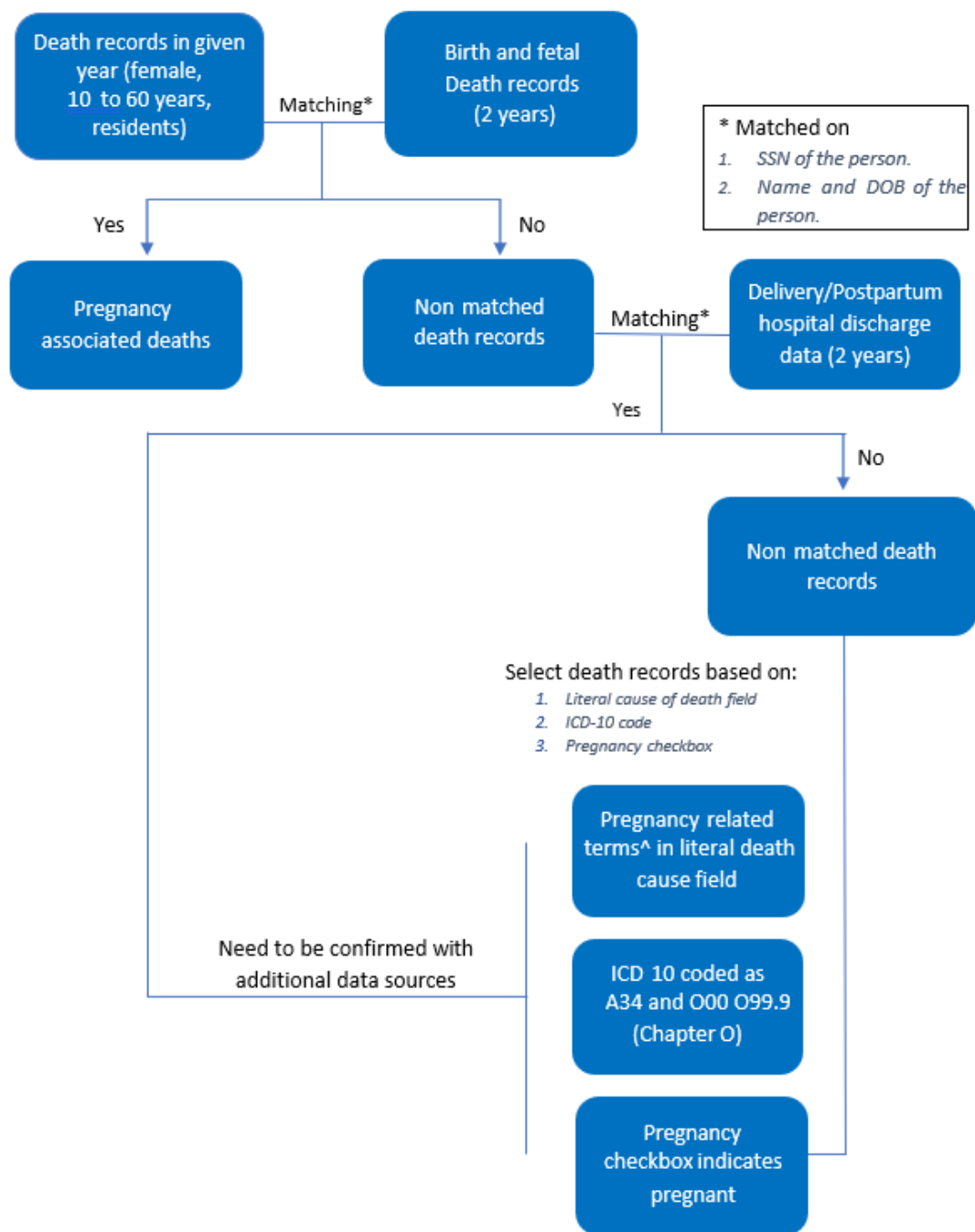
- Obituaries
- Social Media
- Media and News Reports
- Certifier Confirmation
- Autopsy Reports

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

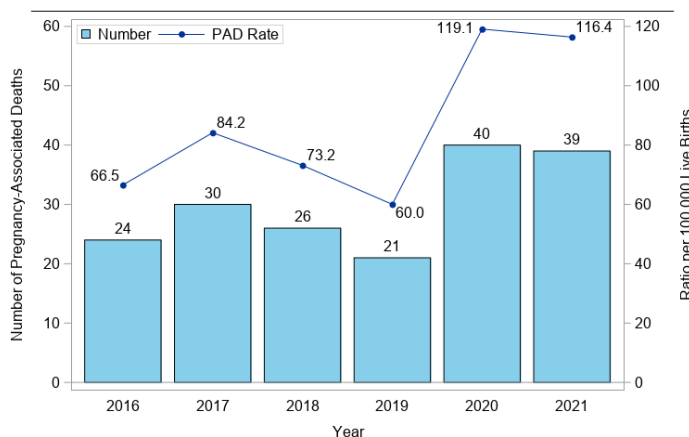


[^] Pregnancy-related terms are amniotic, chorioamnionitis, eclampsia, ectopic, intrauterine fetal demise, peripartum, peripartum cardiomyopathy, placental, postpartum, pregnancy, pregnant, uterine hemorrhage, and uterine rupture.

Findings

There were 180 pregnancy-associated deaths in Nevada from 2016 to 2021. There was no consistent increasing or decreasing trend in pregnancy-associated death ratio, with the highest ratio in 2020, at 119.1 per 100,000 live births (Figure 3). The sections below explain the demographics, underlying cause of death, and drug overdose death associated with pregnancy-associated deaths from January 2020 to December 2021. There were total of 79 pregnancy-associated deaths from January 2020 to December 2021.

Figure 3. Pregnancy-Associated Death Ratio per 100,000 Live Births and Number of Deaths, Nevada Residents, 2016 - 2021

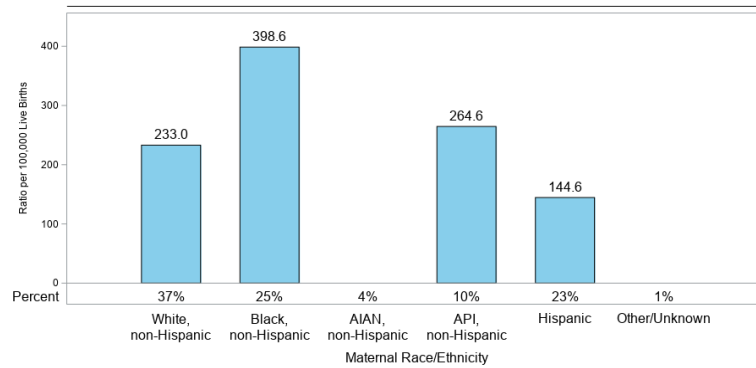


Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.

Demographics

When comparing all Nevada births for the years 2020 through 2021, broken down by race and ethnicity, of those with pregnancy-associated deaths, 37% were White, non-Hispanic, 25% were Black, non-Hispanic, 23% were Hispanic, 10% were Asian/Pacific Islander (API), non-Hispanic, and 4% were American Indian/Alaska Native (AI/AN), non-Hispanic. Figure 4 illustrates that Black, non-Hispanic had highest pregnancy-associated death ratio at 398.6 per 100,000 live births and 25% of the pregnancy-associated deaths. Hispanic had the lowest death ratio at 144.6 per 100,000 live births, accounting for 23% of all pregnancy-associated deaths.

