Kansas Maternal Mortality Report 2016-2018

Including Severe Maternal Morbidity, 2016-2019

December 2020

Kansas Maternal Mortality Review Committee

KANSAS MATERNAL & CHILD HEALTH

Kansas Department of Health and Environment

Kansas Maternal Mortality Review

Purpose

The purpose of the review is to determine the factors contributing to maternal mortality in Kansas and identify public health and clinical interventions to improve systems of care. Maternal Mortality includes deaths occurring during pregnancy and up to one year after pregnancy.

Mission

The mission is to increase awareness of the issues surrounding pregnancy-related death and to promote change among individuals, communities, and healthcare systems in order to reduce the number of deaths.

Vision

The Maternal Mortality Review Committee's vision is to eliminate preventable maternal deaths in Kansas.

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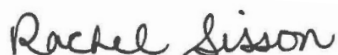
Laura Kelly, Governor

December 2020

Dear Fellow Kansans:

As Kansas Title V Maternal and Child Health (MCH) Director, it is my pleasure to release the inaugural Kansas Maternal Mortality Report and to acknowledge the discipline and passion that guided the development of the report. This report is the culmination of two years of work completed by the Kansas Maternal Mortality Review Committee (KMMRC), tasked with reviewing maternal deaths that occurred in Kansas during 2016-2018. The goal of this report is to identify statewide trends in maternal mortality and provide recommendations to prevent maternal mortality and improve the health of Kansas residents. The recommendations included in this report focus on five primary categories: women and their families, health care providers, hospitals/facilities, system of care, and community. Each set of recommendations addresses specific areas of concern based on the KMMRC's findings and proposes actions which, once implemented, are expected to prevent and reduce maternal mortalities.

Case reviews enable the KMMRC to identify changing trends and areas for statewide improvement with the goal of preventing maternal mortality. Despite the unprecedented public health emergency posed by COVID-19, the KMMRC has continued its work. The committee met virtually in March 2020 to complete 2017 case reviews and begin 2018. In July 2020, they again met virtually to complete 2018 case reviews and begin 2019. A report on the 2016-2020 findings will be issued after the 2019 and 2020 case reviews are completed.

The Kansas Department of Health and Environment extends its sincere appreciation and thanks to those who serve on the KMMRC. Members have contributed their time and expertise to reviewing maternal deaths and developing this report. Thank you for your engagement, dedication and commitment to working together for a healthier Kansas.

Sincerely,

Rachel Sisson

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Acknowledgements

This report is dedicated to all women who lost their lives during and within one year after pregnancy from any cause. We would like to acknowledge the 57 women who died while pregnant or within one year of their pregnancy that occurred in Kansas during 2016-2018 as well as their loved ones. We hope that our efforts to better understand the underlying causes of maternal mortality will help prevent other Kansas families from experiencing this same trauma.

We would like to acknowledge all of those involved in the passage of Senate Substitute for House Bill (HB) 2600 (originally HB 2573) during the 2018 Legislative Session that authorized comprehensive review of maternal deaths. Language in HB 2573, now Kansas law, amended existing law (K.S.A. 65-177) to strengthen efforts related to monitoring maternal health, including pregnancy-associated deaths. Specifically, the amended law grants the Kansas Department of Health and Environment (KDHE) access to all necessary information to implement a comprehensive process to review each pregnancy-associated death and protects all people, records, and interviews obtained as part of each review. The law also allows for routine compilation and wide distribution of aggregate, non-individually identifiable data to further the study of causes and problems associated with deaths. This process leads to informed, data-driven recommendations for actions that reduce death and support health/wellness during the pregnancy, childbirth, and postpartum periods.

We would like to acknowledge some of the design, organization, and contents of this report was inspired by/adapted from the Trends and Disparities in Delivery Hospitalizations Involving Severe Maternal Morbidity, 2006-2015; Illinois Maternal Morbidity and Mortality Report, October 2018; A Report on Pregnancy-Associated Deaths in Ohio, 2008-2016; CDC Building U.S. Capacity to Review and Prevent Maternal Deaths, Report from Nine Maternal Mortality Review Committees; Louisiana Pregnancy-Associated Mortality Review, 2017 Report; Tennessee Maternal Mortality, Review of 2017 Maternal Deaths; and CDC Maternal Mortality Prevention Team, Maternal Mortality Review Information Application (MMRIA) Form v20.

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Key Definitions[1,2]

The following definitions are used throughout this report.

Pregnancy-associated death. The death of a woman while pregnant or anytime within one year of pregnancy regardless of cause.

- **Pregnancy-related death.** 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-associated, but not-related death.** The death of a woman during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy.

- **Pregnancy-associated but unable to determine pregnancy relatedness.** The death of a woman while pregnant or within one year of pregnancy, due to a cause that could not be determined to be pregnancy-related or not pregnancy-related.

Not pregnancy-related or -associated death (i.e., false positive). Woman was not pregnant within one year of her death.

Pregnancy-associated mortality ratio (PAMR). The number of pregnancy-associated deaths per 100,000 live births.

Pregnancy-related mortality ratio (PRMR). The number of pregnancy-related deaths per 100,000 live births.

Pregnancy-associated, but not-related, mortality ratio. The number of pregnancy-associated deaths, that were not pregnancy-related, per 100,000 live births.

Chance to alter outcome. The review committee determination if there was no chance, some chance, or a good chance "of the death being averted by one or more reasonable changes to patient, family, community, provider, and/or systems factors."

Preventability. A death was considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors.

Contributing factor. Factors identified by the review committee that contributed to the death. These are steps along the way that, if altered, may have prevented the woman's death. The factors may be related to the patient, health care providers, facilities/hospitals where the woman

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[1] A Report on Pregnancy-Associated Deaths in Ohio 2008-2016. The Ohio Department of Health 2019. https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/pregnancy-associated-mortality-review/resources/Pregnancy-Associated-Deaths-Ohio-2008-2016.

[2] Centers for Disease Control and Prevention. Division of Reproductive Health. Building U.S. Capacity to Review and Prevent Maternal Deaths Program. Maternal Mortality Review Committee Decisions Form v20. October 13, 2020. https://reviewtoaction.org/content/maternal-mortality-review-committee-decisions-form.

sought care, or to the systems that influence the lifestyle, care, and health services for the woman.

Contributing factor descriptions:

- **Lack of access/financial resources.** Systemic barriers (e.g., lack or loss of healthcare insurance or other financial duress, as opposed to noncompliance), impacted their ability to care for themself (e.g., did not seek services because unable to miss work or afford postpartum visits after insurance expired). Other barriers to accessing care: insurance non-eligibility, provider shortage in their geographical area, and lack of public transportation.

- **Adherence to medical recommendations.** The provider or patient did not follow protocol or failed to comply with standard procedures (i.e., non-adherence to prescribed medications).

- **Failure to screen/inadequate assessment of risk.** Factors placing the individual at risk for a poor clinical outcome recognized, and they were not transferred/transported to a provider able to give a higher level of care.

- **Childhood sexual abuse/trauma.** The patient experienced rape, molestation, or one or more of the following: sexual exploitation during childhood plus persuasion, inducement, or coercion of a child to engage in sexually explicit conduct; physical or emotional abuse or violence other than that related to sexual abuse during childhood.

- **Chronic disease.** Occurrence of one or more significant pre-existing medical conditions (e.g., obesity, cardiovascular disease, or diabetes).

- **Clinical skill/quality of care (provider or facility perspective).** Personnel were not appropriately skilled for the situation or did not exercise clinical judgment consistent with current standards of care (e.g., error in the preparation or administration of medication or unavailability of translation services).

- **Poor communication/lack of case coordination or management/ lack of continuity of care (system perspective).** Care was fragmented (i.e., uncoordinated or not comprehensive) among or between healthcare facilities or units, (e.g., records not available between inpatient and outpatient or among units within the hospital, such as Emergency Department and Labor and Delivery).

- **Lack of continuity of care (provider or facility perspective).** Care providers did not have access to individual's complete records or did not communicate their status sufficiently. Lack of continuity can be between prenatal, labor and delivery, and postpartum providers.

- **Cultural/religious, or language factors**. The provider or patient demonstrated that any of these factors was either a barrier to care due to lack of understanding or led to refusal of therapy due to beliefs (or belief systems).

- **Delay.** The provider or patient was delayed in referring or accessing care, treatment, or follow-up care/action.

- **Discrimination.** Treating someone less or more favorably based on the group, class or category they belong to resulting from biases, prejudices, and stereotyping. It can manifest as differences in care, clinical communication and shared decision-making. (Smedley et al, 2003 and Dr. Rachel Hardeman)

- **Environmental factors.** Factors related to weather or social environment.

- **Inadequate or unavailable equipment/technology.** Equipment was missing, unavailable, or not functional, (e.g., absence of blood tubing connector).

- **Interpersonal racism.** Discriminatory interactions between individuals based on differential assumptions about the abilities, motives, and intentions of others and resulting in differential actions toward others based on their race. It can be conscious as well as unconscious, and it includes acts of commission and acts of omission. It manifests as lack of respect, suspicion, devaluation, scapegoating, and dehumanization. (Jones, CP, 2000 and Dr. Cornelia Graves).

- **Knowledge - lack of knowledge regarding importance of event or of treatment or follow-up.** The provider or patient did not receive adequate education or lacked knowledge or understanding regarding the significance of a health event (e.g., shortness of breath as a trigger to seek immediate care) or lacked understanding about the need for treatment/follow-up after evaluation for a health event (e.g., needed to keep appointment for psychiatric referral after an ED visit for exacerbation of depression).

- **Inadequate law enforcement response.** Law enforcement response was not in a timely manner or was not appropriate or thorough in scope.

- **Legal.** Legal considerations that impacted outcome.

- **Mental health conditions.** The patient carried a diagnosis of a psychiatric disorder. This includes postpartum depression.

- **Inadequate community outreach/resources.** Lack of coordination between healthcare system and other outside agencies/organizations in the geographic/cultural area that work with maternal health issues.

- **Lack of standardized policies/procedures.** The facility lacked basic policies or infrastructure germane to the individual's needs (e.g., response to high blood pressure, or a lack of or outdated policy or protocol).

- **Lack of referral or consultation.** Specialists were not consulted or did not provide care; referrals to specialists were not made.

- **Structural racism.** The systems of power based on historical injustices and contemporary social factors that systematically disadvantage people of color and advantage white people through inequities in housing, education, employment, earnings, benefits, credit, media, health care, criminal justice, etc. – (Adapted from Bailey ZD. Lancet. 2017 and Dr. Carla Ortique)

- **Social support/isolation - lack of family/friend or support system.** Social support from family, partner, or friends was lacking, inadequate, and/or dysfunctional.

- **Substance use disorder - alcohol, illicit/prescription drugs.** Substance use disorder is characterized by recurrent use of alcohol and/or drugs causing clinically and functionally significant impairment, such as health problems or disability. The committee may determine that substance use disorder contributed to the death when the disorder directly compromised their health status (e.g., acute methamphetamine intoxication exacerbated pregnancy- induced hypertension, or they were more vulnerable to infections or medical conditions).

- **Tobacco use.** The patient's use of tobacco directly compromised the patient's health status (e.g., long-term smoking led to underlying chronic lung disease).

- **Unstable housing.** Individual lived "on the street," in a homeless shelter, or in transitional or temporary circumstances with family or friends.

- **Violence and intimate partner violence (IPV)**. Physical or emotional abuse perpetrated by current or former intimate partner, family member, friend, acquaintance, or stranger.

- **Other.** Contributing factor not otherwise mentioned. Please provide description.

Prevention type:

- **Primary.** Prevents the contributing factor before it ever occurs

- **Secondary.** Reduces the impact of the contributing factor once it has occurred (i.e., treatment)

- **Tertiary.** Reduces the impact or progression of what has become an ongoing contributing factor (i.e., management of complications)

Expected impact:

- **Small.** Education/counseling (e.g., community- and/or provider- based health promotion and education activities)

- **Medium.** Clinical intervention and coordination of care across continuum of well-woman visits (e.g., protocols, prescriptions)

- **Large.** Long-lasting protective intervention (e.g., improve readiness, recognition and response to obstetric emergencies or long-term interventions such as long-acting reversible contraceptives (LARCs))

- **Extra Large.** Change in context (e.g., promote environments that support healthy living/ensure available and accessible services)

- **Giant.** Address social determinants of health (e.g., poverty, inequality, etc.)

Executive Summary

The issue of maternal morbidity and mortality is complex. Severe maternal morbidity (SMM) occurs nearly 100 times more frequently than maternal death, the "tip of the iceberg" for adverse maternal outcomes.[3] Death certificates do not include all the information needed to evaluate the proximate and contributory causes of maternal mortality, whether the deaths were actually related to the pregnancy, and whether the deaths were preventable. Nationally, the Centers for Disease Control and Prevention (CDC), Pregnancy Mortality Surveillance System (PMSS) indicates the pregnancy-related mortality ratios have been relatively stagnant in the past decade[4], which underscores the need for more work in optimizing maternal health. The Kansas Department of Health and Environment (KDHE) identifies all pregnancy-associated deaths, or deaths occurring while a woman is pregnant or within a year of pregnancy, to collect data on maternal mortality. KDHE has worked with the Kansas Maternal Mortality Review Committee (KMMRC) to review cases of pregnancy-associated death that occurred in Kansas during 2016-2018. The aim of the KMMRC is to better understand the causes of maternal mortality and develop statewide recommendations to prevent future maternal deaths, as well as determine whether the deaths were pregnancy-related (occurring due to a pregnancy complication) and whether they were preventable.

Key Findings

Severe Maternal Morbidity: During 2016-2019, of the 132,643 delivery hospitalizations of Kansas residents, 767 deliveries with one or more severe maternal morbidities were identified, representing a rate of 57.8 per 10,000 delivery hospitalizations. This implies that about *1 in 173 women who delivered a baby experienced SMM*.

- The rate of SMM at delivery increased 13.4% from 54.6 in 2016 to 61.9 per 10,000 delivery hospitalizations in 2019, although this increase was not statistically significant.
- The top five most common indicators of SMM were acute renal failure, disseminated intravascular coagulation, sepsis, hysterectomy, and adult/acute respiratory distress syndrome (10.3, 10.1, 9.3, 9.0, 8.8 per 10,000 delivery hospitalizations, respectively).
- Some conditions often involved procedural intervention. In 2016-2019, one-quarter of deliveries with shock had a hysterectomy.
- SMM was *highest among women aged 40+ years* and lowest for those aged 25-29 years (150.6 and 44.6 per 10,000 delivery hospitalizations, respectively).
- Despite the downward trend in the SMM rate of non-Hispanic Black women during 2016-2019, the overall rate of SMM per 10,000 delivery hospitalizations for non-Hispanic Black women was 100.4: 58.3% higher than the rate among Hispanics (63.7), 72.2% higher than the rate among non-Hispanic Asian/Pacific Islanders (58.3), and 87.3% higher than the rate among non-Hispanic White women (53.6). The SMM rate for *non-Hispanic Blacks was significantly higher than any other race and ethnicity*.
- Compared with other deliveries, *women who were on Medicaid or from low-income ZIP Codes were more likely to experience SMM*.

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[3] Ohio Department of Health. Severe Maternal Morbidity (SMM) Factsheet. https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/pregnancy-associated-mortality-review/smm
[4] Centers for Disease Control and Prevention. Pregnancy Mortality Surveillance System. https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm

Maternal Mortality: Of the 75 identified deaths that occurred in Kansas (regardless of residency) in 2016-2018, the KMMRC determined that 57 deaths were pregnancy-associated.

Of the 57 pregnancy-associated deaths reviewed, the KMMRC determined (Figure 1):
- 13 deaths (22.8%) were pregnancy-related
- 32 deaths (56.1%) were pregnancy-associated, but not-related, and
- 12 deaths (21.1%) were pregnancy-associated but unable to determine pregnancy-relatedness.

Figure 1. Number of pregnancy-associated deaths by pregnancy-relatedness, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

During 2016-2018, there were *57 pregnancy-associated deaths*. This translated to a pregnancy-associated mortality ratio (PAMR) of *50 deaths per every 100,000 live births that occurred in Kansas*.

- Timing of death:
  - 17 deaths (29.8%) occurred during pregnancy.
  - 13 deaths (22.8%) occurred within 42 days of the end of pregnancy.
  - 27 deaths (*47.4%*) *occurred 43 days to one year* after the end of pregnancy.
- The leading causes of death were motor vehicle crash, followed by homicide, poisoning/overdose, and infection.
- KMMRC determinations on circumstances surrounding death were:
  - *Substance use disorder contributed to about one in three* (17 deaths, 29.8%) of pregnancy-associated deaths.
  - *Mental health conditions contributed to about one in five* (11 deaths, 19.3%).