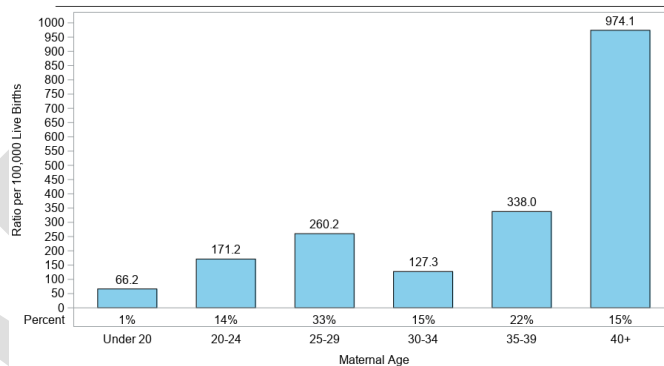
Figure 4. Pregnancy-Associated Death Ratio and Percent by Race/Ethnicity, Nevada, 2020-2021



Abbreviations: Asian or Pacific Islander(API); American Indian(AI); Alaska Native(AN). AIAN rates suppressed due to small counts not meeting criteria for statistical reliability. Other/Unknown rates are not calculated.
Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.

In Figure 5, 40 years and older had the highest pregnancy-associated death ratio at 974.1 per 100,000 live births, followed by ratio of 35-39 age group at a ratio of 338.0 per 100,000 live births. 35 and older age group accounted for only 37% while 20 to 29 age groups accounted for 47% of pregnancy-associated deaths.

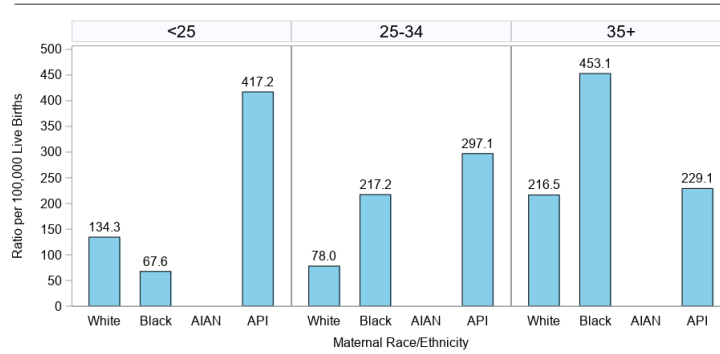
Figure 5. Pregnancy-Associated Death Ratio and Percent by Maternal Age, Nevada, 2020-2021



Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.

Figure 6 illustrates pregnancy-associated death ratio for each race and ethnicity within the age groups of under 25, 25-34, and 35 and older. For age group under 25 and 25 to 34, Asian/Pacific Islander (API) had the highest ratio, at 417.2 per 100,000 live births and 297.1 per 100,000 live births, respectively. For age group 35 and older Black, non-Hispanic had the highest ratio at 453.1 per 100,000 live births, followed by Asian/Pacific Islander at 229.1 per 100,000 live births; American Indian/Alaska Native (AI/AN) data were suppressed due to small counts not meeting criteria for statistical reliability.

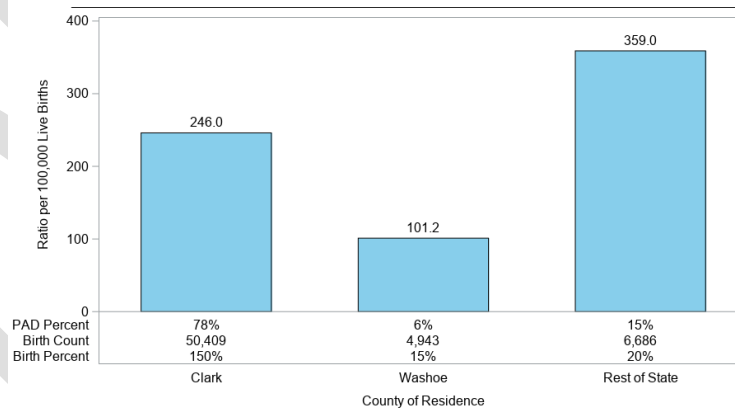
Figure 6. Pregnancy-Associated Death Ratio by Maternal Age and Race/Ethnicity, Nevada, 2020-2021



Abbreviations: Asian or Pacific Islander(API); American Indian(AI); Alaska Native(AN). AIAN rates suppressed due to small counts not meeting criteria for statistical reliability. Other/Unknown rates are not calculated.
Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.

Figure 7 shows that most of the pregnancy-associated deaths (78%) occurred in Clark County. The Rest of State category had the highest pregnancy-associated death ratio at 359.0 per 100,000 live births and Washoe county had the lowest ratio at 101.2 per 100,000 live births. Counties included in the category of Rest of State were Carson City, Churchill, Douglas, Elko, Esmeralda, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Pershing, Storey, and White Pine.

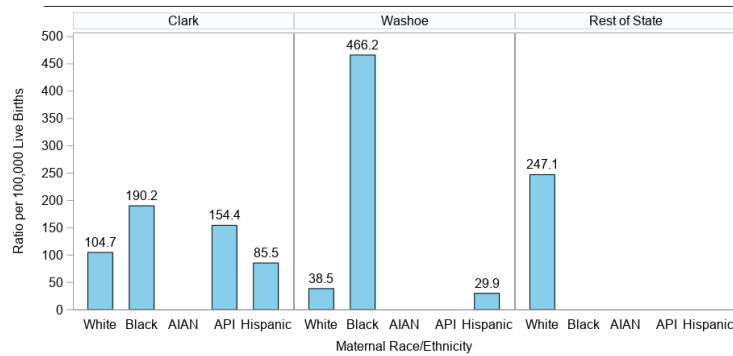
Figure 7. Pregnancy-Associated Death (PAD)Ratio by County of Residence, Nevada, 2020-2021



Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.

Figure 8 illustrates pregnancy-associated ratio for each race and ethnicity group within Clark County, Washoe County and Rest of State. In Washoe County Black, non-Hispanic had the highest ratio at 466.2 per 100,000 live births. In the Rest of State, White, non-Hispanic had the highest ratio at 247.1 per 100,000 live births compared to Clark County residents (104.7 per 100,000 live births).

Figure 8. Pregnancy-Associated Death Ratio by County of Residence and Race/Ethnicity, Nevada, 2020-2021

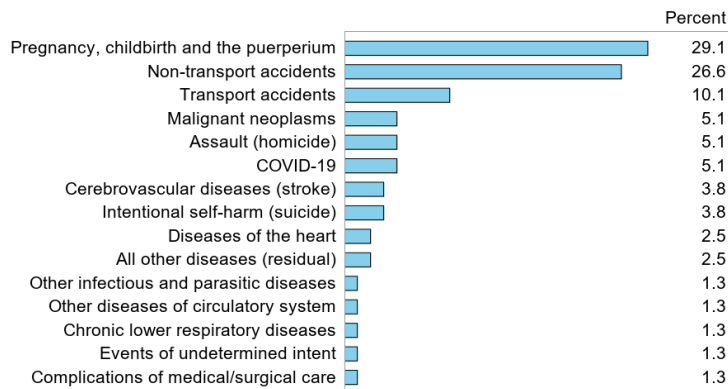


AIAN rates suppressed due to small counts not meeting criteria for statistical reliability. Other/Unknown rates are not calculated.
 Abbreviations: Asian or Pacific Islander(API); American Indian(AI); Alaska Native(AN).
 Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.

Underlying Cause of Pregnancy-Associated Deaths

During the previous two years (January 2020 through December 2021), the most common underlying death cause was Pregnancy, childbirth, and the puerperium accounting for 29.1% of all pregnancy-associated deaths. The second most common death cause was non-transport accidents, accounting for 26.6%, followed by transport accidents (10.1%). About 96% of the non-transport accidental deaths were due to unintentional drug overdose.

Figure 9. Underlying Causes of Death of Pregnancy-Associated Deaths, Nevada, 2020-2021



Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.

Table 1. Cause of Death by Race/Ethnicity, Nevada, 2020-2021

Causes of Death	Race/Ethnicity	Total	
		N	%
Pregnancy, childbirth, and the puerperium	White	9	11.4
	Black	5	6.3
	AIAN	2	2.5
	API	6	7.6
	Other/Unknown	1	1.3
	Total	23	29.1

Non-transport accidents	White	10	12.7
	Black	4	5.1
	AIAN	2	2.5
	API	5	6.3
	Total	21	26.6
Transport accidents	White	2	2.5
	Black	2	2.5
	AIAN	2	2.5
	API	2	2.5
	Total	8	10.1
Malignant neoplasms	White	1	1.3
	Black	2	2.5
	AIAN	1	1.3
	Total	4	5.1
Assault (homicide)	Black	2	2.5
	API	2	2.5
	Total	4	5.1
COVID-19	White	1	1.3
	Black	1	1.3
	AIAN	2	2.5
	Total	4	5.1
Intentional self-harm (suicide)	White	2	2.5
	API	1	1.3
	Total	3	3.8
Cerebrovascular diseases (stroke)	White	1	1.3
	Black	1	1.3
	API	1	1.3
	Total	3	3.8
All other diseases (residual)	Black	1	1.3
	API	1	1.3
	Total	2	2.5
Diseases of the heart	White	1	1.3
	AIAN	1	1.3
	Total	2	2.5
Chronic lower respiratory diseases	White	1	1.3
	Total	1	1.3
Other infectious and parasitic diseases	Black	1	1.3
	Total	1	1.3
Events of undetermined intent	White	1	1.3
	Total	1	1.3

Complications of medical/surgical care	Black	1	1.3
	Total	1	1.3
Other diseases of circulatory system	AIAN	1	1.3
	Total	1	1.3
Total	White	29	36.7
	Black	20	25.3
	AIAN	11	13.9
	API	18	22.8
	Other/Unknown	1	1.3
	Total	79	100

Abbreviations: Asian or Pacific Islander (API); American Indian (AI); Alaska Native (AN).

Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.

Table 2. Underlying Causes of Death by County of Residence, Nevada, 2020-2021

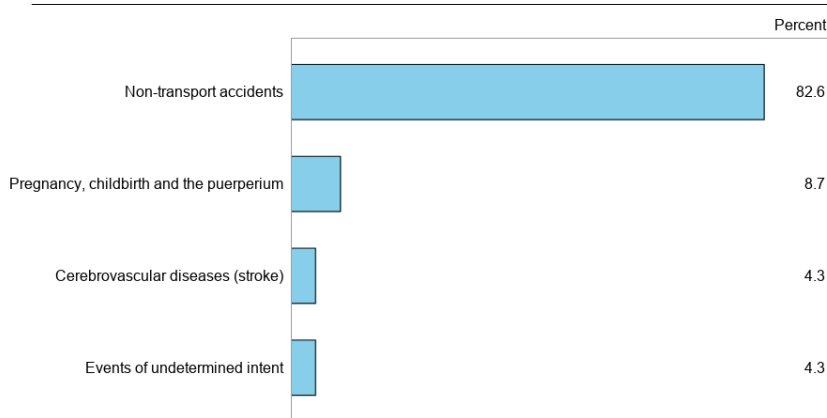
Causes of Death		Total	
		N	%
Pregnancy, childbirth, and the puerperium	Clark	20	25.3
	Washoe	1	1.3
	Rest of State	2	2.5
	Total	23	29.1
Non-transport accidents	Clark	18	22.8
	Rest of State	3	3.8
	Total	21	26.6
Transport accidents	Clark	5	6.3
	Rest of State	3	3.8
	Total	8	10.1
Malignant neoplasms	Clark	3	3.8
	Washoe	1	1.3
	Total	4	5.1
Assault (homicide)	Clark	3	3.8

	Washoe	1	1.3
	Total	4	5.1
COVID-19	Clark	3	3.8
	Rest of State	1	1.3
	Total	4	5.1
Intentional self-harm (suicide)	Washoe	2	2.5
	Rest of State	1	1.3
	Total	3	3.8
Cerebrovascular diseases (stroke)	Clark	3	3.8
	Total	3	3.8
All other diseases (residual)	Clark	2	2.5
	Total	2	2.5
Diseases of the heart	Clark	1	1.3
	Rest of State	1	1.3
	Total	2	2.5
Chronic lower respiratory diseases	Clark	1	1.3
	Total	1	1.3
Other infectious and parasitic diseases	Clark	1	1.3
	Total	1	1.3
Events of undetermined intent	Rest of State	1	1.3
	Total	1	1.3
Complications of medical/surgical care	Clark	1	1.3
	Total	1	1.3
Other diseases of circulatory system	Clark	1	1.3
	Total	1	1.3
Total	Clark	62	78.5
	Washoe	5	6.3
	Rest of State	12	15.2
	Total	79	100
<i>Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.</i>			

Drug Overdose Deaths

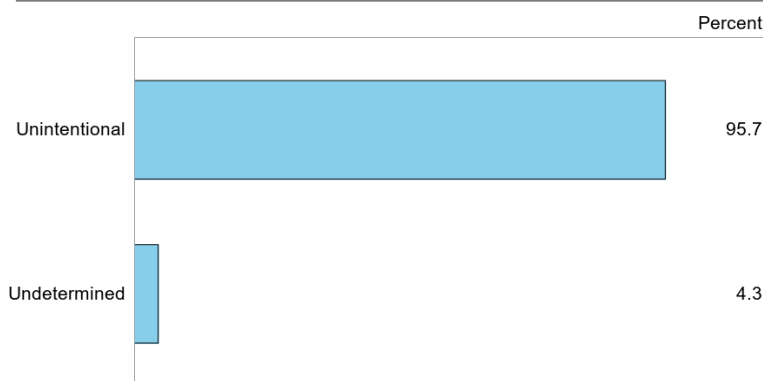
Drug overdose deaths were identified using underlying and contributing ICD-10 cause-of-death codes: X40-X44 (unintentional), X60-X64 (suicide), X85 (homicide), and Y10-Y14 (undetermined). Figure 10 shows 82.6% of drug overdose deaths had non-transport accidents as underlying death cause. Figure 11 shows that 95.7% of drug overdose deaths were unintentional deaths.

Figure 10. Drug Overdose Deaths by Underlying Cause of Death, Nevada, 2020-2021



*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 Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.*

Figure 11. Drug Overdose Deaths by Intention, Nevada, 2020-2021



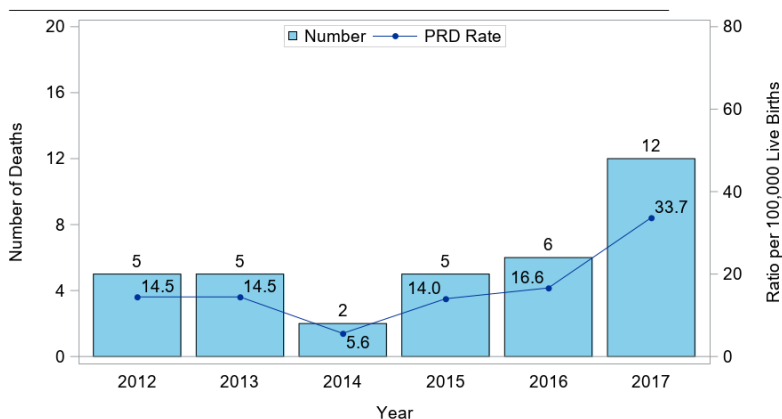
*Drug overdose deaths are identified using underlying and contributing ICD-10 cause-of-death codes: X40-X44 (unintentional), X60-X64 (suicide), X85 (homicide), and Y10-Y14 (undetermined).
Data Sources: Hospital Billing, Fetal Death, Nevada Electronic Birth and Death.*