During 2016-2018, *13 deaths* (22.8%) were *pregnancy-related*. This translated to a pregnancy-related mortality ratio (PRMR) of *11 deaths per every 100,000 live births that occurred in Kansas*.

- Timing of death:
  - 3 deaths (23.1%) occurred during pregnancy.
  - 7 deaths (**53.8%**) ***occurred within 42 days*** of the end of pregnancy.
  - 3 deaths (23.1%) occurred 43 days to one year after the end of pregnancy.
- The leading causes of death were cardiovascular and coronary conditions, followed by preeclampsia and eclampsia, embolism, and infection.
- Committee determinations on circumstances surrounding death were:
  - ***Obesity contributed to more than half of the deaths*** (7 deaths, including 1 additional probably contributed, 53.8%).
  - ***Substance use disorder contributed to nearly one in four*** (3 deaths, 23.1%).
- 12 (**92.3%**) of the 13 deaths ***were preventable*** with 7 deaths (58.3%) showing a good chance of prevention and 5 deaths (41.7%) had some chance.
- ***Racial and ethnic minorities were disproportionately affected.*** About two-thirds (8 deaths, 61.5%) were racial and ethnic minorities and 5 deaths (38.5%) were non-Hispanic White women.
- ***Two-thirds of deaths*** (9 deaths, 69.2%) ***occurred between the ages of 25 and 34 years.***
- Nearly two-thirds (8 deaths, 61.5 %) had ***either completed high school or general educational development (GED), or had less education than high school.***
- Less than half (6 deaths, 46.2 %) had private insurance; ***others had Medicaid, no insurance or unknown insurance status.***

During 2016-2018, ***32 deaths*** (56.1%) were ***pregnancy-associated, but not-related***.

- Timing of death:
  - 12 deaths (37.5%) occurred during pregnancy.
  - 3 deaths (9.4%) occurred within 42 days of the end of pregnancy.
  - 17 deaths (**53.1%**) ***occurred 43 days to one year*** after the end of pregnancy.
- The leading causes of death were motor vehicle crash, followed by homicide and poisoning/overdose.
- Committee determinations on circumstances surrounding death were:
  - ***Substance use disorder and/or mental health contributed to more than half*** (17 deaths, 53.1%).
  - ***Nearly two thirds*** (6 deaths, 60.0%) ***of deaths with substance use disorder*** (10 deaths) as a contributing factor ***also had a co-occurring mental health conditions*** as a contributing factor.
- ***About one third*** (9 deaths, 28.1%) were the result of a ***motor vehicle crash***.

DATA to ACTION: As of October 2019, a total of 37 pregnancy-associated deaths had been reviewed by the KMMRC. 10 (36%) of the 28 pregnancy-associated, but not-related deaths were the result of a motor vehicle crash. Frequently, the ***women were not wearing seat belts and were ejected from the vehicle.*** Deaths occurred during pregnancy and the postpartum period. An action alert discussing proper seat belt use during and after pregnancy was created and disseminated. The action alert can be found at: https://kmmrc.org/action-alerts/.

During 2016-2018, *12 deaths* (21.1%) were *pregnancy-associated but unable to determine pregnancy-relatedness*.

- Timing of death:
    - 2 deaths (16.7%) occurred during pregnancy.
    - 3 deaths (25.0%) occurred within 42 days of the end of pregnancy.
    - 7 deaths (*58.3%*) *occurred 43 days to one year* after the end of pregnancy.
- The leading causes of death were embolism, hematomas, motor vehicle crashes, and suicides.

Key KMMRC recommendations for action and contributing factors for pregnancy-related deaths

The key KMMRC recommendations based on 12 preventable pregnancy-related deaths are as follows*:*

- *Screen, provide brief intervention, and referrals* for:
    - Comorbidities and chronic illness
    - Intimate partner violence
    - Pregnancy intention
    - Mental health conditions (including postpartum anxiety and depression)
    - Substance use disorder
- *Better communication and collaboration* between providers, including referrals
- *Patient education and empowerment*

A total of *51 contributing factors* related to the patient/family (31.4%), health care providers (29.4%), facilities/hospitals where the woman sought care (13.7%), the systems that influence the lifestyle, care, and health services for the woman (13.7%), or community (11.8%) were identified by KMMRC to pregnancy-related deaths (Figure 2). While patient/family and provider level factors were the most common, *but it is important to acknowledge they were often dependent on systems of care, facility, and community level factors*.

Figure 2. Distribution of levels of contributing factors among preventable pregnancy-related deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

- The proportion of each *contributing factor* was:
  - 8 (15.7%) lack of continuity of care/care coordination (provider or facility perspective)
  - 7 (13.7%) clinical skill/quality of care (provider or facility perspective)
  - 6 (11.8%) poor communication/lack of case coordination or management/lack of continuity of care (system perspective)
  - 5 (9.8%) delay
  - 5 (9.8%) lack of knowledge regarding importance of event or of treatment or follow-up
  - 4 (7.8%) cultural/religious or language factors
  - 3 (5.9%) lack of access/financial resources
  - 3 (5.9%) lack of standardized policies/procedures
  - 2 (3.9%) chronic disease
  - 2 (3.9%) failure to screen/inadequate assessment
  - 1 (2.0%) adherence to medical recommendations
  - 1 (2.0%) substance use disorder-alcohol, illicit/prescription drugs
  - 1 (2.0%) tobacco use
  - 1 (2.0%) social support/isolation - lack of family/friend or support system
  - 1 (2.0%) legal
  - 1 (2.0%) other - unrestrained passenger in car

Type of prevention for recommendations and expected impact of actions if implemented for pregnancy-related deaths

- Most recommendations were identified as resulting in either primary (35.9%) or secondary (40.6%) prevention, and 23.4% of recommendations were identified as resulting in tertiary prevention.

- The *level of impact* if the recommendation was implemented was *expected to be large, extra large, or giant for 66.1% of recommendations*.

- More consistent use of screening tools, providing brief intervention, referral to treatment, patient education and empowerment, communication and collaboration between health care providers, community engagement and education, and/or family planning education would likely have a larger impact for prevention.

Introduction

Background

In the United States, there are two national sources for trends and information on maternal mortality using vital statistics data (Table 1).[5] The first, the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS) uses two pieces of information on the death certificate – the pregnancy checkbox and the certified recording of the cause of death to assign International Classification of Diseases, 10th Revision (ICD-10) codes – are used together to identify maternal deaths and produce a maternal mortality rate (follows the World Health Organization (WHO) definition, i.e., maternal deaths while pregnant or within 42 days postpartum per 100,000 live births).[6,7] The second, the CDC's Pregnancy Mortality Surveillance System (PMSS) uses death certificates that show a relationship to pregnancy, identified by either a checkbox on the death certificate or by a linked birth or fetal death certificate registered in the year preceding death.[8] Medical epidemiologists review this information to identify pregnancy-related deaths and produce a pregnancy-related mortality ratio (i.e., pregnancy-related deaths while pregnant or within a year postpartum per 100,000 live births).[9]

Table 1. National Sources of Maternal Mortality Information[10]

	CDC – National Center for Health Statistics (NCHS)	CDC – Pregnancy Mortality Surveillance System (PMSS)	Maternal Mortality Review Committees
Data Source	Death certificates	Death certificates linked to fetal death and birth certificates	Death certificates linked to fetal death and birth certificates, **medical records, social service records, autopsy, informant interviews...**
Time Frame	During pregnancy – 42 days	During pregnancy – 365 days	During pregnancy – 365 days
Source of Classification	Pregnancy checkbox ICD-10 codes	Medical epidemiologists (PMSS-MM)	**Multidisciplinary committees**
Terms	Maternal death	Pregnancy associated, (Associated and) Pregnancy related, (Associated but) Not pregnancy related	Pregnancy associated, (Associated and) Pregnancy related, (Associated but) Not pregnancy related
Measure	Maternal Mortality Rate - # of Maternal Deaths per 100,000 live births	Pregnancy Related Mortality Ratio - # of Pregnancy Related Deaths per 100,000 live births	Pregnancy Related Mortality Ratio - # of Pregnancy Related Deaths per 100,000 live births
Purpose	Show national trends and provide a basis for international comparison	Analyze clinical factors associated with deaths, publish information that may lead to prevention strategies	**Understand medical and non-medical contributors to deaths, prioritize interventions that effectively reduce maternal deaths**

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[5] Building U.S. Capacity to Review and Prevent Maternal Deaths. 2018. Report from nine maternal mortality review committees. https://reviewtoaction.org/Report_from_Nine_MMRCs.

[6] Ibid.

[7] Centers for Disease Control and Prevention. Maternal Mortality, Implementation of New Coding Methods. https://www.cdc.gov/nchs/maternal-mortality/implementation.htm

[8] Report from nine maternal mortality review committees. Op. cit., p. 15.

[9] Ibid.

[10] Credit: Julie Zaharatos, MPH, Kansas MMRIA Training Slides. June 12, 2018. Adapted from St. Pierre A, Zaharatos J, Goodman D, Callaghan WM. Jan 2018. Challenges and opportunities in identifying, reviewing, and preventing maternal deaths. Obstetrics and Gynecology. 131; 138-142.

Depending on vital statistics data alone to measure maternal mortality makes it challenging to determine whether changes observed are the result of improved identification or changes in the risk.[11] While surveillance using vital statistics data can tell us about trends and disparities, Maternal Mortality Review Committees (MMRCs) have access to multiple sources of information that provide a far better and more nuanced insight of the circumstances surrounding each pregnancy-associated death (Table 1).[12] Thus, MMRCs are best positioned to comprehensively assess each death, develop actionable recommendations, and identify opportunities for prevention for future deaths.

In FY 2019, CDC made 24 awards, supporting 25 states, for the Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM) Program.[13] This funding directly supports agencies and organizations that coordinate and manage Maternal Mortality Review Committees to identify, review, and characterize maternal deaths; and identify prevention opportunities. ***Kansas is one of 25 states awarded a grant through the Preventing Maternal Deaths Act to support MMRCs.***

Kansas Maternal Mortality Information

General Information

The Kansas maternal mortality rate of 14.8 (2014-2018) is 29.8% higher than the Healthy People 2020 goal of 11.4 maternal deaths per 100,0000 live births (follows WHO definition).[14] This underscores more work is needed and indicates the need to conduct maternal mortality review to gain insight into the medical and social factors leading to these events and to prevent further occurrences. In 2018, KDHE established the Kansas Maternal Mortality Review Committee (KMMRC). At any given time, the committee consists of 25-40 geographically diverse members representing various specialties, facilities, and systems that interact and impact maternal health. Within the population of women of reproductive age, maternal mortality is an indicator monitored by the Kansas Department of Health and Environment pursuant to K.S.A. 65-177.

Kansas Maternal Mortality Case Review & Committee

Kansas formally convened an MMRC for the first time in June 2018 and started with review of 2016 death cases. All Kansas processes and procedures, including abstraction/data collection and storage, are in accordance with national guidelines and recommendations via the Review to Action resource website.

Authority/Legislation: Senate Substitute (S Sub) for House Bill (HB) 2600 was approved by the Governor of Kansas on April 26, 2018. Effective July 1, 2018, the bill amends existing public health law (K.S.A. 65-177) as necessary to establish the Kansas Maternal Mortality Review Committee (KMMRC) and authorize review of pregnancy-associated deaths (i.e., death of any woman from any cause while pregnant or within one calendar year of the end of pregnancy). Specifically, the legislation grants/ensures:

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[11] Report from nine maternal mortality review committee, op. cit., p. 15
[12] Ibid.
[13] Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE MM). https://www.cdc.gov/reproductivehealth/maternal-mortality/erase-mm/index.html
[14] Maternal and Child Health Bureau. Federally Available Data (FAD) Resource Document. July 2, 2020; Rockville, MD: Health Resources and Services Administration. National Outcome Measure 3 - Maternal mortality rate per 100,000 live births. https://mchb.tvisdata.hrsa.gov/uploadedfiles/TvisWebReports/Documents/FADResourceDocument.pdf.

- Authority to access data (i.e., all records, documentation, reports)
- Confidentiality and protection of collected data, proceedings and activities
- Authority to convene a diverse committee of experts
- Immunity for all involved in the process (i.e., committee members)
- Regular reporting and dissemination of findings for the purposes of improving public health

Timeline (past/history and future)
- February-May 2017: Planning Discussions with March of Dimes and American College of Obstetricians and Gynecologists (ACOG KS Section)
- June-July 2017: KDHE-CDC Planning Calls/Technical Assistance/Consultation
- September 2017: KDHE Staffing Changes to Increase Capacity for Implementation
- October 2017: External Partner Planning Meeting and Peer State On-Site Visits
- November 2017: Drafted KS MMR Legislation
- January 2018: HB 2573 Introduced
- February 2018: Restructured the Kansas Perinatal Quality Collaborative (KPQC)
    - First quality initiative: Neonatal Abstinence Syndrome (2018-2020)
    - ***Second quality initiative: Fourth Trimester Initiative began in 2020 (KPQC Initiative based on KMMRC findings and recommendations)***
- February-March 2018: House and Senate Bill Hearings; formed the KMMRC
- April 2018: Legislation Approved by Governor (S Sub HB 2600)
- May 2018: Contracted with MMR Abstractor (previously worked for the state of GA)
- ***June 2018: First convening of the KMMRC; orientation and mock case review with CDC***
- November 2018: First KS MMRC Meeting (began with 2016 cases)
- March 2019: KMMRC Meeting (continued 2016 cases)
- June 2019: KMMRC Meeting (completed 2016 cases; began 2017 case review)
- October 2019: KMMRC Meeting (continued 2017 cases)
- March 2020: KMMRC Meeting (completed 2017 cases and began 2018 case review)
- July 2020: KMMRC Meeting (completed 2018 cases and began 2019 case review)
- September 2020: KMMRC Meeting (continued 2019 cases)
- October and November 2020: KMMRC Meetings (continued 2019 cases)
- ***December 2020: Publish inaugural annual KS MMR report (pursuant to statute)***
- ***February 2021: KMMRC Meeting (complete 2019 cases, begin 2020)***

Kansas MMR: Data to Action (System, Practice, and/or Policy Changes)

As of October 2019, a total of 37 pregnancy-associated deaths had been reviewed by the KMMRC. Approximately 36% (10 cases) of pregnancy-associated, but not-related deaths (28 cases) were the result of a motor vehicle crash. Frequently, the women were not wearing seat belts and were ejected from the vehicle. Deaths occurred during pregnancy and the postpartum period. ***An action alert discussing proper seat belt use during and after pregnancy was created and disseminated***. The action alert can be found at: https://kmmrc.org/action-alerts/ or https://kmmrc.org/wp-content/uploads/2020/02/Final-MMR-Action-Alert-Seat-Belts-12-2019.pdf.

The KMMRC and KDHE Bureau of Family Health (BFH) Maternal and Child Health (MCH) team are closely monitoring any emerging patterns or trends identified because of case reviews. At this time, 2019 cases are nearing completion, so enough data and information should be available by February 2021 to determine the need for action alerts, bulletins, or proposed

changes in policy or system to prevent future occurrences. Additional staff have been hired to address the maternal, perinatal, and infant health needs.

Future work of the KMMRC & KPQC

State Perinatal Quality Collaboratives (PQCs) and MMRCs function to improve maternal and perinatal health (investing in the mother's health leads to a healthier birth/pregnancy outcomes)
- PQCs: Focus on efforts during the maternal and perinatal periods intended to improve birth outcomes and strengthen perinatal systems of care for mothers and infants.
- MMRCs: Focus on reviewing pregnancy-associated deaths to identify gaps in health services and make actionable recommendations to prevent future deaths, improving maternal and perinatal health.
- Lessons learned over time have resulted in the national recommendation (CDC) for states to intentionally and strategically align the review efforts (MMRC) with the action/quality improvement (QI) efforts (PQC), creating a "culture of safety".