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

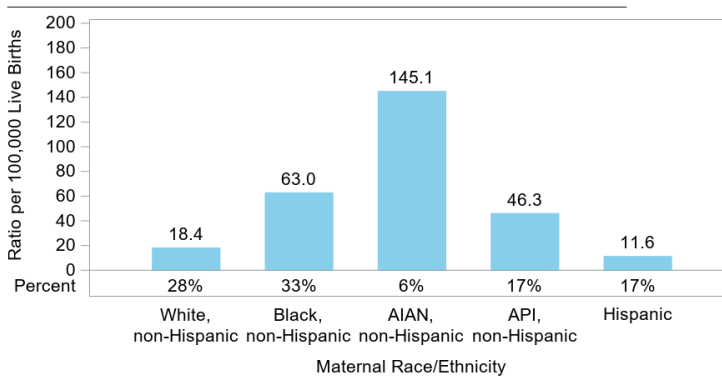


Data Sources: Pregnancy Mortality Surveillance System (PMSS), Nevada Electronic Birth and Death.

Demographics

Figure 13 shows that AIAN, non-Hispanic had highest pregnancy-related death ratio at 145.1 per 100,000 live births and 6% of the pregnancy-related deaths occurred in 2016 through 2017. Hispanic had lowest death ratio at 11.6 per 100,000 live births, accounting for 17% of all deaths.

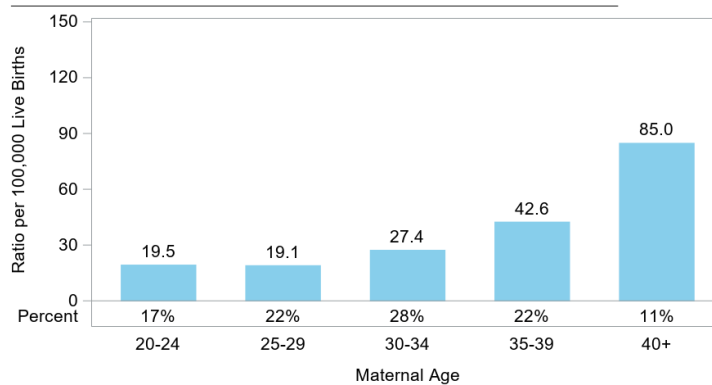
Figure 13. Pregnancy-Related Death Ratio and Percent by Race/Ethnicity Nevada, 2016 - 2017



Abbreviations: Asian or Pacific Islander(API); American Indian(AI); Alaska Native(AN).
Data Sources: Pregnancy Mortality Surveillance System (PMSS), Nevada Electronic Birth and Death.

In Figure 14, 40 and older had the highest pregnancy-related death ratio at 85.0 per 100,000 live births, followed by 35-39 age group at a ratio of 42.6 per 100,000 live births. Fifty percent of the deaths occurred among 25 to 34 age group.

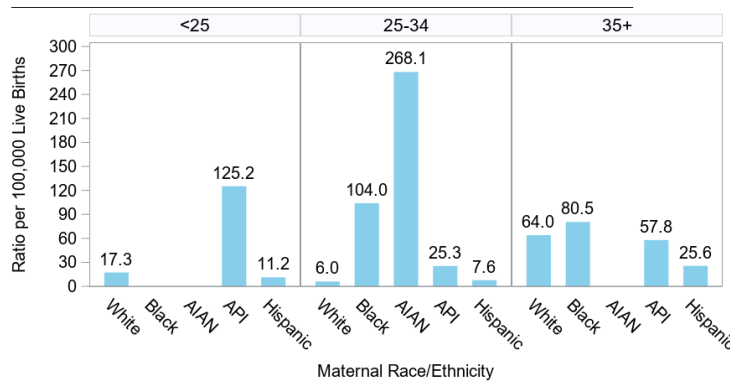
Figure 14. Pregnancy-Related Death Ratio and Percent by Maternal Age Nevada, 2016 - 2017



Data Sources: Pregnancy Mortality Surveillance System (PMSS), Nevada Electronic Birth and Death.

Figure 15 illustrates pregnancy-related death ratio for each race and ethnicity within age groups of under 25, 25-34, and 35 and older. For age group, 25 to 34 American Indian Alaska Native, non-Hispanic (AIAN) had the highest death ratio, at 268.1 per 100,000 live births and followed by black, non-Hispanic with death ratio at 104 per 100,000 live births. For 25 and under, Asian/Pacific Islander (API), non-Hispanic had the highest death ratio at 125.2 per 100,000 live births.

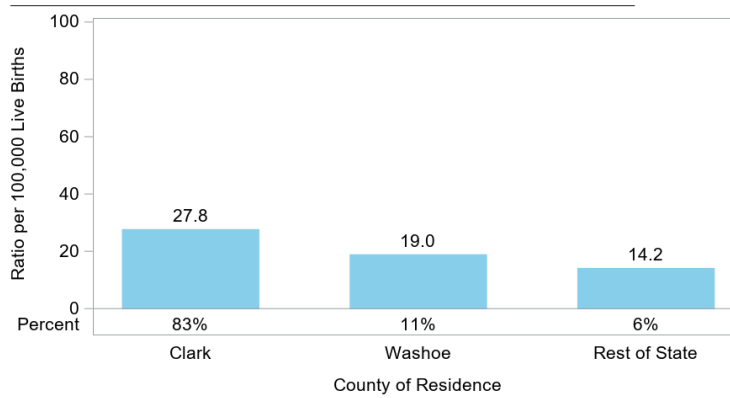
Figure 15. Pregnancy-Related Death Ratio by Maternal Age and Race/Ethnicity Nevada, 2016 - 2017



Abbreviations: Asian or Pacific Islander(API); American Indian(AI); Alaska Native(AN).
Data Sources: Pregnancy Mortality Surveillance System (PMSS), Nevada Electronic Birth and Death.

Figure 16 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.

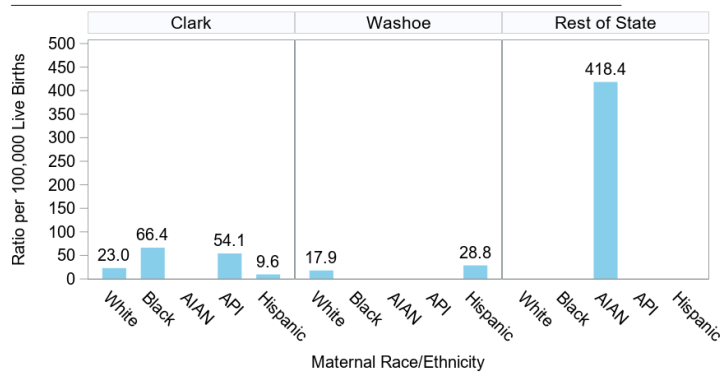
Figure 16. Pregnancy-Related Death Ratio by County of Residence Nevada, 2016 - 2017



Data Sources: Pregnancy Mortality Surveillance System (PMSS), Nevada Electronic Birth and Death.

Figure 17 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 had the highest ratio at 66.4 per 100,000 live births. While in Washoe County Hispanic had the highest ratio at 28.8 per 100,000 live births. In Rest of State, American Indian/American Native, non-Hispanic had the highest ratio at 418.4 per 100,000 live births.

Figure 17. Pregnancy-Related Death Ratio by Residence County and Race/Ethnicity, Nevada, 2016 - 2017

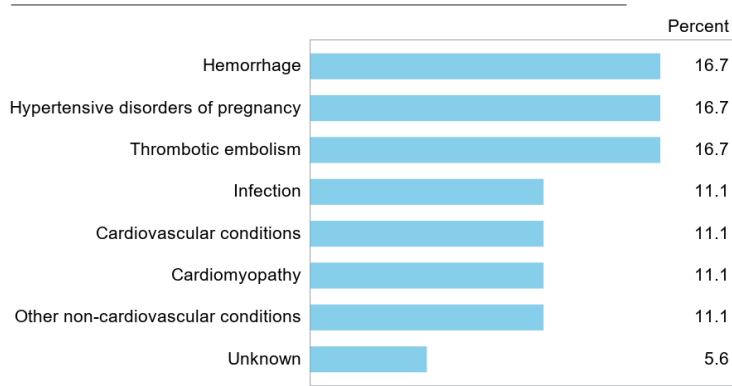


Abbreviations: Asian or Pacific Islander(API); American Indian(AI); Alaska Native(AN).
Data Sources: Pregnancy Mortality Surveillance System (PMSS), Nevada Electronic Birth and Death.

Cause of Pregnancy-Related Deaths

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

Figure 18. Cause of Death of Pregnancy-Related Deaths, Nevada, 2016 - 2017



Data Sources: Pregnancy Mortality Surveillance System (PMSS), Nevada Electronic Birth and Death.

Table 3. Count of Pregnancy-Related Deaths by Causes of Death/Race Ethnicity			
Nevada Residents, 2016 - 2017			
Causes of Death		N	%
Hemorrhage	API	2	11.1
	AIAN	1	5.6
	Total	3	16.7
Thrombotic embolism	Black	1	5.6
	White	1	5.6
	Hispanic	1	5.6
	Total	3	16.7
Hypertensive disorders of pregnancy	Black	2	11.1
	API	1	5.6
	Total	3	16.7
Cardiovascular conditions	Black	1	5.6
	White	1	5.6

	Total	2	11.1
Infection	White	1	5.6
	Hispanic	1	5.6
	Total	2	11.1
Cardiomyopathy	Black	1	5.6
	White	1	5.6
	Total	2	11.1
Other non-cardiovascular conditions	Black	1	5.6
	White	1	5.6
	Total	2	11.1
Unknown	Hispanic	1	5.6
	Total	1	5.6
Total	Black	6	33.3
	White	5	27.8
	API	3	16.7
	Hispanic	3	16.7
	AIAN	1	5.6
	Total	18	100
<i>Data Sources: Pregnancy Mortality Surveillance System (PMSS), Nevada Electronic Birth and Death.</i>			

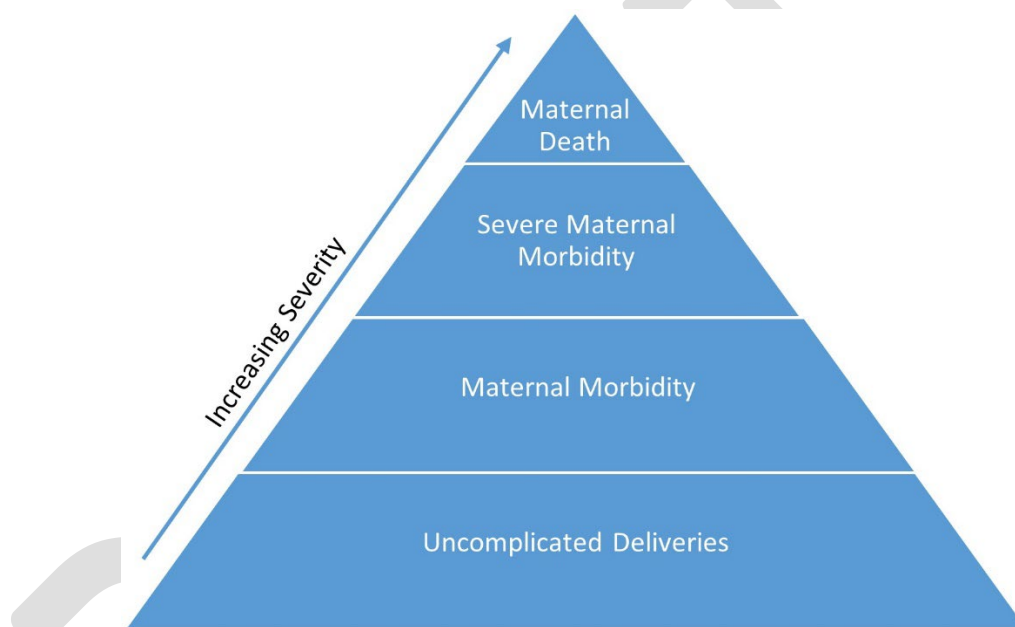
Table 4. Count of Pregnancy-Related Deaths by Causes of Death by County			
Nevada Residents, 2016 - 2017			
Causes of Death		N	%
Hemorrhage	Clark	2	11.1
	Rest of State	1	5.6
	Total	3	16.7
Thrombotic embolism	Clark	2	11.1
	Washoe	1	5.6
	Total	3	16.7
Hypertensive disorders of pregnancy	Clark	3	16.7
	Total	3	16.7
Cardiovascular conditions	Clark	2	11.1
	Total	2	11.1
Infection	Clark	1	5.6

	Washoe	1	5.6
	Total	2	11.1
Cardiomyopathy	Clark	2	11.1
	Total	2	11.1
Other non-cardiovascular conditions	Clark	2	11.1
	Total	2	11.1
Unknown	Clark	1	5.6
	Total	1	5.6
Total	Clark	15	83.3
	Washoe	2	11.1
	Rest of State	1	5.6
	Total	18	100

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Severe Maternal Morbidity (SMM)

Figure 19 below illustrates the maternal morbidity continuum. The Centers for Disease Control and Prevention (CDC) reports that it has been steadily increasing in recent years and has affected more than 50,000 pregnant people in the United States in 2014.⁵ The overall rate of SMM per 10,000 deliveries increased almost 200% over the years, from 49.5 in 1993 to 144.0 in 2014.⁵ Blood transfusions play a primary role in this increase.⁵ A blood transfusion refers to the procedure in which pregnant people 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 2014.⁵ There was a 20% increase in the rate of SMM per 10,000 deliveries after excluding blood transfusions (28.6 per 10,000 deliveries in 1993 to 35.0 per 10,000 deliveries in 2014).⁵



Methodology

Data Sources

Nevada Electronic Birth Registration Data

Nevada Department of Health and Human Services, Office of Vital Records used Web-enabled Vital Records Registry System (WEVRRS) to collect information on all live births in Nevada and issue birth certificates. The birth certificate contains demographic information, such as the mother's age, race, education, and pregnancy information, such as parity and prenatal care.