Kansas will enroll in the Alliance for Innovation on Maternal Health (AIM) initiative when ready and implement a safety bundle pilot: ***Postpartum Discharge Transition***, which is currently in development, in partnership with the KPQC and KMMRC (tentatively March-April 2021)(Table 2).
- AIM is a national data-driven maternal safety and QI initiative for states and hospitals and partners from participating states (focus on consistent obstetric practices).
- AIM is based on proven implementation approaches to improving maternal safety and outcomes in the United States.
- AIM works through state teams and health systems to align national, state, and hospital level QI efforts to improve maternal and perinatal health outcomes.
- Any state can join AIM as part of a state-level PQC QI efforts/initiatives.
    - Access to "Patient Safety Bundles"
    - Access to "Patient Safety Tools"
    - Access to "Education & Engagement Tools"
    - Access to the AIM Community of States

Tables 2. Patient Safety Bundles and Tools

Patient Safety Bundles

- Primary Bundles
    - Obstetric Care for Women with Opioid Use Disorder
    - Obstetric Hemorrhage
    - Safe Reduction of Primary Cesarean Birth
    - Severe Hypertension in Pregnancy
    - Cardiac Conditions in Obstetrical Care - *In Development*
    - ***Postpartum Discharge Transition - In Development***
- Supporting Bundles
    - Maternal Mental Health: Depression and Anxiety
    - Maternal Venous Thromboembolism
    - Postpartum Care Basics: From Birth to the comprehensive Postpartum Visit
    - Postpartum Care Basics: Transition from Maternity to Well-Woman Care
    - Prevention of Retained Vaginal Sponges After Birth
    - Reduction of Peripartum Racial/Ethnic Disparities
    - Support After a Severe Maternal Event

- Non-Obstetric Bundles
  - Enhanced Recovery After Major Gynecologic Surgery
  - Prevention of Surgery Site Infections After Gynecologic Surgery

Patient Safety Tools

- Maternal Early Warning Criteria
- Urgent Maternal Warning Signs
- Severe Maternal Morbidity & Mortality
  - Severe Maternal Morbidity Review Form
  - Support After a Severe Maternal Event Patient Safety Bundle (+AIM)

Education & Engagement Tools

- Safety Action Series
- Practicing for Patients
- Quality Improvement Competitions
- Voices of Impact
- Implementing Quality Improvement Projects Toolkit

Source: The Council on Patient Safety in Women's Health Care. Alliance for Innovation on Maternal Health (AIM) Program. https://safehealthcareforeverywoman.org/

For more information on Kansas Maternal Mortality Review Committee, please visit https://kmmrc.org/.

DATA to ACTION: When deciding on the AIM bundle that fit our State's needs best, KDHE worked in coordination with the KMMRC and KPQC to review the data and recommendations from the KMMRC. Most of the pregnancy-related deaths had recommendations involving better communication and collaboration between providers, timely referrals to specialty physicians as well as community providers, and screening for behavioral health conditions, social determinants of health, and pregnancy intentions. The **AIM bundle Postpartum Discharge Transition** was chosen based on these recommendations because it addresses the majority of our recommendations.

Severe Maternal Morbidity

According to American College of Obstetricians and Gynecologists and the Society for Maternal-Fetal Medicine, "Severe maternal morbidity can be thought of as unintended outcomes of the process of labor and delivery that result in significant short-term or long-term consequences to a woman's health. Severe maternal morbidity is associated with a high rate of preventability, similar to that of maternal mortality. It also can be considered *a near miss for maternal mortality* because without identification and treatment, in some cases, these conditions would lead to maternal death. Identifying severe morbidity is, therefore, important for preventing such injuries that lead to mortality and for highlighting opportunities to avoid repeat injuries." [15] Severe maternal morbidity (SMM) occurs nearly 100 times more frequently than maternal death, the "tip of the iceberg" for adverse maternal outcomes.[16] Because they are closely related, investigation of SMM can provide valuable/critical insights into underlying/contributing causes of maternal death.[17]

To identify delivery hospitalization with SMM, this report follows the CDC-developed definition of SMM from hospital discharge procedure and diagnosis codes that indicate a potentially life-threatening condition or maternal complication. Only the 2016-2019 Kansas hospital discharge data were used and analyzed, due to the national transition from International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) to International Classification of Diseases, 10th Revision, Clinical Modification/Procedure Coding System (ICD-10-CM/PCS) in October 2015 and concerning issues around compatibility.

The most recent updated list of 21 SMM indicators are (Appendix 1):

- acute myocardial infarction
- aneurysm
- acute renal failure
- adult respiratory distress syndrome
- amniotic fluid embolism
- cardiac arrest/ventricular fibrillation
- conversion of cardiac rhythm
- disseminated intravascular coagulation
- eclampsia
- heart failure/arrest during procedure or surgery
- puerperal cerebrovascular disorders
- pulmonary edema/acute heart failure
- severe anesthesia complications
- sepsis
- shock
- sickle cell disease with crisis
- air and thrombotic embolism
- blood products transfusion
- hysterectomy
- temporary tracheostomy
- ventilation

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[15] American College of Obstetricians and Gynecologists and the Society for Maternal–Fetal Medicine, Kilpatrick SK, Ecker JL. Severe maternal morbidity: screening and review. *Am J Obstet Gynecol*. 2016;215(3):B17-B22. doi:10.1016/j.ajog.2016.07.050. https://www.acog.org/-/media/project/acog/acogorg/clinical/files/obstetric-care-consensus/articles/2016/09/severe-maternal-morbidity-screening-and-review.pdf.
[16] Severe Maternal Morbidity Factsheet, op. cit., p.11
[17] Ibid.

Blood products transfusion was excluded in the analysis due to known coding issues in ICD-10-CM (i.e., which decreased significantly overall with the transition from ICD-9-CM to ICD-10-CM/PCS coding and may not always indicate severe morbidity in the absence of other codes) and 3 of the 21 SMM indicators are combined due to small numbers (acute myocardial infarction and aneurysm; cardiac arrest/ventricular fibrillation and conversion of cardiac rhythm; and temporary tracheostomy and ventilation). Thus, there are a total of 17 SMM indicators. Additionally, both the numerator (number of delivery hospitalizations with an indication of SMM from diagnosis or procedure codes, Appendix 1) and denominator (number of delivery hospitalization, Appendix 2) were limited to deliveries at community hospitals*, of Kansas residents, to women aged 12-55 years, and to records with sex equal to female.[18,19,20]

*Kansas hospital discharge data are provided by the Kansas Hospital Association (KHA). Data are reported on a calendar year basis, compiled from surveys submitted by most Kansas community hospitals. Community hospitals are non-federal, short-term, general or other specialty hospitals whose facilities are open to the public. Community hospitals, including those out of state to which Kansas residents are admitted, are asked to submit data voluntarily to Kansas Hospital Association (KHA) which in turns compiles the dataset and provides it to the state of Kansas. While most of the state's hospitals are community hospitals, facilities that are not included are: hospital units of institutions, long-term care hospitals, psychiatric hospitals, federal hospitals, and alcoholism and chemical dependency facilities.[21]

During 2016-2019, of the 132,643 delivery hospitalizations of Kansas residents, 767 deliveries (0.6%) with one or more SMMs were identified, using the ICD-10-CM/PCS codes as defined by 17 SMM indicators, representing a rate of 57.8 per 10,000 delivery hospitalizations (Table 3 and Table 4). This translates to about ***1 in 173 women who delivered a baby experienced SMM***. The SMM rate among delivery hospitalizations in Kansas has been steadily increasing in recent years, from 54.6 in 2016 to 61.9 per 10,000 delivery hospitalizations in 2019, a 13.4% increase (Table 3). Figure 3 shows trends in SMM in Kansas between 2016 and 2019. The SMM rate steadily increased by 4.8% per year (95% Confidence Interval: -0.0%, 9.8%), although this increase was not statistically significant.

Table 3. Numbers and rates of delivery hospitalizations involving severe maternal morbidity, Kansas, 2016-2019

Year	Deliveries involving any severe maternal morbidity	Delivery hospitalizations	Rate per 10,000 deliveries		
			Rate	95% conference interval	
2016	191	34,952	54.6	46.9	62.4
2017	184	33,499	54.9	47.0	62.9
2018	191	31,739	60.2	51.6	68.7
2019	201	32,453	61.9	53.4	70.5
Total	767	132,643	57.8	53.7	61.9

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

[18] Centers for Disease Control and Prevention. Severe Maternal Morbidity in the United States. January 31, 2020. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/smm/severe-morbidity-ICD.htm.
[19] Fingar KF (IBM Watson Health), Hambrick MM (AHRQ), Heslin KC (AHRQ), Moore JE (Institute for Medicaid Innovation). Trends and Disparities in Delivery Hospitalizations Involving Severe Maternal Morbidity, 2006–2015. HCUP Statistical Brief #243. September 2018. Agency for Healthcare Research and Quality, Rockville, MD. https://www.hcup-us.ahrq.gov/reports/statbriefs/sb243-Severe-Maternal-Morbidity-Delivery-Trends-Disparities.pdf.
[20] Maternal and Child Health Bureau. Federally Available Data (FAD) Resource Document. July 2, 2020; Rockville, MD: Health Resources and Services Administration. National Outcome Measure 2 - Rate of severe maternal morbidity per 10,000 delivery hospitalizations. SAS code and Data Notes. https://mchb.tvisdata.hrsa.gov/uploadedfiles/TvisWebReports/Documents/FADResourceDocument.pdf.
[21] Kansas Hospital Discharge Data - Notes and Limitations. http://kic.kdheks.gov/OHA/kicnote.html#Discharge

Figure 3. Trends in delivery hospitalizations involving severe maternal morbidity, Kansas, 2016-2019

^ Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

Table 4 presents numbers, distributions, and rates of delivery hospitalizations involving SMM, overall and each of the 17 SMM indicators from 2016 through 2019. As noted, there were 767 deliveries with one or more SMMs in 2016-2019. A total of 1,055 SMMs were identified. If a delivery involved multiple indicators of SMM, it was counted in each category. *The top five most common indicators of SMM in Kansas were:*
- acute renal failure (17.7%)
- disseminated intravascular coagulation (17.5%)
- sepsis (16.0%)
- hysterectomy (15.5%), and
- adult respiratory distress syndrome (15.3%)

Altogether, the five most common indicators, consists of about 60% (629) *of the total 17 SMM indicators* (1,055). Figure 4 displays the percentage of deliveries involving hysterectomy (one of the most common types of procedures indicating SMM) among deliveries with a condition indicating SMM. About one-quarter (25.9%) of deliveries involving shock also involved a hysterectomy. Furthermore, approximately 1 in 10 deliveries involving adult respiratory distress syndrome (13.7%), aneurysm/acute myocardial infarction (11.1%), or disseminated intravascular coagulation (9.0%) involved a hysterectomy.

Table 4. Delivery hospitalizations involving severe maternal morbidity, overall and for each indicator of severe maternal morbidity, Kansas, 2016-2019

Severe maternal morbidity indicators	[a] Deliveries involving any severe maternal morbidity		Rate per 10,000 deliveries		
	Number	Percent	Rate	95% conference interval	
Any severe maternal morbidity	767	100.0	57.8	53.7	61.9
Acute renal failure	136	17.7	10.3	8.5	12.0
Disseminated intravascular coagulation	134	17.5	10.1	8.4	11.8

Sepsis	123	16.0	9.3	7.6	10.9
Hysterectomy	119	15.5	9.0	7.4	10.6
Adult respiratory distress syndrome	117	15.3	8.8	7.2	10.4
Eclampsia	90	11.7	6.8	5.5	8.3
Shock	81	10.6	6.1	4.8	7.6
Pulmonary edema/acute heart failure	67	8.7	5.1	3.9	6.4
Temporary tracheostomy/ventilation	60	7.8	4.5	3.5	5.8
Puerperal cerebrovascular disorders	37	4.8	2.8	2.0	3.8
Air and thrombotic embolism	37	4.8	2.8	2.0	3.8
Cardiac arrest/ventricular fibrillation/conversion of cardiac rhythm	17	2.2	1.3[b]	0.7	2.1
Severe anesthesia complications	11	1.4	0.8[b]	0.4	1.5
Sickle cell disease with crisis	10	1.3	0.8[b]	0.4	1.4
Aneurysm/acute myocardial infarction	9	1.2	0.7[b]	0.3	1.3
Amniotic fluid embolism	7	0.9	0.5[b]	0.2	1.1
Heart failure/arrest during procedure	0	0.0	0.0	0.0	0.3

[a] There were 767 deliveries with one or more severe maternal morbidities in 2016-2019. A total of 1,055 severe maternal morbidities were identified. If a delivery involved multiple indicators of severe maternal morbidity, it was counted in each category. [b] The rate is based on counts fewer than 20, does not meet the requirement for a minimum degree of accuracy, and should be interpreted with caution.

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

Figure 4. Percentage of deliveries involving hysterectomy among deliveries with a condition indicating severe maternal morbidity, Kansas 2016-2019

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

Table 5 presents characteristics of deliveries with and without SMM during 2016-2019. The rate of SMM per 10,000 total delivery hospitalizations also is presented. ***Deliveries involving SMM*** were more likely than deliveries that did not involve SMM to ***be in the youngest*** (aged<20 years, 6.9% vs. 5.7%) ***and oldest*** (aged 40+ years, 5.6% vs. 2.1%) age ranges. Rates of SMM generally followed a similar pattern as these percentage distributions. For example, the rate of deliveries involving SMM per 10,000 delivery hospitalizations ***generally increased with age*** (from 44.6 among women aged 24-25 years to 150.6 among those aged 40+ years). The rate also was elevated among women aged <20 years (70.0).

Table 5. Characteristics of deliveries with and without severe maternal morbidity, Kansas, 2016-2019

Characteristic	Deliveries with any severe maternal morbidity		Deliveries without severe maternal morbidity		Rate of any severe maternal morbidity per 10,000 delivery hospitalizations		
	Number	Percent[a]	Number	Percent[a]	Rate	95% conference interval	
All	767	100.0	131,876	100.0	57.8	53.7	61.9
Age group, years							
<20	53	6.9	7,514	5.7	70.0	52.5	91.6
20-24	145	18.9	28,926	21.9	49.9	41.8	58.0
25-29	185	24.1	41,291	31.3	44.6	38.2	51.0
30-34	208	27.1	36,130	27.4	57.2	49.5	65.0
35-39	133	17.3	15,202	11.5	86.7	72.0	101.5
>40	43	5.6	2,813	2.1	150.6	109.0	202.8
Race and ethnicity							
Non-Hispanic White	493	65.8	91,510	71.2	53.6	48.9	58.3
Non-Hispanic Black	98	13.1	9,665	7.5	100.4	81.5	122.3
Non-Hispanic Asian/Pacific Islander	25	3.3	4,262	3.3	58.3	37.7	86.1
Hispanic[b]	102	13.6	15,908	12.4	63.7	51.3	76.1
Primary payer							
Medicaid	284	37.0	41,016	31.1	68.8	60.8	76.8
Private	381	49.7	78,289	59.4	48.4	43.6	53.3
Uninsured	21	2.7	4,267	3.2	49.0	30.3	74.9
Other	81	10.6	8,317	6.3	96.5	76.6	119.9
Median household income of maternal residential ZIP Code[c]							
Quartile 1 (poorest)	249	32.8	33,461	25.4	73.9	64.7	83.0
Quartile 2	179	23.6	32,477	24.7	54.8	46.8	62.8
Quartile 3	189	24.9	33,293	25.3	56.4	48.4	64.5
Quartile 4 (wealthiest)	143	18.8	32,285	24.5	44.1	36.9	51.3
Location of residence[d]							
Large fringe metropolitan	230	30.0	41,969	31.8	54.5	47.5	61.5
Medium metropolitan	249	32.5	32,171	24.4	76.8	67.3	86.3
Small metropolitan	95	12.4	17,441	13.2	54.2	43.8	66.2
Non-metropolitan	193	25.2	40,295	30.6	47.7	40.9	54.4
Location of residence by public health region							
Northeast	347	45.2	64,622	49.0	53.4	47.8	59.0
North Central	18	2.3	5,749	4.4	31.2[e]	18.5	49.3
Northwest	12	1.6	3,190	2.4	37.5[e]	19.4	65.5
Southeast	51	6.6	8,545	6.5	59.3	44.2	78.0
South Central	286	37.3	40,651	30.8	69.9	61.8	78.0
Southwest	53	6.9	9,119	6.9	57.8	43.3	75.6

[a] Percentages add to 100 percent within the column and were calculated from unrounded counts of observations with non-missing values.
[b] Includes persons of any race.
[c] Based on the median household income of the maternal ZIP Code of last residence. Quartiles are defined so that the total Kansas population is evenly distributed. Cut-offs for the quartiles are determined using ZIP Code demographic data obtained from the U.S. Census, American Community Survey, 2014-2018, Table S1903, Median Income in the Past 12 Months (in 2018 inflation-adjusted dollars). Each ZIP Code was classified into quartiles based on median household income of each ZIP Code. These quartiles are the following: quartile 1: $1 to $46,245; quartile 2: $46,246 to $55,122; quartile 3: $55,123 to $72,461; quartile 4: $72,462 or more.
[d] Location of residence is based on 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties. Large fringe metropolitan is defined as metropolitan areas with at least 1 million residents (Johnson, Leavenworth, Linn, Miami, Wyandotte). Medium metropolitan is defined as metropolitan areas of 250,000-999,999 residents (Butler, Harvey, Kingman, Sedgwick, Sumner). Small metropolitan is defined as metropolitan areas of less than 250,000 residents (Doniphan, Douglas, Jackson, Jefferson, Osage, Pottawatomie, Riley, Shawnee, Wabaunsee). Non-metropolitan is defined as micropolitan and noncore (rural) areas (Remainder of the state).

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

Figure 5 displays the distribution of race and ethnicity among deliveries with any SMM compared with all other deliveries in 2016-2019. Non-Hispanic White women constituted a 7.6% lower percentage of deliveries (65.8%) with any SMM than other deliveries (71.2%). In contrast, *racial/ethnic minorities constituted a higher percentage of deliveries with any SMM than other deliveries*. The distribution of non-Hispanic Blacks and Hispanics among deliveries with any SMM was 74.7% and 9.7% higher, respectively, than the distribution of these racial/ethnic groups among deliveries without SMM. About 13.1% of deliveries involving SMM were among women who were non-Hispanic Black compared with 7.5% of deliveries without SMM. Among deliveries involving SMM, women also were more likely to be Hispanic (13.6% vs. 12.4%) compared with deliveries without any SMM.

Figure 5. The distribution of maternal race/ethnicity among delivery hospitalizations, according to whether the delivery involved any severe maternal morbidity, Kansas, 2016-2019

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

When in the youngest and oldest age groups, women have a greater risk of SMM. [22,23] Because *maternal age may differ across racial/ethnic groups*, Figure 6 shows the age distribution of all delivery hospitalizations (combining those with and without any SMM) in 2016-2019, by patient's race/ethnicity and also provides context when examining racial/ethnic disparities in SMM. A large percentage of non-Hispanic Black and Hispanic women with a delivery hospitalization were in the youngest age groups: <20 years (9.9% and 9.7%, respectively) or 20-29 years (59.8% and 55.9%, respectively). By comparison, fewer non-Hispanic White women with a delivery hospitalization were in these younger age groups (4.5% aged <20 and

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[22] Fingar, Hambrick, Heslin and Moore, op. cit., p. 21
[23] Creanga AA, Bateman BT, Kuklina EV, Callaghan WM. Racial and ethnic disparities in severe maternal morbidity: a multistate analysis, 2008-2010. American Journal of Obstetrics & Gynecology. 2014;210(5):435.e1-8.

52.2% aged 20-29 years). Compared with non-Hispanic White women, non-Hispanic Asian/Pacific Islander women with a delivery hospitalization were more likely to be older (58.5% vs. 43.3% aged >=30 years).

Figure 6. The distribution of age of all delivery hospitalizations by maternal race/ethnicity, Kansas 2016-2019

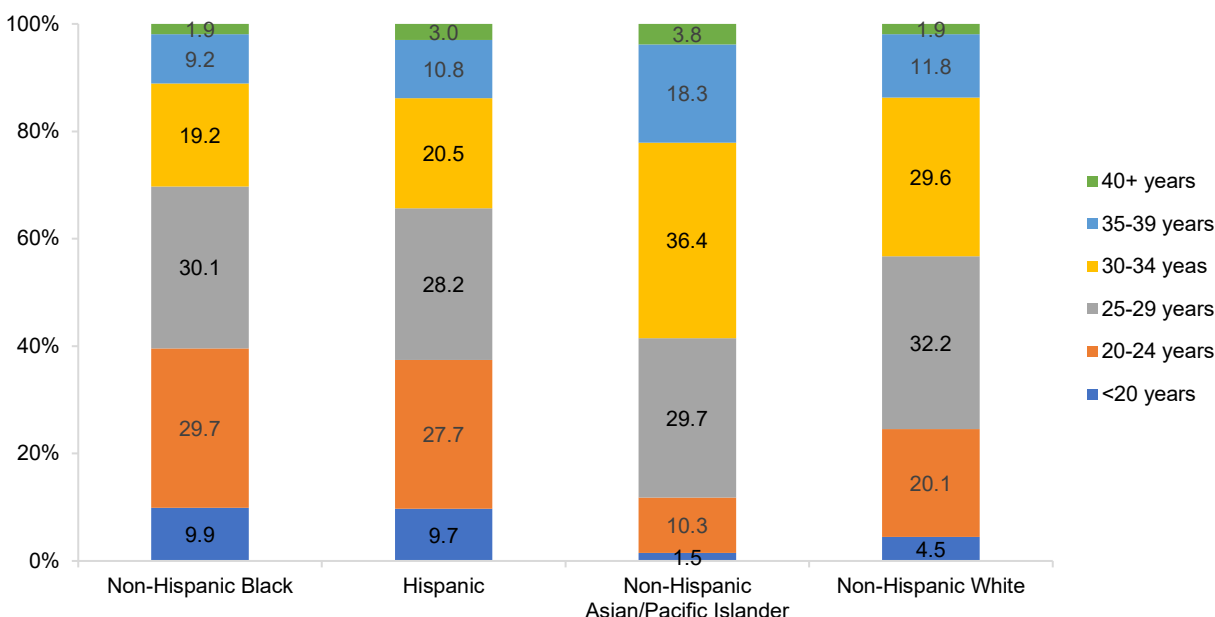Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

Table 6 and Figure 7 show trends in SMM rates by race and ethnicity in Kansas between 2016 and 2019. SMM rates for non-Hispanic Black decreased by 6.4% per year (95% Confidence Interval (CI): -22.5%, 13.1%), although not statistically significant, while non-Hispanic White increased by 3.1% per year (95% CI: -2.1%, 8.5%) and Hispanic by 15.7% per year (95% CI: -18.3%, 63.8%). These increases were not statistically significant. Despite a decreasing SMM rates of non-Hispanic Blacks during 2016-2019, the overall rate of SMM per 10,000 delivery hospitalizations was 100.4 for non-Hispanic Black women: 87.3% higher than the rate among non-Hispanic White women (53.6), 72.2% higher than the rate among non-Hispanic Asian/Pacific Islanders (58.3), and 58.3% higher than the rate among Hispanics (63.7) (Table 5). **The SMM rate for non-Hispanic Blacks was significantly higher than any other race and ethnicity.**

Table 6. Rates of severe maternal morbidity per 10,000 delivery hospitalizations, by maternal race/ethnicity, Kansas, 2016-2019

Year	Non-Hispanic White			Non-Hispanic Black			Non-Hispanic Asian/Pacific Islanders			Hispanic		
	Number	Deliveries	Rate	Number	Deliveries	Rate	Number	Deliveries	Rate	Number	Deliveries	Rate
2016	125	23,986	52.1	28	2,415	115.9	*	1,154	*	19	4,158	45.7
2017	122	23,417	52.1	25	2,477	100.9	*	1,088	*	24	3,966	60.5
2018	118	22,223	53.1	21	2,426	86.6	*	987	*	31	3,858	80.4
2019	128	22,377	57.2	24	2,445	98.2	*	1,058	*	28	4,028	69.5
Total	493	92,003	53.6	98	9,763	100.4	25	4,287	58.3	102	16,010	63.7

Note: *Counts less than 10, therefore the corresponding rates are suppressed due to statistical reliability.
Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

Figure 7. Trends in delivery hospitalizations involving severe maternal morbidity, by maternal race/ethnicity, Kansas, 2016-2019

^ Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

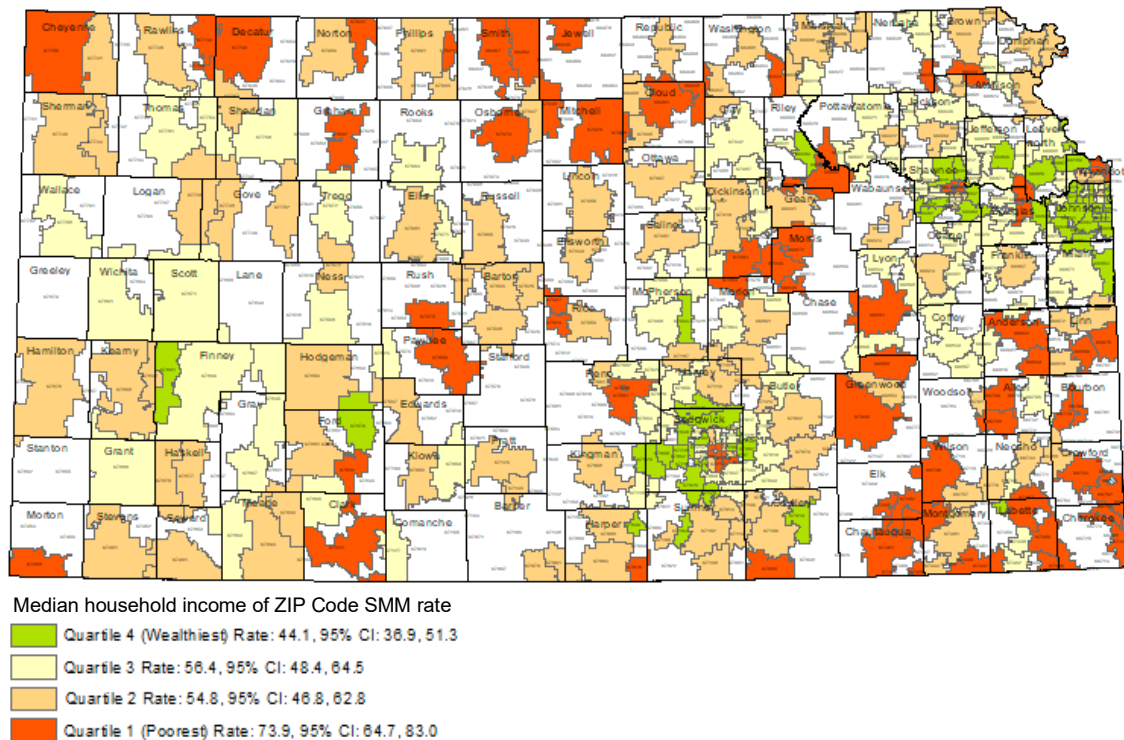As shown in Table 5, ***rates of SMM were significantly higher for women whose delivery was paid by Medicaid compared with private insurance*** (68.8 vs. 48.4). Figure 8 displays rates of SMM based on the median household income of the maternal ZIP Code of residence. Quartiles are defined so that the total Kansas population is evenly distributed. Cut-offs for the quartiles are determined using ZIP Code demographic data obtained from the U.S. Census, American Community Survey, 2014-2018, Table S1903, Median Income in the Past 12 Months (in 2018 inflation-adjusted dollars). There was a total of 700 ZIP Codes in Kansas, 698 within Kansas and 2 partially in two states, Kansas and Nebraska. Twenty-eight ZIP Codes within Kansas had no computed estimates available due to either no sample observations or too few sample observations. Additionally, 32 ZIP Codes were in the Kansas hospital discharge data but were not in the ACS. Therefore, the income quartile is missing for these ZIP Codes. Each ZIP Code was classified into quartiles based on median household income of each ZIP Code. These quartiles are the following: quartile 1: $1 to $46,245; quartile 2: $46,246 to $55,122; quartile 3: $55,123 to $72,461; quartile 4: $72,462 or more. Table 4 and Figure 7 show ***SMM rates decreased as levels of the median household income of the maternal ZIP Code of residence increased*** from 73.9 in quartile 1 (poorest) to 44.1 in quartile 4 (wealthiest). There was a statistically significant difference between the two rates.

Rates of SMM were significantly higher in medium metropolitan areas (76.8) compared with other areas (55.0 or less) (Table 5). Compared with deliveries that did not involve SMM, those that did were more likely to occur in the southcentral (37.3% vs. 30.8%) and the southeast (6.6% vs. 6.5%) than other areas. In general, rates of SMM generally followed a similar pattern as these percentage distributions. The rate of SMM per 10,000 delivery hospitalizations was ***higher in the Southcentral*** (69.9) where most of medium metropolitan counties are located, the southeast (59.3), and the northeast (53.4) where most large fringe metropolitan counties are located, compared with other public health regions (Figure 9).

Figure 8. Severe maternal morbidity (SMM) rates per 10,000 delivery hospitalizations, by median household income of the maternal ZIP Code of residence, Kansas 2016-2019

Median household income of ZIP Code SMM rate

- Quartile 4 (Wealthiest) Rate: 44.1, 95% CI: 36.9, 51.3
- Quartile 3 Rate: 56.4, 95% CI: 48.4, 64.5
- Quartile 2 Rate: 54.8, 95% CI: 46.8, 62.8
- Quartile 1 (Poorest) Rate: 73.9, 95% CI: 64.7, 83.0

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident); U.S. Census. American Community Survey

Figure 9. Severe maternal morbidity (SMM) rates per 10,000 delivery hospitalizations, by county of residence, Kansas 2016-2019

SMM Rate: 0.0 | 0.1 - 56.3 | 56.4 - 83.5   Kansas = 57.8

RSE (Relative Standard Error): Defined as the estimate divided by its standard error, RSE is an indicator for statistical reliability. § Estimates with a RSE greater than 30% are replaced with a § and are suppressed.

Source: Kansas Department of Health and Environment, Kansas hospital discharge data (resident)

Maternal Mortality

Pregnancy-Associated Case Identification and Verification

The CDC recommendations for pregnancy-associated death identification consist of selecting death records for linkage for women ages 10-60 years and residents (regardless of where the death occurred); linking births and fetal deaths occurring during the year prior to women's death, two calendar years of birth and fetal death record data; literal cause of death fields containing pregnancy-related terms (amniotic, chorioamnionitis, eclampsia, ectopic, intrauterine fetal demise, peripartum, peripartum cardiomyopathy, placental, postpartum, pregnancy, pregnant, uterine hemorrhage, and uterine rupture); ICD-10 codes (A34 and O00-O99.9); pregnancy checkbox indicating pregnant at the time of death, not pregnant but pregnant within 42 days of death, and not pregnant but pregnant 43 days to 1 year before death; and other data sources (e.g., hospital and emergency department records, obituaries, social media, media and news reports, certifier confirmation, autopsy reports).

Kansas selects death records of women ages 10-60 years for linkage with live birth and fetal death records. Kansas currently reviews deaths that occurred in Kansas regardless of whether the person was a Kansas resident. In addition to linkage, Kansas uses ICD-10 codes and the pregnancy checkbox. Currently, the Kansas name comparison code is exact, without using any approximate methods. Both maiden name and last name are compared. Kansas does not search literal cause of death fields.

If the abstractor determines a woman was not actually pregnant, even if the checkbox indicates pregnancy, the record is returned to OVS for verification that it's a false-positive. If confirmed by OVS that it is a false-positive, the abstractor notes that in Maternal Mortality Review Information Application (MMRIA)* and the project coordinator informs the Kansas Maternal Mortality Review Committee (KMMRC).

*MMRIA is a comprehensive database provided by CDC to all state maternal mortality review committees. It is designed to facilitate/support a common language for review committees and standardized documentation of committee decisions.

Kansas does not currently use hospital discharge data for case identification or abstraction but is exploring linking de-identified hospital discharge data. The Kansas MMRC project director, abstractor and MCH epidemiologist have access to Medicaid data to support case identification and abstraction as well as access to two health information exchanges, the Kansas Health Information Network (KHIN) and the Lewis and Clark Information Exchange (LACIE). These are often explored for additional case identifications and records to support complete case abstraction.