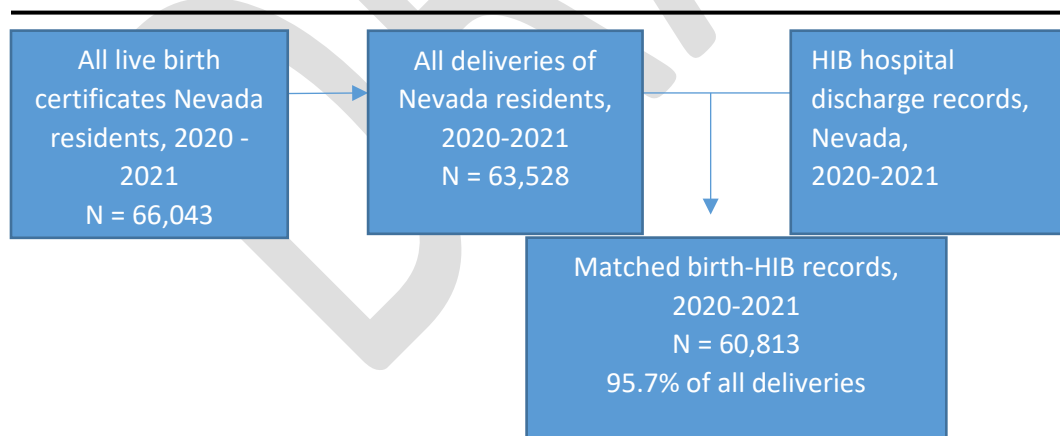
Hospital Inpatient Billing (HIB) Data

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. The data are for patients admitted for at least 24 hours as an inpatient but do not include patients discharged from the emergency room. The data consists of demographics such as age, gender, race/ethnicity and uses International Classification of Diseases-10-Clinical 5 Modification (ICD-10-CM) diagnoses (up to 33 diagnoses respectively). In addition, the data includes billed hospital charges, procedure codes, length of hospital stay, discharge status, and external cause of injury codes. 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 with multiple births). The total number of live births to Nevada residents was 66,043 from January 2020 to December 2021. The total number of deliveries was 63,528, comprising all records from singleton births and one record per multiple births. Approximately 95.7% of all deliveries were matched with a hospital discharge record. All analyses are based on matched data (N=60,813). Birth certificates and hospital discharge records were matched with the 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 numbers, misspelled names, etc.

Figure 20. Data Matching Process for Birth Certificates and HIB Records, Nevada, 2020-2021



Identification of Severe Maternal Morbidity (SMM)

SMM events were identified during delivery hospitalizations using an algorithm developed by researchers at the CDC.⁶ 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 was 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 90th 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 this report include blood transfusion in SMM calculation unless otherwise noted. P-values less than 0.05 were deemed statistically significant.

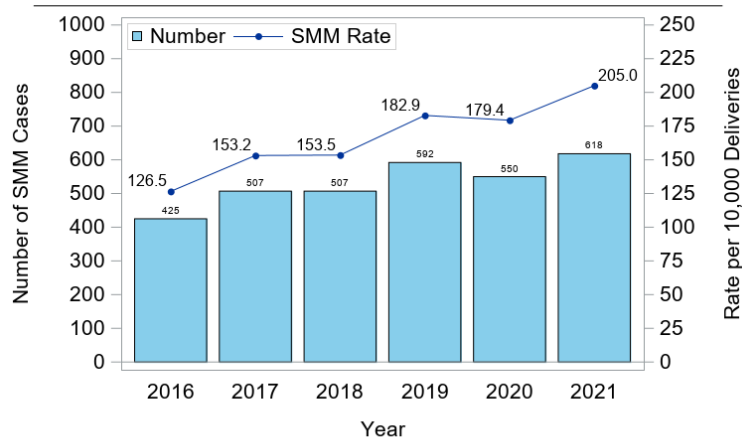
Records with missing data on a variable of interest were not represented in the graph of SMM but are represented in the tables.

All analyses were conducted using SAS 9.4.

Findings

The SMM ratio in Nevada increased from 2016 to 2021 from 126.5 to 205.0, with the highest ratio in 2021, at 205.6 per 100,000 live births with a total of 618 cases (Figure 21).

Figure 21. Severe Maternal Morbidity Rate per 10,000 Deliveries and Number of Cases, Nevada Residents, 2016 - 2021

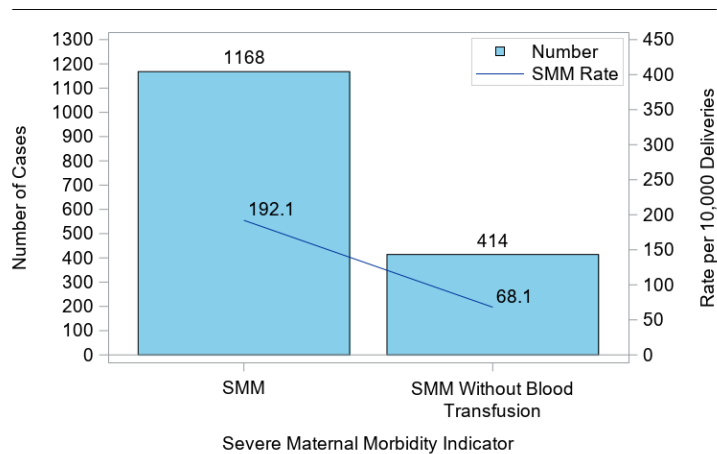


Data Sources: Hospital Inpatient Billing and Nevada Electronic Birth.

Leading Indicators

The 1168 SMM cases were found in January 2020 through December 2021 included blood transfusions in the calculation. However, when excluding blood transfusions from the equation, the case count dropped to 414 and the rate decreased from 192.1 to 68.1 per 10,000 deliveries (Figure 22).

Figure 22. Severe Maternal Morbidity Rate per 10,000 Deliveries and Number of Cases, Nevada, 2020 - 2021



Data Sources: Hospital Inpatient Billing and Nevada Electronic Birth.

Most deliveries with SMM (83%) had one indicator (out of a total of 21 SMM indicators), 10% of deliveries in 2020 through 2021 had two indicators, and 7% of deliveries had three or more indicators present (Figure 23).