The KDHE BFH, KMMRC leadership, and MCH epidemiologist have a very strong collaborative relationship with the OVS. This creates a rich data sharing environment making this strategy achievable. There has been development of important data sharing practices and the ability for KMMRC staff, including the abstractor, to be notified of deaths in real time (at the time they are registered). As of February 2019, OVS provides BFH a monthly electronic list (e-list) of pregnancy-associated mortality, resulting from linking live births and fetal deaths, which is the 1st linkage of case identification. Currently the e-list contains 2019 plus 2020 year to date registered deaths. The e-list contains the following variables/fields:
- pregnancy-associated deaths: optical key number (unique id), date of registration, date of death, last name, maiden name, given name, date of birth, state (residence), state

(death occurred, i.e., Kansas), pregnancy status, age (years), immediate cause of death (verbatim), underlying cause of death (verbatim), immediate cause of death (ICD-10), underlying cause of death in cause categories 1-20 (ICD-10)

- Live births and fetal deaths: optical key number (unique id), infant date of birth, plurality, birth order (if not a single birth)

If a certifier has not indicated a record is complete, then the status is pending. At this point, there will be no reference to maternal death other than, perhaps, the checkbox. It is blank for cause of death and manner of death. Once the cause of death has been entered, the record is automatically sent to the National Center for Health Statistics (NCHS) for coding. NCHS returns the coded records. Kansas OVS takes the coded records and ensures that the ones they are passing to the Kansas MMRC leadership are appropriate to share (based on statutes and interpretation of the Inter-Jurisdictional Exchange (IJE) agreement). Once deaths are identified by OVS through the linkage, copies of death certificates and matching birth or fetal death certificates are provided to the project director for record abstractions. The abstractor then enters certificates and case information into MMRIA. The abstractor works closely with the Kansas Violent Death Reporting System (VDRS) staff to identify and verify deaths occurring during the prenatal and postpartum periods. This extra step ensures all deaths are captured and verified across both programs.

Kansas has a plan to increase identification of additional pregnancy-associated deaths in the future. Death certificates that do not link through OVS will be linked with hospital discharge data that have ICD-10 codes of A34, or O00-O99 for a second linkage. Furthermore, a 3rd linkage with Medicaid data is being explored to identify an even greater number of additional pregnancy-associated deaths. Once the three linkages are complete, the number of pregnancy-associated deaths identified through the first linkage, the number of additional pregnancy-associated deaths identified through the second linkage, and the number of yet additional pregnancy-associated deaths identified through the third linkage will be determined. The types of deaths added by the additional linkages will also be explored as well as any challenges encountered accessing the various datasets. Cases that are identified that happened >1 year after pregnancy do not go to the KMMRC for full review, however, any additional cases identified through the new linkages that did in fact occur >1 year after pregnancy would be summarized for the KMMRC in order to learn if they were due to direct obstetric causes. This linked data also allows for the exploration of identifying delivery hospitalizations with severe maternal morbidity (SMM) and tracking of SMM among pregnancy-associated deaths.

Case Abstraction and Review

Kansas has had a contract in place with a qualified MMR abstractor since May 2018 to carry out record collection; complete abstraction; enter data into MMRIA; and summarize case information at committee review meetings. The first death cohort (2016) data entry started in June 2018. Since that time, all 2017 cohort data has also been entered. Once OVS completes their data searches, the potential cases are reviewed by the abstractor, KMMRC project coordinator and MCH epidemiologist to document any potential false positives or seek clarifying information from OVS prior to conducting comprehensive abstraction that may not be warranted. Death certificates are delivered to BFH along with all linked birth certificates and fetal death certificates. The abstractor enters data from the death certificates and linked live birth or fetal death certificates from OVS into MMRIA.

The abstractor is responsible for manually entering vital records into MMRIA at the present time. It is during this manual data entry process that the abstractor identifies initial sources of data to be abstracted, which may include the coroner or medical examiner reports for the appropriate jurisdiction, medical records (inpatient and outpatient), medical transport or investigating agencies as appropriate based on type or location of death, and other pertinent reports. The abstractor locates addresses to then prepare and send letters of request for relevant records with appropriate identifiers. Respondents may submit documents via the File Transfer Protocol (FTP) server.

Data abstracted from the initial documents are entered into MMRIA and may generate a second round of requests to individuals or agencies referenced. This data provides the basis for the abstractor to construct case narratives synthesizing salient information for review. Review committee members have access to de-identified data in MMRIA and are provided a list of cases prior to each meeting so that they can log in and become familiar with the case narratives in advance of review committee meetings.

The KMMRC was initially convened with the intention to meet four times per year to establish structure and process. Kansas started reviewing 2016 cases in November 2018; it was the first meeting and focus was on orienting to the work and forms; therefore, the committee was not able to complete more than six cases at that meeting. At the second meeting in March 2018, 10 cases were completed which left 10 remaining to be reviewed. Two additional meetings were held in June and August 2019 to complete 2016 cases and start 2017 cases. The committee met in October 2019 and March 2020 (virtual) to review 2017 cases and begin 2018 case review. Yet again, in July 2020, the KMMRC met virtually to complete the few remaining 2018 case reviews and began 2019 case review. During each review meeting, the abstractor presents each case for discussion and review. An effort is made to limit discussion to 15-20 minutes per case. In coordination with every review meeting, meeting with the KMMRC leadership (Project Director, Abstractor, Title V/BFH Director, KMMRC Chair and Co-Chair, and MCH Epidemiologist) is held to review the meeting materials and upcoming cases, as well as a debrief of previous meetings.

The Data

Kansas has been diligent in its efforts to align KMMRC to the best practices promoted by CDC as described on the Review to Action website. Prior to the first official KMMRC meeting, a site visit with CDC was completed to further ensure that Kansas processes were aligned to those that have been proven to be most successful. The KMMRC began applying all Review to Action recommendations/guidelines and using all Review to Action forms upon initiation. Additionally, MMRIA has been utilized for KMMRC from the beginning. Information is entered directly into MMRIA during the KMMRC case review meetings. The MMRIA Committee Decisions form is projected onto a screen visible to all participants while discussion is underway at review meetings. The recorder at the meeting tracks discussion points, committee decisions, and recommendations on screen/in clear view of all participating members so information is captured completely and accurately at each meeting. Once consensus is achieved and the committee is satisfied with the data entered in relevant fields, the next case is presented. In addition, a KDHE staff member is responsible for documenting decisions on the shared document while the abstractor takes notes regarding the discussion and decisions.

As an extra measure to help ensure validity of the decisions made, the abstractor, project director, and KDHE staff member discuss any discrepancies in the documentation and finalize

the case in MMRIA within two weeks after each meeting. The project director then enters data from the Committee Decision Form into the appropriate fields in MMRIA for each case. Then findings are summarized, and reviewed at the beginning of each subsequent meeting, giving the committee members an additional opportunity to confirm the information is accurate.
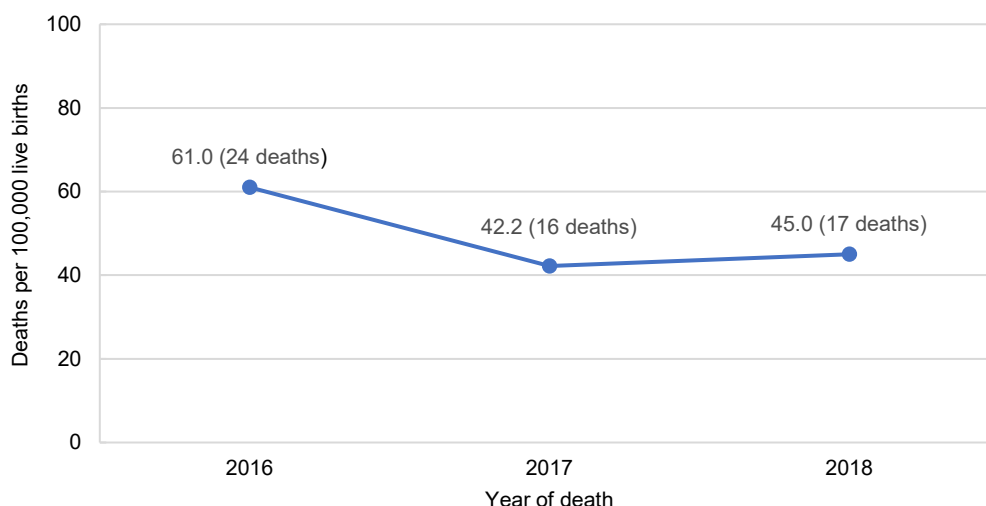
Findings

Pregnancy-Associated Deaths (57 deaths)

A pregnancy-associated death refers to the death of a woman while pregnant or anytime within one year of pregnancy regardless of cause. Of the 75 identified deaths that occurred in Kansas (regardless of residency) in 2016-2018, the KMMRC determined that 57 (76%) deaths were pregnancy-associated.

The following are based on the KMMRC reviews and decisions on the 57 pregnancy-associated deaths, which translated to a pregnancy-associated mortality ratio (PAMR) of ***50 deaths per every 100,000 live births that occurred in Kansas***. Figure 10 shows trends in PAMRs in Kansas during 2016-2018. The Kansas PAMRs appeared to be showing a slight downward trend. However, this downward trend was not statistically significant.

Figure 10. Number of pregnancy-associated deaths and pregnancy-associated mortality ratios, Kansas, 2016-2018

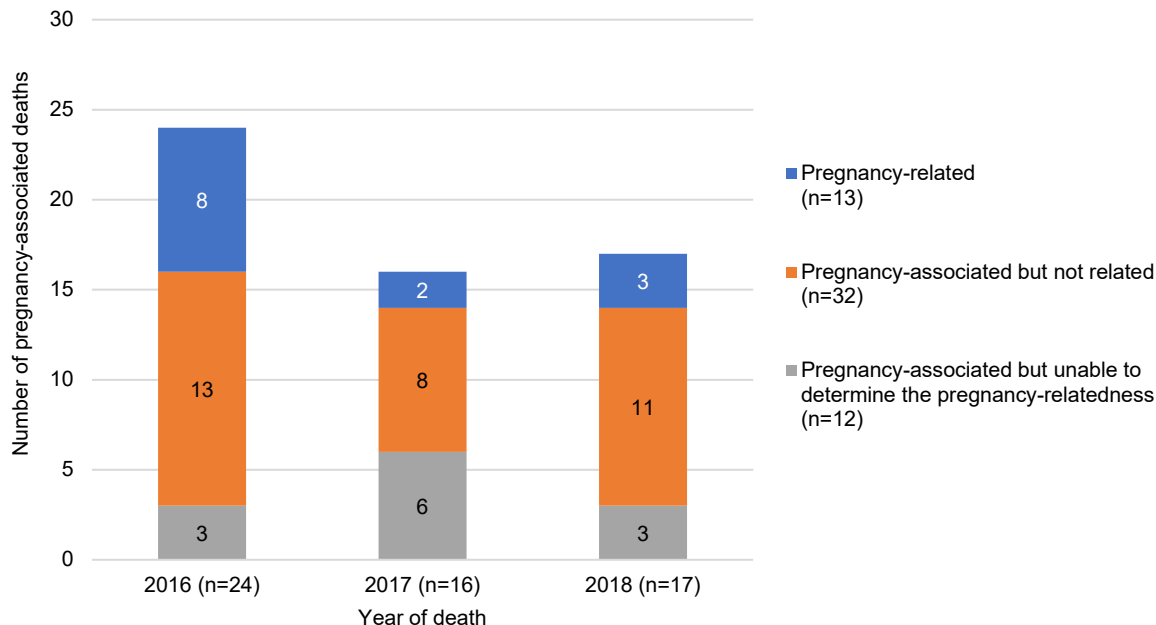Source: Kansas Maternal Mortality Review Committee; Kansas Department of Health and Environment, Kansas live births data (occurrence)

Of the 57 pregnancy-associated deaths reviewed, the KMMRC determined (Figure 11):
- 13 deaths (22.8%) were pregnancy-related
- 32 deaths (56.1%) were pregnancy-associated, but not-related, and
- 12 deaths (21.1%) were pregnancy-associated but unable to determine the pregnancy-relatedness.

Figure 11. Number of pregnancy-associated deaths by pregnancy-relatedness, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

Table 7 describes the demographic characteristics of women who experienced a pregnancy-associated death. Most deaths occurred among women aged 20-34, with a high school education or less, who were non-Hispanic White, who were on Medicaid during pregnancy (or for delivery), were never married, who were overweight or obese, who lived in a ZIP Code with the lowest median household income (quartile 1), and who lived in metropolitan counties.

In Table 7, the pregnancy-associated mortality ratio (PAMR) is also shown for different sub-groups of women. The PAMR is more meaningful than case counts when comparing the likelihood of pregnancy-associated death across different groups.[24] The PAMR is calculated by dividing the number of pregnancy-associated deaths by the number of live births for each sub-group, multiplied by 100,000.[25] The PRAMR is interpreted as the number of deaths that occurred for every 100,000 live births in a specific group of women.[26] As shown in Table 6, pregnancy-associated mortality is not equally experienced by all groups of women. There are significant differences in the PAMR for women based on their education level, insurance type, and marital status.

- *Women with a high school education or less* were *more than four times* as likely to die within one year of pregnancy as women who had more than a high school education.
- *Women on Medicaid* during pregnancy or for delivery were *more than three times* as likely to die within one year of pregnancy as women with private insurance.
- *Unmarried women* were *nearly four times* as likely to die within one year of pregnancy as married women.

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[24] Illinois Department of Public Health. Illinois Maternal Morbidity and Mortality Report. October 2018.
http://dph.illinois.gov/sites/default/files/publications/publicationsowhmaternalmorbiditymortalityreport112018.pdf.
[25] Ibid.
[26] Ibid.

Although no statistical significance differences were observed in the PAMR among the maternal age groups, racial and ethnicity groups, prenatal care, and the location of residence based on the ZIP Code median household income (socioeconomic) groups, it is important to note the disparities in these groups of women.

- Women 30-34 years old had the lowest PAMR. Other states show the largest increase in risk was present for women in their 40s.[27,28] In Kansas, during 2016-2018, the PAMR for this age group is not reported due to small sample size, fewer than 5 deaths.
- *Non-White minority women* were *nearly two times* as likely to die within a year of pregnancy as non-Hispanic White women.
- *Women who did not enter prenatal care during the first trimester* were *nearly twice* as likely to die within one year of pregnancy as women who entered prenatal care during the first trimester.
- *Women who lived in ZIP Codes with the lowest median household income (quartile 1, poorest)* were *more than two times* as likely to die within one year of pregnancy as women who lived in the highest median household income (quartile 4, wealthiest).

It is important to identify the differences in pregnancy-associated deaths. It is important to understand who is most affected by pregnancy-associated death in order to target interventions and resources.[29]

Table 7. Characteristics of women experienced a pregnancy-associated death, Kansas, 2016-2018

Demographics	Number	Percent[a] of all pregnancy-associated deaths	Pregnancy-associated mortality ratio		
			Ratio[b]	95% conference interval	
All women	57	100.0	49.5	37.5	64.2
Age in years at time of death					
<20	4	7.0	-[c]	-	-
20-24	18	31.6	71.9	42.6	113.7
25-29	16	28.1	44.3	25.3	72.0
30-34	13	22.8	40.7	21.7	69.5
35-39	4	7.0	-	-	-
>40	2	3.5	-	-	-
Race and ethnicity					
Non-Hispanic White	32	56.1	39.8	27.2	56.2
Racial/ethnic minorities	25	43.9	72.2	46.7	106.6
Hispanic[d]	12	21.1	64.2	33.2	112.2
Non-Hispanic Black	8	14.0	97.5[e]	42.1	192.2
Non-Hispanic, other races	5	8.8	64.7[e]	21.0	151.0
Education					
High school or less	40	70.2	99.4	71.0	135.4
More than high school	17	29.8	22.8	13.3	36.6
Some college	13	22.8	54.0	28.8	92.4
Associate or bachelor's degree	2	3.5	-	-	-
Advanced degree	2	3.5	-	-	-
Health insurance during pregnancy or for delivery					

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[27] Illinois Maternal Morbidity and Mortality Report, op. cit., p. 33
[28] A Report on Pregnancy-Associated Deaths in Ohio 2008-2016, op. cit., p. 7
[29] Illinois Maternal Morbidity and Mortality Report, op. cit., p. 33

Medicaid	31	54.4	88.4	60.1	125.5
Private	17	29.8	26.1	15.2	41.8
Uninsured or self-pay	3	5.3	-	-	-
Unknown	6	10.5	-	-	-
Marital status					
Married	18	31.6	24.3	14.4	38.3
Unmarried: divorced (4) or never married (34)	38	66.7	93.1	65.9	127.7
Unknown	1	1.8	-	-	-
Body mass index (BMI)[f]					
Underweight	2	3.5	-	-	-
Normal weight	17	29.8	35.5	20.7	56.9
Overweight	10	17.5	32.4[e]	15.5	59.6
Obese	18	31.6	55.2	32.7	87.2
Unknown	10	17.5	-	-	-
Prenatal care entry					
1st trimester	37	64.9	39.6	27.9	54.7
Late and none	14	24.6	65.7	35.9	110.2
2nd trimester	8	14.0	47.8[e]	20.6	94.2
3rd trimester	2	3.5	-	-	-
None	4	7.0	-	-	-
Unknown	6	10.5	-	-	-
Location of residence within Kansas (excluding 6 out of state residents)					
Median household income of maternal residential ZIP Code[g]					
Quartile 1 (poorest)	21	41.2	75.9	47.0	116.1
Quartile 2	11	21.6	41.4	20.7	74.0
Quartile 3	11	21.6	40.8	20.4	72.9
Quartile 4 (wealthiest)	8	15.7	31.8[e]	13.7	62.7
Urban-rural residence[h]					
Metropolitan	31	60.8	42.7	29.0	60.7
Micropolitan	11	21.6	51.4	25.6	91.9
Rural	9	17.6	71.1[e]	32.5	134.9

[a] Percentages might not total 100% due to rounding. Due to rounding some totals may not correspond with the sum of the separate figures.
[b] Number of deaths per 100,000 live births.
[c] Ratios are not reported when number of decedents is <5 or when characteristic response is "unknown". It is denoted by "-".
[d] Includes persons of any race.
[e] Relative standard error (RSE), defined as the estimate divided by its standard error, is an indicator for statistical reliability. Estimates have a RSE greater than 30% and less than or equal to 50% and should be used with caution as they do not meet the standard of reliability or precision.
[f] Body mass index (BMI): a key index for relating a person's body weight to their height. The BMI is a person's weight in pounds times 703 divided by their height in inches squared. Adult BMI ranges underweight: <18.5, normal weight: 18.5-24.9, overweight: 25.0-29.9, and obese: $\geq$30.0.
[g] Based on the median household income of the maternal ZIP Code of last residence. Quartiles are defined so that the total Kansas population is evenly distributed. Cut-offs for the quartiles are determined using ZIP Code demographic data obtained from the U.S. Census, American Community Survey, 2014-2018, Table S1903, Median Income in the Past 12 Months (in 2018 inflation-adjusted dollars). Each ZIP Code was classified into quartiles based on median household income of each ZIP Code. These quartiles are the following: quartile 1: $1 to $46,245; quartile 2: $46,246 to $55,122; quartile 3: $55,123 to $72,461; quartile 4: $72,462 or more.
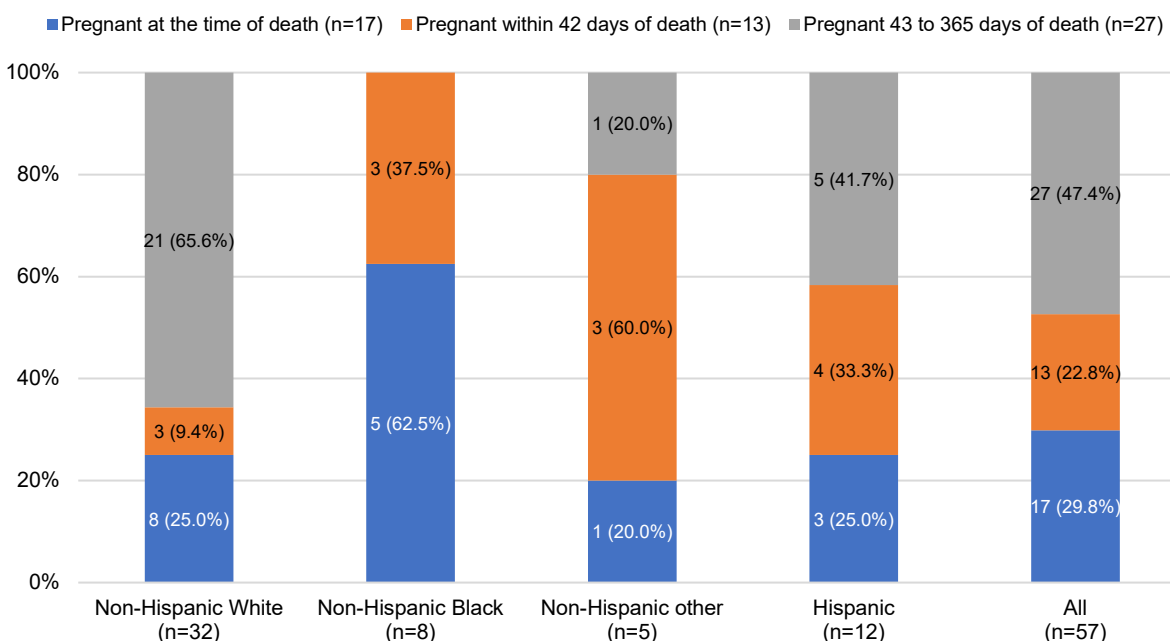[h] Counties of last residence are classified into three urbanization levels - metropolitan (large fringe, medium, small) counties, micropolitan counties, noncore (rural) counties - using the 2013 National Center for Health Statistics (NCHS) Rural-Urban Classification Scheme for Counties. Large fringe metropolitan is defined as metropolitan areas with at least 1 million residents (Johnson, Leavenworth, Linn, Miami, Wyandotte). Medium metropolitan is defined as metropolitan areas of 250,000-999,999 residents (Butler, Harvey, Kingman, Sedgwick, Sumner). Small metropolitan is defined as metropolitan areas of less than 250,000 residents (Doniphan, Douglas, Jackson, Jefferson, Osage, Pottawatomie, Riley, Shawnee, Wabaunsee). Micropolitan is defined as micropolitan areas of 10,000-49,999 residents (Atchison, Barton, Cowley, Crawford, Ellis, Finney, Ford, Franklin, Geary, Kearny, Labette, Lyon, McPherson, Montgomery, Ottawa, Reno, Saline, Seward). Noncore (rural) is defined as noncore areas of <10,000 residents (remainder of the state).

Sources: Kansas Maternal Mortality Review Committee; Kansas Department of Health and Environment, Kansas live births data (occurrence)

Data interpretation example: The row for women with a high school education or less means that 40 pregnancy-associated deaths occurred among women with a high school or less in Kansas during 2016-2018. These deaths represented 70.2% of all the pregnancy-associated deaths that occurred over that period. Women with a high school education or less in Kansas experienced pregnancy-associated deaths at a ratio of 99.4 deaths per 100,000 live births (i.e., for every 100,000 births among women with a high school or less, 99 women with a high school or less experienced a pregnancy-associated death).

Of the 57 pregnancy-associated deaths that occurred in Kansas during 2016-2018, 27 deaths (47.4%) occurred 43 days to one year after the end of pregnancy, 17 (29.8%) occurred during pregnancy, and 13 (22.8%) occurred within 42 days of the end of pregnancy (Figure 12). These data show that tracking pregnancy-associated deaths to one year postpartum is essential, rather than the traditional measure of the first 42 days, as ***nearly half (47.4%) of all pregnancy-associated deaths occurred after 42 days postpartum***. Furthermore, in considering policy initiatives, since so many of the pregnancy-associated deaths involved health care and occurred months after parturition, these data suggest that extending Medicaid coverage for pregnant women from 60 days to 12 months postpartum, which would allow women access the care they need to address health concerns well after their pregnancy ends. This would be a first and important step toward closing gaps in access to care and improving outcomes.[30] In Kansas, among non-Hispanic Black women, a greater proportion of pregnancy-associated deaths occurred during pregnancy (62.5%). If Medicaid continues in effect for one year postpartum rather than 60 days, it presents opportunities to ensure access to quality healthcare for this at-risk population, before, during, and after pregnancies, and to provide coordinated care between pregnancies to prevent pregnancy-associated deaths.[31]

Figure 12. Timing of pregnancy-associated deaths by race and ethnicity, Kansas, 2016-2018
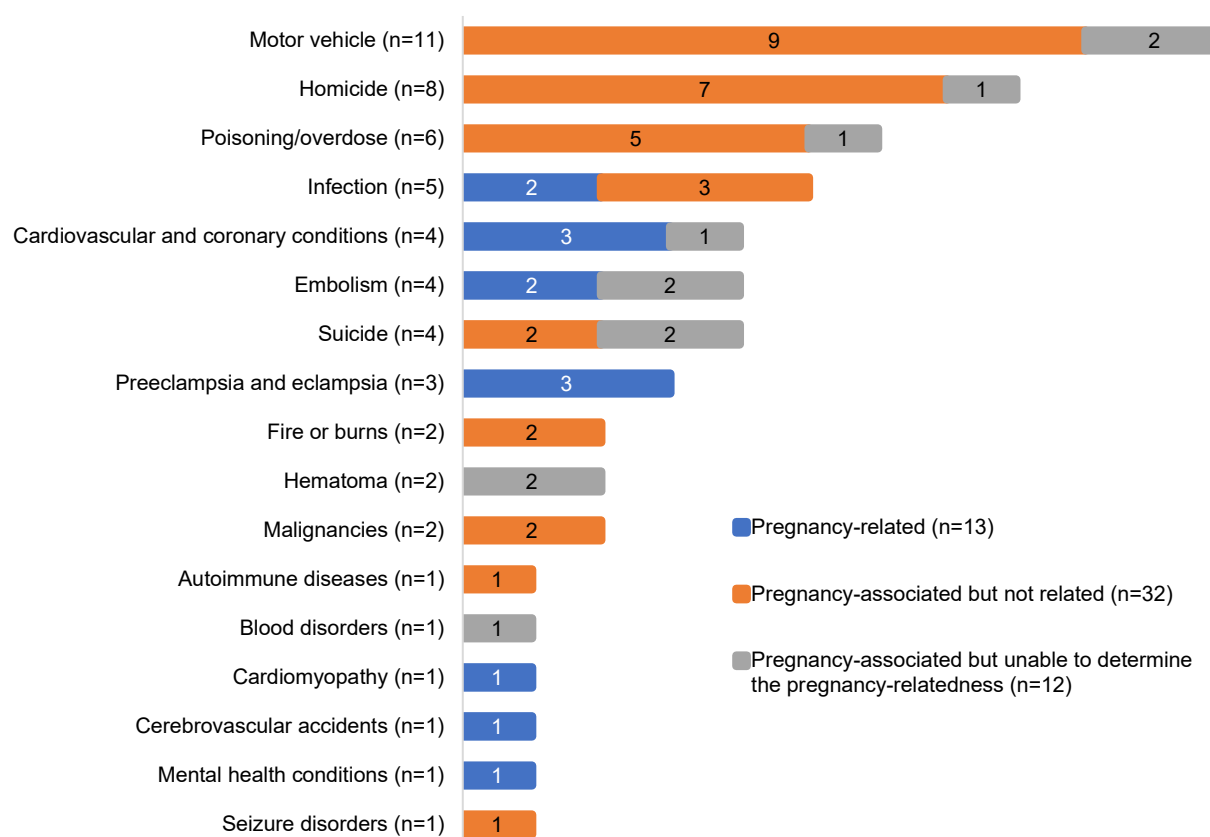

Source: Kansas Maternal Mortality Review Committee

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[30] Illinois Maternal Morbidity and Mortality Report, op. cit., p. 33
[31] Louisiana pregnancy-associated mortality review, 2017 report. July 2020. https://ldh.la.gov/assets/oph/Center-PHCH/Center-PH/maternal/2017_PAMR_Report_FINAL.pdf

Underlying cause refers to the disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence which produced the fatal injury.[32] The combination of the underlying cause of death determined by the KMMRC and the underlying cause field on the death certificate were used to categorize the type of pregnancy-associated death. For pregnancy-associated deaths that occurred during 2016-2018, nearly half (25 deaths, 43.9%) were related to medical causes of death, such as infection, cardiovascular and coronary conditions, embolism, or preeclampsia and eclampsia (Figure 13). About one-third (19 deaths, 33.3%) were caused by homicide, suicide, mental health conditions, or unintentional poisoning/overdose. The remainders were caused by motor vehicle crash and fire or burn accidents (13 deaths, 22.8%).

Figure 13. Number of underlying cause of death for pregnancy-associated deaths by pregnancy-relatedness, Kansas, 2016-2018

Note: For Figure 11, the underlying cause of death categories listed above are mutually exclusive – meaning that each case is classified into only one of the groups. In the death that a suicide was completed by intentionally overusing a drug or medication, these cases are included in the "Suicide" category and not the "Poisoning/overdose" category.

Source: Kansas Maternal Mortality Review Committee

Timing of pregnancy-associated deaths varied somewhat by cause (Table 8). Overall, of the 57 pregnancy-associated deaths that occurred in Kansas during 2016-2018, *about 70% of pregnancy-associated deaths occurred in the postpartum period (40 deaths, 70.2%).* The leading cause of death for postpartum women was motor vehicle crashes (7 deaths, 17.5%),

[32] Maternal Mortality Review Committee Decisions Form v20. October 13, 2020, op. cit., p. 6

followed by accidental poisoning/overdose (6 deaths, 15.0%), infection (4 deaths, 10.0%), cardiovascular and coronary conditions (3 deaths, 7.5%) and embolism (3 deaths, 7.5%). Together, these five causes represented 57.5% of deaths that occurred during the postpartum period.
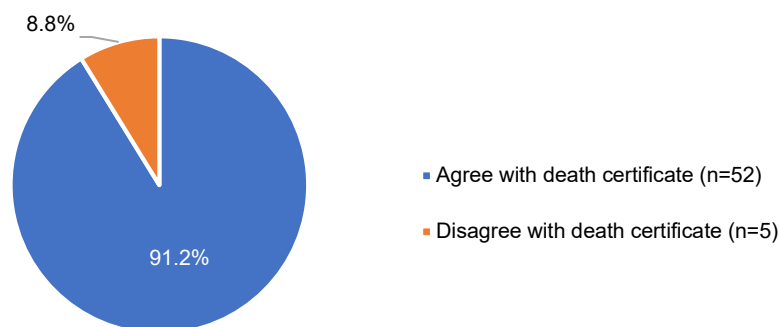
Table 8. Timing of pregnancy-associated death by underlying causes of death, Kansas, 2016-2018

Underlying cause of death	Timing of pregnancy-associated death number (%)			
	Pregnant	Within 42 days	Within 43 to 365 days	Postpartum period
Motor vehicle crash (n=11)	4 (36.4)	0 (0.0)	7 (63.6)	7 (17.5)
Homicide (n=8)	6 (75.0)	1 (12.5)	1 (12.5)	2 (5.0)
Poisoning/overdose (n=6)	0 (0.0)	2 (33.3)	4 (66.7)	6 (15.0)
Infection (n=5)	1 (20.0)	2 (40.0)	2 (40.0)	4 (10.0)
Cardiovascular and coronary conditions (n=4)	1 (25.0)	2 (50.0)	1 (25.0)	3 (7.5)
Embolism (n=4)	1 (25.0)	2 (50.0)	1 (25.0)	3 (7.5)
Suicide (n=4)	2 (50.0)	0 (0.0)	2 (50.0)	2 (5.0)
Preeclampsia and eclampsia (n=3)	1 (33.3)	2 (66.7)	0 (0.0)	2 (5.0)
Fire or burns (n=2)	0 (0.0)	0 (0.0)	2 (100.0)	2 (5.0)
Hematoma (n=2)	1 (50.0)	0 (0.0)	1 (50.0)	1 (2.5)
Malignancies (n=2)	0 (0.0)	0 (0.0)	2 (100.0)	2 (5.0)
Autoimmune diseases (n=1)	0 (0.0)	0 (0.0)	1 (100.0)	1 (2.5)
Blood disorders (n=1)	0 (0.0)	1 (100.0)	0 (0.0)	1 (2.5)
Cardiomyopathy (n=1)	0 (0.0)	0 (0.0)	1 (100.0)	1 (2.5)
Cerebrovascular accidents (n=1)	0 (0.0)	1 (100.0)	0 (0.0)	1 (2.5)
Mental health conditions (n=1)	0 (0.0)	0 (0.0)	1 (100.0)	1 (2.5)
Seizure disorders (n=1)	0 (0.0)	0 (0.0)	1 (100.0)	1 (2.5)
Total (n=57)	17	13	27	**40 (100.0)**

Source: Kansas Maternal Mortality Review Committee

The KMMRC agreed with the cause of death listed on the death certificate in 91.2% (52 deaths) of the pregnancy-associated deaths (Figure 14). Often, the KMMRC was able to identify a more specific underlying cause of death than was listed on the death certificate.
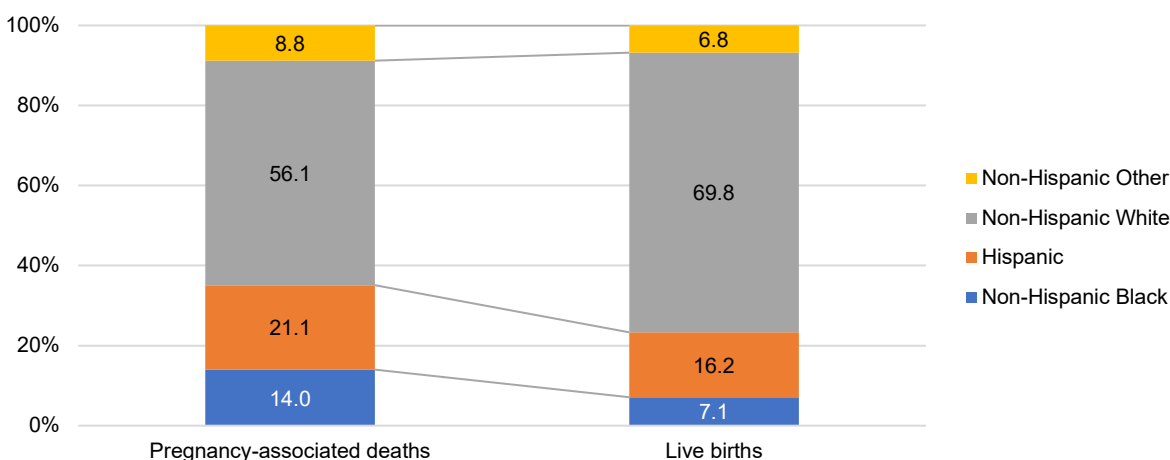
Figure 14. Committee agreement with cause of death listed on death certificate, pregnancy-associated deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

Pregnancy-associated deaths can happen to women of any race and ethnicity. However, in Kansas during 2016-2018, *racial and ethnic minority women were disproportionately affected* (Figures 15 and 16). Figure 15 shows that the percent of deaths that occurred among non-Hispanic Black women (14.0%), Hispanic women (21.1%) and women of other races (8.8%) far exceeded their representation among the population of women giving birth (7.1%, 16.2%, 6.8%, respectively) in Kansas.