Figure 23. Distribution of SMM Indicators, Nevada, 2020-2021

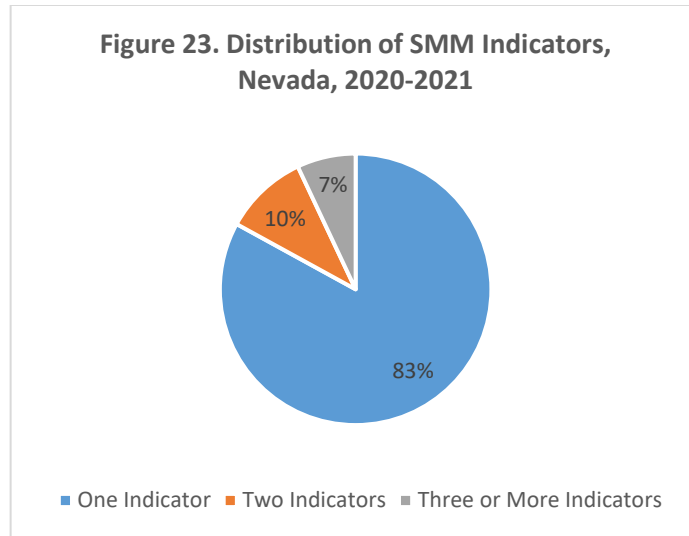


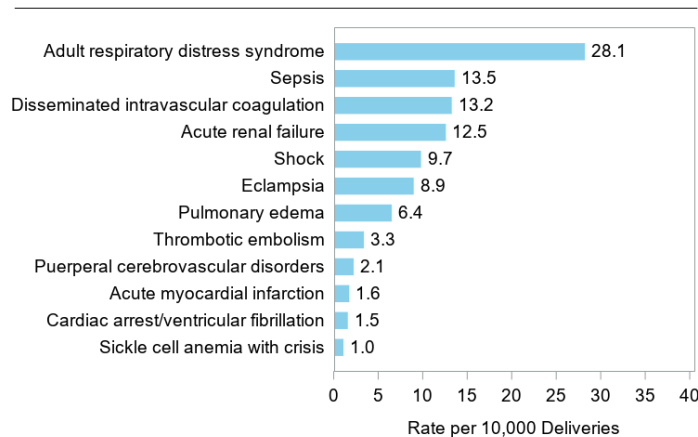
Table 5 and Figure 24 show that the leading diagnosis-based indicators of SMM were adult respiratory distress syndrome (28.1 per 10,000 deliveries), sepsis (13.5 per 10,000 deliveries), disseminated intravascular coagulation (13.2 per 10,000 deliveries), acute renal failure (12.5 per 10,000 deliveries), shock (9.7 per 10,000 deliveries), eclampsia (8.9 per 10,000 deliveries), pulmonary edema (6.4 per 10,000 deliveries), thrombotic embolism (3.3 per 10,000 deliveries), Puerperal cerebrovascular disorders (2.1 per 10,000 deliveries), acute myocardial infarction (1.6 per 10,000 deliveries), cardiac arrest or ventricular fibrillation (1.5 per 10,000 deliveries), and lastly Sick cell anemia with crisis (1.0 per 10,000 deliveries). Around 52% of adult respiratory distress syndrome cases were confirmed COVID-19 cases in these two years.⁷ See Appendix A for a complete list and description of SMM indicators.

SMM indicator	Rate per 10,000 deliveries
Diagnosis-based Indicators	
Adult respiratory distress syndrome	28.1
Sepsis	13.5
Disseminated intravascular coagulation	13.2
Acute renal failure	12.5
Shock	9.7
Eclampsia	8.9
Pulmonary edema	6.4
Thrombotic embolism	3.3
Puerperal cerebrovascular disorders	2.1
Acute myocardial infarction	1.6
Cardiac arrest/ventricular fibrillation	1.5

Sickle cell anemia with crisis	1
Aneurysm	0.5
Severe anesthesia complications	0.2
Procedure-based Indicators	
Blood transfusion	141.9
Hysterectomy	19.9
Ventilation	10.4
Conversion of cardiac rhythm	1.2
Temporary tracheostomy	0.7
SMM Rate Overall	276.6

* Four indicators were not carried over to ICD-10-CM codes system from ICD-9-CM.

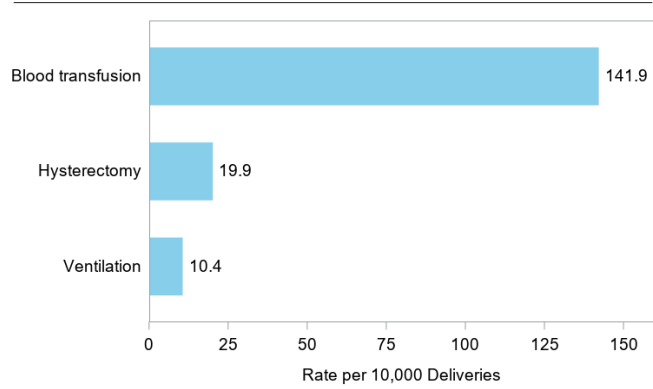
Figure 24. Leading Diagnosis-Based Indicators of Severe Maternal Morbidity Nevada, 2020 - 2021



Data Sources: Hospital Inpatient Billing and Nevada Electronic Birth.

Table 5 and Figure 25 show that the leading procedure-based indicators of SMM were blood transfusion (141.9 per 10,000 deliveries), hysterectomy (19.9 per 10,000 deliveries), and ventilation (10.4 per 10,000 deliveries). See Appendix A for a complete list and description of SMM indicators.

**Figure 25. Leading Procedure-Based Indicators of Severe Maternal Morbidity
Nevada, 2020 - 2021**



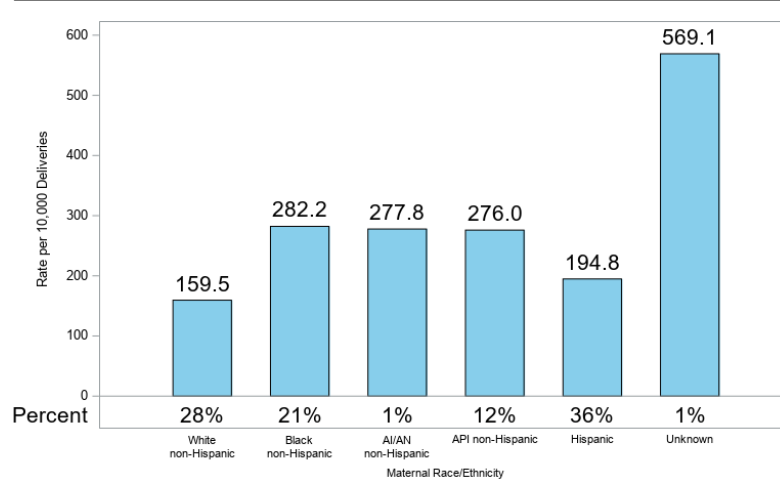
Data Sources: Hospital Inpatient Billing and Nevada Electronic Birth.

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Maternal Demographic Characteristics

When comparing race and ethnicity among those SMM cases that were known, Black, non-Hispanic had the highest SMM rate of 282.2 per 10,000 deliveries followed by AI/AN, non-Hispanic who had an SMM rate of 277.8 per 10,000 deliveries. Conversely, Black and AI/AN, non-Hispanic only accounted for 21% and 1% of all SMM cases. Hispanic accounted for the highest proportion of SMM cases (36%) followed by White, non-Hispanic (28%). Hispanic and White, non-Hispanic had the lowest rates of SMM (194.8 and 159.5 per 10,000 deliveries). (Figure 26).

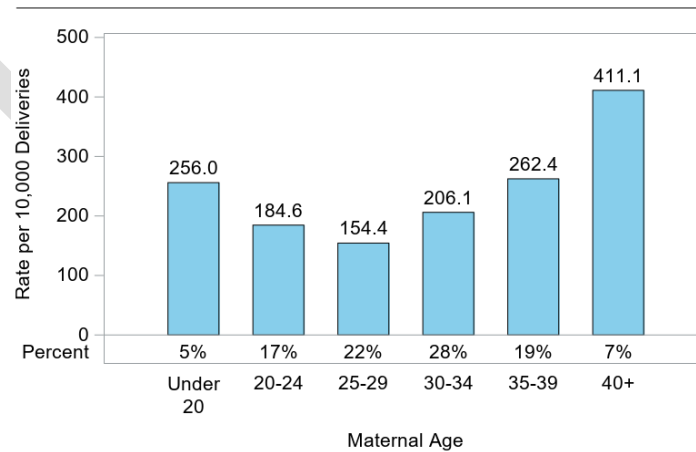
Figure 26. Severe Maternal Morbidity Rate and Percent by Race/Ethnicity Nevada, 2020 - 2021



Abbreviations: Asian or Pacific Islander(API); American Indian(AI); Alaska Native(AN).
Data Sources: Hospital Inpatient Billing and Nevada Electronic Birth.

When stratifying SMM cases by age groups, although 40 years and older age group only accounted for 7% of all SMM cases, they had the highest SMM rate of 411.1 per 10,000 deliveries. 25-29 age group accounted for approximately 22% of SMM cases and had the lowest rate of SMM (154.4 per 10,000 deliveries) (Figure 27).

Figure 27. Severe Maternal Morbidity Rate and Percent by Age Nevada, 2020 - 2021



Data Sources: Hospital Inpatient Billing and Nevada Electronic Birth.