Figure 15. Percent of Pregnancy-associated deaths and live births by race and ethnicity, Kansas, 2016-2018
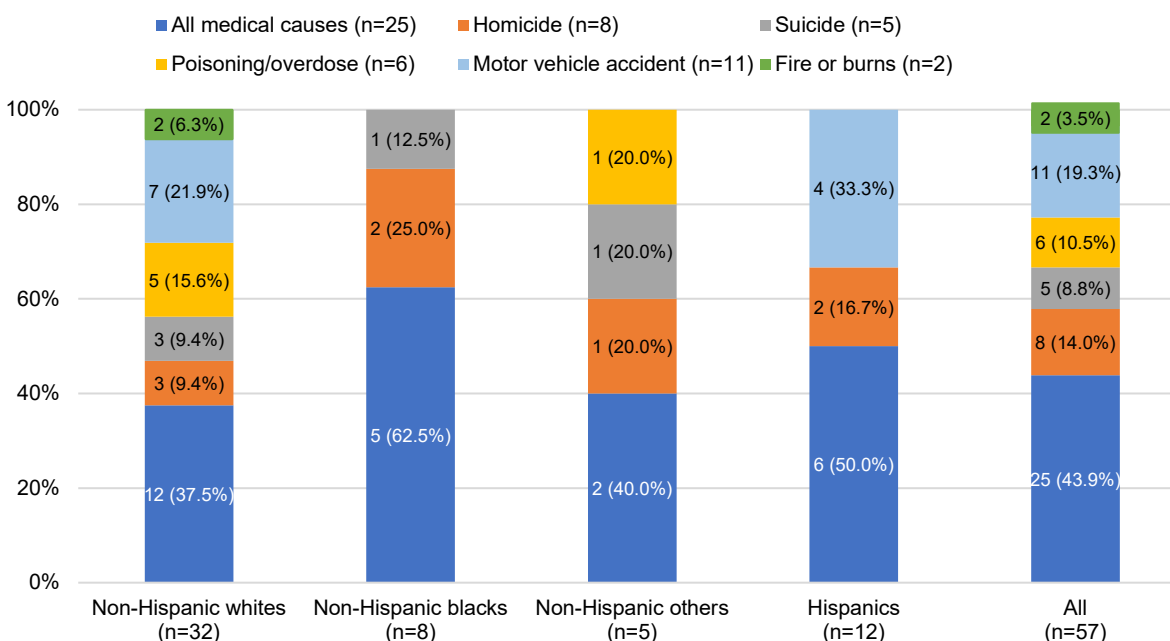

Source: Kansas Maternal Mortality Review Committee; Kansas Department of Health and Environment, birth data (occurrence)

- While medical causes were the most common cause of death for all racial and ethnic groups, *medical deaths comprised a larger proportion of pregnancy-associated deaths for non-Hispanic Black (62.5%) and Hispanic women (50.0%)* than they did for non-Hispanic White women (37.5%).

- Homicides accounted for 25.0% of all pregnancy-associated deaths for non-Hispanic Black women and 16.7% for Hispanic women. In contrast, homicide accounted for fewer pregnancy-associated deaths for non-Hispanic White women (9.4%).

- Suicides accounted for 12.5% of all pregnancy-associated deaths for non-Hispanic Black women but accounted for slightly fewer pregnancy-associated deaths for non-Hispanic White women (9.4%) and did not cause any pregnancy-associated deaths for Hispanic women.

- *Accidental/unintentional drug poisoning/overdose comprised 15.6% of all pregnancy-associated deaths for non-Hispanic White women.* In contrast, drug poisoning/overdose did not cause any pregnancy-associated deaths for non-Hispanic Black and Hispanic women.

- Motor vehicle crashes accounted for 33.3% and 21.9% of all pregnancy-associated deaths for Hispanic and non-Hispanic White women, respectively. However, it did not cause any pregnancy-associated deaths for non-Hispanic Black and non-Hispanic other women.

- Homicides, suicides (including one probable suicide due to mental health conditions), unintentional poisoning/overdoses combined accounted for 34.4% of deaths to non-Hispanic White and 37.5% of deaths to non-Hispanic Black women, but only 16.7% of deaths to Hispanic women.

Due to time and resource restrictions, a comprehensive review of each death cannot be completed; however, questions on differences in deaths and preventability cannot be identified using death certificate data alone.[33]

Figure 16. Underlying cause of death for pregnancy-associated deaths by race and ethnicity, Kansas, 2016-2018

Note: For Figure 16, the six categories listed above are mutually exclusive - meaning that each case is classified into only one of the six groups. In the death that a suicide was completed by intentionally overusing a drug or medication, these cases are included in the "Suicide" category and not the "Poisoning/overdose" category.

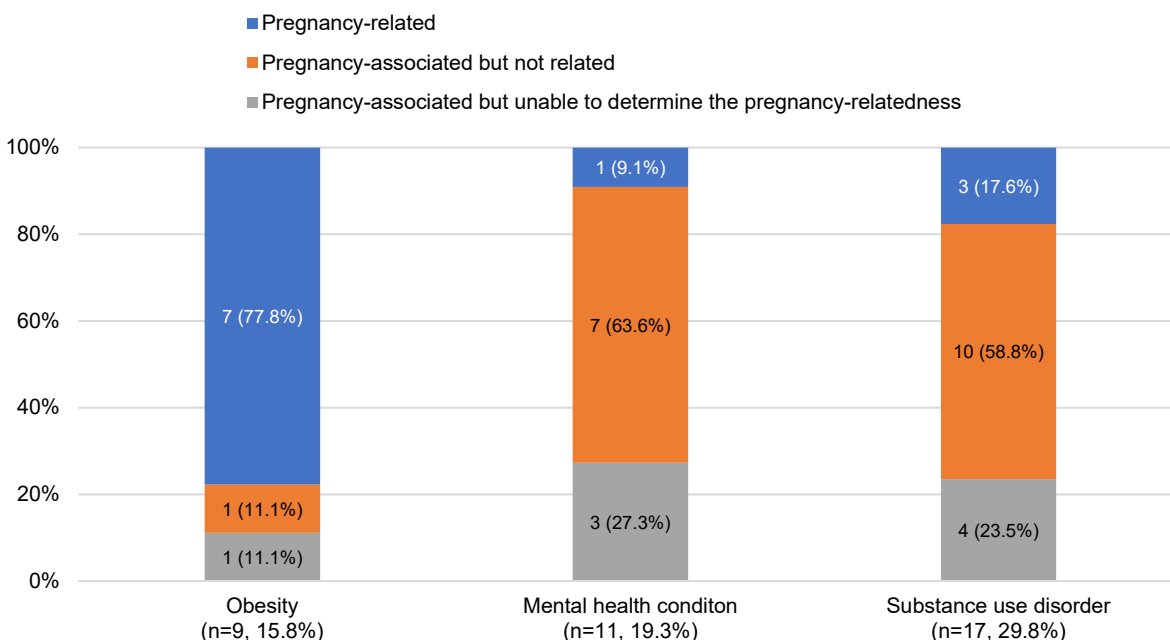Source: Kansas Maternal Mortality Review Committee

The KMMRC also discussed circumstances surrounding the pregnancy-associated deaths and determined if obesity, mental health conditions other than substance use disorder, and substance use disorder (SUD) contributed to each death (as specified by the MMRIA form - see Appendix 3). Of the 57 pregnancy-associated deaths, obesity contributed to 15.8% (9 deaths, including one probably contributed), mental health conditions other than substance use disorder contributed to 19.3% (11 deaths, including five probably contributed), and substance use disorder contributed to 29.8% (17 deaths, including one probably contributed) (Figure 17). While these three conditions may not have caused the death, they may have contributed to the death. The association between these three conditions and mortality is complicated, because these conditions do not directly cause death.[34] Obesity serves as an underlying factor that may result in death associated with chronic disease complications. Mental health and/or substance use

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[33] Illinois Maternal Morbidity and Mortality Report, op. cit., p. 33
[34] Report from nine maternal mortality review committees, op. cit., p. 15

disorder serves as an underlying factor that may result in suicide, accidental death, and death due to accidental drug intoxication or homicide.[35]

Figure 17. Factors that contributed to pregnancy-associated deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

Of the pregnancy-associated deaths where obesity contributed, the majority (77.8%, 7 deaths) ***were pregnancy-related deaths***, such as cardiomyopathy, cardiovascular and coronary conditions, embolism, or preeclampsia and eclampsia. Nearly half (44.4%, 4 deaths) occurred within 42 days of the end of pregnancy, 33.3% (3 deaths) occurred 43 days to one year after the end of pregnancy, and 22.2% (2 deaths) occurred during pregnancy. More than half of these deaths were to non-Hispanic White women (55.6%, 5 deaths), women with a high school education or less (55.6%, 5 deaths), women with Medicaid coverage (44.4%), and women who lived in metropolitan areas (55.6%, 5 deaths).

Mental health conditions are defined as the women carried a diagnosis of a psychiatric disorder. This includes postpartum depression.[36] ***Of the pregnancy-associated deaths where mental health conditions contributed***, the large majority (90.9%, 10 deaths) were pregnancy-associated, but not-related or pregnancy-associated but unable to determine the pregnancy-relatedness, such as poisoning/overdose or suicide. These deaths ***mostly occurred in the late post-partum period*** (63.6%, 7 deaths), ***43 days to one year after the end of pregnancy***. Almost three-quarters of these deaths were to non-Hispanic White women (72.7%, 8 deaths), women with a high school education or less (63.6%, 7 deaths), women with Medicaid coverage (54.5%, 6 deaths), and women who lived in metropolitan areas (54.5%, 6 deaths).

Substance use disorder (SUD) is characterized by recurrent use of alcohol and/or illicit/prescription drugs causing clinically and functionally significant impairment, such as health

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[35] Report from nine maternal mortality review committees, op. cit., p. 15
[36] Maternal Mortality Review Committee Decisions Form v20. October 13, 2020, op. cit., p. 6

problems or disability. The committee may determine that substance use disorder contributed to the death when the disorder directly compromised a woman's health status (e.g., acute methamphetamine intoxication exacerbated pregnancy-induced hypertension, or women was more vulnerable to infections or medical conditions).[37] Of the three conditions, **SUD contributed to the largest percentage of pregnancy-associated deaths**. About **one-third** (29.8%) of all pregnancy-associated deaths **had SUD as a contributing factor**, as noted above. Of the SUD contributed pregnancy-associated deaths, the large majority (82.4%, 14 deaths) were pregnancy-associated, but not-related or pregnancy-associated but unable to determine the pregnancy-relatedness, such as poisoning/overdose, suicide, cardiovascular and coronary conditions, infection, embolism, fire or burns, or motor vehicle crash. **Almost two-thirds** (58.8%, 10 deaths) of these deaths **occurred in the late post-partum period, 43 days to one year after the end of pregnancy**. The majority were to non-Hispanic White women (70.6%, 12 deaths), women with a high school education or less (70.6%, 12 deaths), women with Medicaid coverage (76.5%, 13 deaths), and women who lived in metropolitan areas (56.3%, 9 deaths).

Manner of death refers to the mechanism or circumstances that result in death, which are designated either natural or unnatural. Unnatural deaths are classified as accidents, homicides, suicides or undetermined (Table 9).[38] Table 7 shows the manners of death, as reported on the death certificate, for all 57 pregnancy-associated deaths. **Two-thirds (63.2%, 36 deaths) of pregnancy-associated deaths were of an unnatural manner.** The KMMRC discussed and determined each pregnancy-associated death was a suicide or homicide as specified by the MMRIA form (see Appendix 3). If accidental death, homicide, or suicide, the KMMRC further determined the means of fatal injury as specified by the MMRIA form (see Appendix 3).

Table 9. Manner of death among pregnancy-associated deaths, Kansas, 2016-2018

Manner	Number	Percent
Natural	21	36.8
Accident	21	36.8
Homicide	8	14.0
Suicide	5	8.8
Could not be determined	2	3.5
Total	57	100

Due to rounding, percent totals may not equal 100.
Source: Kansas Department of Health and Environment, Kansas death data (occurrence)

Eight of the 57 pregnancy-associated deaths (**14.0%**) **resulted from substance poisoning/overdose**: one intentional and seven unintentional (including one death due to fire or burns with tetrahydrocannabinol (THC) intoxication and probably substance use disorder contributed). All of the poisoning/overdose deaths were not pregnancy-related: six not-related and two unable to determine pregnancy-relatedness. The eight poisoning/overdose deaths accounted for 18.2% of the 44 non-pregnancy-related deaths. Of the eight overdose deaths, one involved intentional mixed drug toxicity (heroin, fentanyl and methamphetamine); seven unintentional: one mixed (clonazepam, oxycodone and heroin), one mixed (morphine and hydrocodone), one benzodiazepine, one hydrocodone, one Kratom, and one THC. The average age at death was 27.5 years (range 21 to 32 years). **Almost all substance overdose deaths occurred among women who were non-Hispanic White** (7 deaths, 87.5%) and one involved a non-Hispanic woman of other race (12.5%). **Two-thirds occurred among women who were**

[37] Maternal Mortality Review Committee Decisions Form v20. October 13, 2020, op. cit., p. 6
[38] A Report on Pregnancy-Associated Deaths in Ohio 2008-2016, op. cit., p. 7

Medicaid insured, a marker of low-income (5 deaths, 62.5%), two private insurance (25.0%), and one self-pay (12.5%). *All overdose deaths occurred among women who were never married at the time of deaths.* Two-thirds were to women with a high school education or less (4 deaths, 66.7%) and three with some college, no degree (37.5%). More than half lived in a metropolitan area (4 deaths, 57.1%), two in a micropolitan (two deaths, 28.6%) and one in rural (1 death, 14.3%). In seven of the 8 cases, *mental health conditions were contributed to the deaths (87.5%)*. All eight of the overdose victims had history of substance use disorder (including one probably contributed). *All overdose occurred in the postpartum period. Three out of four overdose deaths occurred between 43 to 365 days postpartum (6 deaths, 75.0%)* and two occurred within 42 days postpartum (25.0%). The year after delivery is a vulnerable period for women with substance use disorder. Longitudinal supports and interventions tailored to women in the first year postpartum are needed to prevent and reduce overdose events.[39,40] Access to affordable healthcare is imperative during the first year following childbirth, when many women struggle with challenges such as sleep deprivation and postpartum depression.[41]

The six *suicides* (including one probable suicide due to mental health conditions, one probable suicide due to accidental poisoning/overdose) *accounted for 10.5% of the 57 pregnancy-associated deaths*: one pregnancy-related, two not-related and two unable to determine pregnancy-relatedness. The most common method used was hanging/strangulation/suffocation (66.7%), followed by poisoning/overdose (33.3%). *Four of the six suicides occurred between 43 to 365 days postpartum* (66.7%) and two occurred during pregnancy (33.3%). The average age at death was 26.5 years (range 22 to 32 years). *Two-thirds of suicides were among non-Hispanic White women* (4 deaths, 66.7%), one among non-Hispanic Black women (16.7%), and one involved a non-Hispanic woman of other race (16.7%). The majority were unmarried (four never married and one divorced) (83.3%) and one was married at the time of death (16.7%). Two-thirds were to women with a high school education or less (4 deaths, 66.7%), one some college, no degree (16.7%) and one associate or bachelor's degree (16.1%).