Table 6. shows the comparisons of maternal demographic characteristics among SMM cases. When considering the SMM rate including blood transfusions, the SMM is significantly associated with maternal **Maternal Mortality and Severe Maternal Morbidity Report, Nevada 2020-2021**

age ($p < 0.0001$), maternal race and ethnicity ($p < 0.0001$), education ($p = 0.0030$), and health insurance status ($p = 0.0018$).

Table 6. Severe Maternal Morbidity by Maternal Demographics Nevada 2020 - 2021						
Demographics	SMM Cases	Rate per 10,000 Deliveries	Count of Deliveries	Percent of Deliveries	Percent of SMM Cases	Chi-Square P-value
Maternal Age (Years)						
<=19	58	213.3	2719	4.5	5	<0.0001
20-24	198	169.1	11707	19.3	17	
25-29	289	160.8	17978	29.6	24.7	
30-34	321	188.2	17052	28	27.5	
35-39	224	245.5	9126	15	19.2	
>=40	78	350.2	2227	3.7	6.7	
Race/ Ethnicity						
White	330	152	21707	35.7	28.3	<0.0001
Black	262	279.9	9359	15.4	22.4	
Native American	12	244.4	491	0.8	1	
Asian	133	230.3	5774	9.5	11.4	
Hispanic	419	181.3	23105	38	35.9	
Other	0	0	118	0.2	0	
Unknown	12	470.6	255	0.4	1	
Education						
Less than High School	177	215.1	8228	13.5	15.2	0.003
High School Graduate	411	202.2	20325	33.4	35.2	
Some College	292	171.9	16990	27.9	25	
College Graduate or Higher	212	159	13331	21.9	18.2	
Unknown	76	392.8	1935	3.2	6.5	
Insurance*						
Medicaid	568	209.6	27105	44.6	48.6	0.0018
Other Government	30	276	1087	1.8	2.6	
Private	522	171.2	30499	50.2	44.7	
Self-pay	30	198.3	1513	2.5	2.6	
Other	13	270.8	480	0.8	1.1	
Unknown	5	400	125	0.2	0.4	

* Health Insurance status indicates the primary payer for the delivery as recorded on hospital discharge form.

Prenatal and Delivery Characteristics

Table 7 shows that the SMM rate including blood transfusions is significantly associated with prenatal care initiation ($p < 0.0001$), adequacy of prenatal care ($p < 0.0001$), parity ($p = 0.0105$), method of delivery ($p < 0.0001$), plurality ($p < 0.0001$), and chronic disease status ($p < 0.0001$).

Table 7. Severe Maternal Morbidity Indicators per 10,000 Deliveries

Nevada, 2020 - 2021

Indicator	SMM Cases	Rate per 10,000 Deliveries	Count of Deliveries	Percent of Deliveries	Percent of SMM Cases	Chi-Square P-value
Prenatal Care Initiation						
No Care	60	424.9	1412	2.3	5.1	<0.0001
First Trimester	775	168.4	46012	75.7	66.4	
Second Trimester	164	195.5	8387	13.8	14	
Third Trimester	48	285	1684	2.8	4.1	
Had Care but Unknown Start Date	9	205.9	437	0.7	0.8	
Unknown	112	389.3	2877	4.7	9.6	
Adequacy of Prenatal Care						
Data Missing/Unknown	185	385	4805	7.9	15.8	<0.0001
Inadequate	135	229.4	5884	9.7	11.6	
Intermediate	82	153	5361	8.8	7	
Adequate	328	136.7	23998	39.5	28.1	
Adequate Plus	438	211	20761	34.1	37.5	
Parity						
0 Previous Live Births	465	198.8	23393	38.5	39.8	<0.0001
1 Previous Live Births	253	143.9	17579	28.9	21.7	
2+ Previous Live Births	447	225.9	19787	32.5	38.3	
Unknown	3	600	50	0.1	0.3	
Method of Delivery*						
Repeat Cesarean	317	317.3	9989	16.4	27.1	<0.0001
Primary Cesarean	456	437.7	10418	17.1	39	

Vaginal	395	97.8	40402	66.4	33.8	
Plurality						
Singleton Birth	1096	183.2	59820	98.4	93.8	<0.0001
Multiple Birth	72	728	989	1.6	6.2	
Pre-Pregnancy BMI~						
Underweight (<18.5)	36	175.4	2052	3.4	3.1	0.2207
Normal Weight (18.5- 24.9)	420	176.1	23851	39.2	36	
Overweight (25.0 - 29.9)	274	171.2	16008	26.3	23.5	
Class I (30.0 - 34.9)	198	206.4	9591	15.8	17	
Class II (35.0 - 39.9)	95	207.7	4573	7.5	8.1	
Class III (>=40)	63	201.5	3126	5.1	5.4	
Unknown	82	510	1608	2.6	7	
Chronic Disease^						
No Chronic Disease	77	404.4	1904	3.1	6.6	<0.0001
Any Chronic Disease	1091	185.2	58905	96.9	93.4	

*Method of delivery was identified from hospital discharge data using ICD-10 codes. Four indicators were not carried over to ICD-10-CM codes system from ICD -9-CM.

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

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

Conclusions

The highest pregnancy-associated death ratio was 119.1 per 100,000 births in Nevada in 2020. Black, non-Hispanic had highest pregnancy-associated death ratio at 398.6 per 100,000 live births and 25% of the pregnancy-associated deaths followed by Asian, Pacific Islander at 264.6 per 100,000 live births and 10% of the pregnancy-associated deaths, and White, non-Hispanic (233.0 per 100,000 live births and 37% of pregnancy-associated deaths). Age group 35 and older accounted for 37% of pregnancy-associated deaths. 40 and older age group had the highest pregnancy-associated death ratio at 974.1 per 100,000 live births. In Washoe county Black, non-Hispanic persons had the highest rates of pregnancy-associated deaths at 466.2. Black, non-Hispanic race group had the highest rates of pregnancy-associated deaths at 453.1 per 100,000 live births for the 35 and above age group while API had the highest rate at 417.2 for the below 25 age group. Pregnancy, childbirth, and the puerperium was the most common death cause accounting for 29.1% of all pregnancy-associated deaths. Pregnancy-associated deaths rate have increased from 60 per 100,000 live births in 2019 to 119.1 per 100,000 live births in 2020 and then a slight decrease at 116.4 in 2021.

Nevada's severe maternal morbidity (SMM) rate was 205.6 per 10,000 deliveries in 2021. Most deliveries with SMM (83%) had at least one indicator. The top three leading diagnosis-based indicators for SMM were adult respiratory distress syndrome, sepsis, and disseminated intravascular coagulation. The leading procedure-based indicator was blood transfusion. When comparing demographic characteristics, mother's age, race/ethnicity, health insurance status, adequacy of prenatal care, parity, method of delivery, plurality, and chronic disease are all risk factors for severe maternal morbidity. Black, non-Hispanic accounted for 21% of SMM cases but had the highest pregnancy associated SMM rate followed by AI/AN, non-Hispanic who accounted for 1% of SMM cases (282.2 and 277.8 per 10,000 deliveries, respectively). Age group 40 years and older had the highest rate of SMM (411.1 per 10,000 deliveries) and accounted for 7% of cases. 25-29 age group had the lowest rate (154.4 per 10,000 deliveries) and accounted for 22% of cases. The SMM case count (618) was higher in 2021 and there has been an increase in the SMM rate 205.0 per 10,000 deliveries than in 2020 (rate at 179.4).

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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	OUT90ZZ, OUT94ZZ, OUT97ZZ, OUT98ZZ, OUT9FZZ, OUT90ZL
	Temporary tracheostomy	OB110Z4, OB110F4, OB113Z4, OB113F4, OB114Z4, OB114F4
	Ventilation	5A1935Z, 5A1945Z, 5A1955Z