The eight *homicides accounted for 14.0% of the 57 pregnancy-associated deaths.* All the homicides were not pregnancy-related. The eight homicides accounted for 18.2% of the 44 non-pregnancy-related deaths: seven not-related and one unable to determine pregnancy-relatedness. *Firearms were used in all of these homicides.* The average age at death was 24.4 years (range 20 to 31 years). Three homicides were among non-Hispanic White women (37.5%), two among non-Hispanic Black women (25.0%), two among Hispanic women (25.0%), and one involved a non-Hispanic woman of other race (12.5%). *Six of the eight homicides occurred during pregnancy (75.0%)*, one occurred within 42 days postpartum (12.5%), and one occurred between 43 to 365 days postpartum (12.5%). The relationship of the perpetrator to the decedent was known for seven (87.5%) of eight homicides. *When the relationship was known, the perpetrator was most often a current or former intimate partner (37.5%)*, an acquaintance (25.0%), and a stranger (25.0%). The vast majority of the homicide victims were never married (87.5%) and one was married (12.5%) at the time of death. The majority were to women with a high school education or less (5 deaths, 62.5%) and women who lived in metropolitan areas (6 deaths, 75.0%).

[39] Schiff DM, Nielsen T, Terplan M, et al. Fatal and Nonfatal Overdose Among Pregnant and Postpartum Women in Massachusetts. Obstet Gynecol. 2018;132(2):466-474. doi:10.1097/AOG.0000000000002734. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6060005/
[40] ASTHO*Brief*. Preventing Fatal Overdoses in Postpartum Populations. April 2020. https://www.astho.org/ASTHOBriefs/Preventing-Fatal-Overdoses-in-Postpartum-Populations/
[41] Ibid.

Motor vehicle crashes were the leading cause of pregnancy-associated deaths in Kansas during 2016-2018. One in five pregnancy-associated deaths resulted from motor vehicle crashes (19.3%). All motor vehicle crash deaths were not pregnancy-related: nine not-related and two unable to determine pregnancy-relatedness, accounted for 25.0% of the 44 non-pregnancy-related deaths. ***Two-thirds occurred between 43 to 365 days postpartum*** (7 deaths, 63.6%) and four occurred during pregnancy (36.4%). The average age at death was 24.6 years (range 17 to 37 years), with nearly half were aged 25-29 (45.5%). Two-thirds were among non-Hispanic White women (7 deaths, 63.6%) and four involved Hispanic women (36.4%). Almost all motor vehicle crash deaths occurred among women who had a high school education or less (10 deaths, 90.9%) and one associate or bachelor's degree (9.1%). Two-thirds occurred among women who were Medicaid insured, a marker of low income (7 deaths, 63.6%), three private (27.3%) and one self-pay, a marker of no insurance (9.1%). The majority were unmarried (six never married and two divorced) (8 deaths, 72.7%) and three married at the time of death (27.3%).

Note: In November 2019, from the 2016-2017 KMMRC findings and recommendations, an action alert on motor vehicle safety for mom and baby was created and disseminated in both English and Spanish. The action alert can be found at: https://kmmrc.org/action-alerts/.

In order to understand pregnancy-associated deaths, information from multiple sources is imperative, these sources include but not limited to, medical/health systems, law enforcement, behavioral health providers, and social service agencies.[42] These records can be difficult to obtain due to:
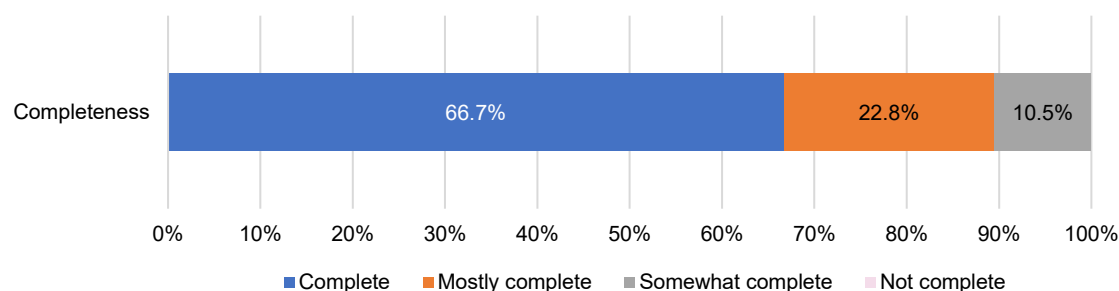- Lack of information (e.g., lack of completion and documentation of screenings and referrals) or data sharing agreements and processes in place across and within these systems (e.g., Medical record sharing across health networks can be limited).
- Legal restrictions and policies that regulate what information agencies can share (e.g., It is difficult to obtain records related to a death that is part of an ongoing criminal investigation).
- Reluctance or hesitation to share copies of records obtained from external agencies.
- Staff turnover which hinders collaboration and information sharing between and across agencies or systems.

It is critical for the review of pregnancy-associated deaths to have access to complete records in order to determine their preventability of the death.[43] ***Almost 90%*** (51 deaths, 89.5%) of 57 deaths were determined by the KMMRC to have either ***"complete" or "mostly complete" records available for review*** (Figure 18). About 10.5% (6 deaths) were identified as having "somewhat complete" records, meaning that information crucial to the review of the case was not available to the KMMRC (see Appendix 3 for full definitions of complete, mostly complete, somewhat complete and not complete).

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[42] Louisiana pregnancy-associated mortality review, 2017 report, op. cit., p. 38
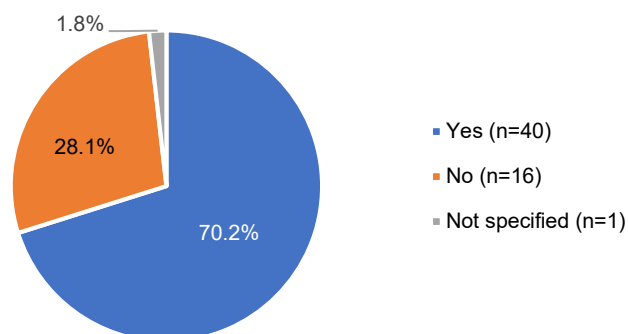[43] Ibid.

Figure 18. Completeness of records for review for pregnancy-associated deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

Autopsies reveal information that helps establish cause of death. Without an autopsy/a post-mortem examination, it is difficult to ascertain the immediate and underlying cause(s) of death in certain scenarios. Data from Kansas death certificates, autopsies were performed on 70.2% of deaths (Figure 19).

Figure 19. Autopsies performed on pregnancy-associated deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee; Kansas death certificate data

Pregnancy-Related Deaths (13 deaths)

There are six key decisions listed below that KMMRC makes for each death reviewed. While all six questions are essential, the last four questions highlight the unique and critical role of KMMRC for the pregnancy-related deaths: preventability, contributing factors, recommendations for improvement, and measurement of potential for impact. [44] The analyses for the pregnancy-related deaths included in this report cover all six questions.
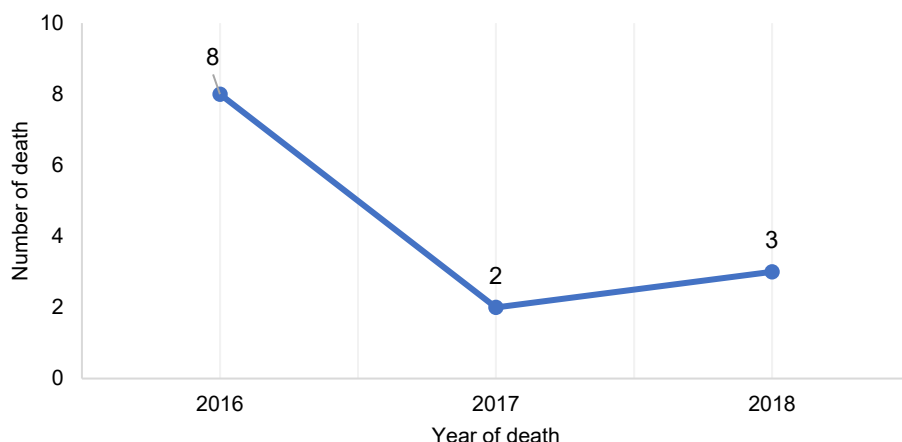
1. Was the death pregnancy-related?
2. What was the underlying cause of death?
3. Was the death preventable?
4. What were the factors that contributed to the death?
5. What are the recommendations and actions that address those contributing factors?
6. What is the expected impact of those actions if implemented?

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[44] Report from nine maternal mortality review committee, op. cit., p. 15

Question 1: Was the death pregnancy-related?

A pregnancy-related death refers to the death of a women 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.[45] The annual number of pregnancy-related deaths determined by KMMRC in Kansas during 2016-2018 were fewer than 20 (Figure 20). Hence, data for all three years were combined for subsequent analyses.

Figure 20. Number of pregnancy-related deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

During 2016-2018, in Kansas, approximately one in four deaths of women during or within one year of pregnancy were determined to be pregnancy-related (13 deaths, 22.8%). This translated to a pregnancy-related mortality ratio (PRMR) of 11 deaths per every 100,000 live births that occurred in Kansas. More than half of deaths occurred within 42 days of the end of pregnancy (7 deaths, 53.8%), three occurred during pregnancy (23.1%), and three occurred 43 days to one year after the end of pregnancy (23.1%) (Figure 21).

Figure 21. Timing of pregnancy-related death, Kansas 2016-2018

Source: Kansas Maternal Mortality Review Committee

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[45] Maternal Mortality Review Committee Decisions Form v20. October 13, 2020, op. cit., p. 6

Timing of pregnancy-related deaths varied by race and ethnicity (Table 10). For non-Hispanic White women and non-Hispanic women of other races, the largest proportion of pregnancy-related deaths occurred within 42 days of pregnancy or within 43 to 365 days after the end of pregnancy. For non-Hispanic Black women, the largest proportion of pregnancy-related deaths occurred during pregnancy. For Hispanic women, all pregnancy-related deaths occurred within 42 days of pregnancy.

Table 10. Timing of pregnancy-related death by race and ethnicity, Kansas, 2016-2018

Race and Ethnicity	Timing of pregnancy-related death number (%)		
	Pregnant	Within 42 days	Within 43 to 365 days
Non-Hispanic White	1 (20.0)	2 (40.0)	2 (40.0)
Non-Hispanic Black	2 (66.7)	1 (33.3)	0 (0.0)
Non-Hispanic other	0 (0.0)	1 (50.0)	1 (50.0)
Hispanic	0 (0.0)	3 (100.0)	0 (0.0)

Source: Kansas Maternal Mortality Review Committee

Question 2. What was the underlying cause of death?

Underlying causes of pregnancy-related deaths were mostly medical conditions (such as preeclampsia and eclampsia, infections, or embolism) or those exacerbated by pregnancy (such as pre-existing cardiovascular disease). There was a case attributed to mental conditions (probable suicide) that was determined to be pregnancy-related. The number of cases in Kansas from any individual cause is so small that determining trends for specific causes of pregnancy-related death is not possible. The pregnancy-related deaths were caused by cardiovascular and coronary conditions (3 deaths, 23.1%), pre-eclampsia and eclampsia (3 deaths, 23.1%), embolism (2 deaths, 15.4%), infection (2 deaths, 15.4%), cardiomyopathy (1 death, 7.7%), cerebrovascular accidents (1 death, 7.7%), and mental health conditions (1 death, 7.7%).

Timing of pregnancy-related deaths varied somewhat by cause (Table 11). Two-thirds of deaths due to cardiovascular and coronary conditions, or preeclampsia and eclampsia occurred within 42 days of pregnancy. Embolism were likely to occur during pregnancy or within 42 days of pregnancy. Infection was likely to occur within 42 days of pregnancy or within 43-365 days after the end of pregnancy. Cardiomyopathy was likely to occur within 43 to 365 days after the end of pregnancy.

Table 11. Timing of pregnancy-related death by underlying causes of death, Kansas, 2016-2018

Underlying cause of death	Timing of pregnancy-related death number (%)		
	Pregnant	Within 42 days	Within 43 to 365 days
Cardiovascular and coronary conditions	1 (33.3)	2 (66.7)	0 (0.0)
Preeclampsia and eclampsia	1 (33.3)	2 (66.7)	0 (0.0)
Embolism	1 (50.0)	1 (50.0)	0 (0.0)
Infection	0 (0.0)	1 (50.0)	1 (50.0)
Cardiomyopathy	0 (0.0)	0 (0.0)	1 (100.0)
Cerebrovascular accidents	0 (0.0)	1 (100.0)	0 (0.0)
Mental health conditions	0 (0.0)	0 (0.0)	1 (100.0)

Source: Kansas Maternal Mortality Review Committee

The distribution of underlying causes of death of pregnancy-related death by race and ethnicity varied, however, low numbers prevent strong conclusions (Figure 22). PRMRs of death by race and ethnicity are not calculated because the numbers of deaths in most groups are very small. Five pregnancy-related deaths occurred in non-Hispanic White women (38.5%), three non-Hispanic Black women (23.1%), three Hispanic women (23.1%), and one involved a non-Hispanic woman of other race (15.4%). ***The proportion of deaths that occurred among non-Hispanic Black women (23.1%), Hispanic women (23.1%), non-Hispanic women of other races (15.4%) far exceeded their representation among the population of women giving birth (7.1%, 16.2%, 6.8%, respectively) in Kansas*** (Figure 14).

Figure 22. Number of underlying causes of pregnancy-related death by race and ethnicity, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

Table 12 describes the demographic characteristics of women who experienced a pregnancy-related death. Both the number of women who died within each demographic group, and the PRMRs are displayed when number of decedents is >=5. Ratios based on fewer than 20 deaths should be interpreted with caution. ***Most deaths occurred among women aged 25-34***, with a high school education or less, who were non-Hispanic White, ***who were overweight or obese***, and who lived in metropolitan counties. A Higher BMI was related to a higher likelihood of pregnancy-related death in Kansas during 2016-2018.

Table 12. Characteristics of women experienced a pregnancy-related death, Kansas, 2016-2018

Demographics	Number	Percent[a] of all pregnancy-related deaths	Pregnancy-related mortality ratio		
			Ratio[b]	95% conference interval	
All women	13	100.0	11.3	6.0	19.3
Age in years at time of death					
<20	0	0.0	0.0	-	-
20-24	0	0.0	0.0	-	-
25-29	4	30.8	-[c]	-	-
30-34	5	38.5	15.6[e]	5.1	36.5
35-39	2	15.4	-	-	-
>40	2	15.4	-	-	-
Race and ethnicity					

Non-Hispanic White	5	38.5	6.2[e]	2.0	14.5
Racial/ethnic minorities	8	61.5	23.1[e]	10.0	45.5
Hispanic[d]	3	23.1	-	-	-
Non-Hispanic Black	3	23.1	-	-	-
Non-Hispanic, other races	2	15.4	-	-	-
Education					
High school or less	8	61.5	19.9[e]	8.6	39.2
More than high school	5	38.5	6.7[e]	2.2	15.7
Some college	2	15.4	-	-	-
Associate or bachelor's degree	1	7.7	-	-	-
Advanced degree	2	15.4	-	-	-
Health insurance during pregnancy or for delivery					
Medicaid	5	38.5	14.3[e]	4.6	33.3
Private	6	46.2	9.2[e]	3.4	20.1
Uninsured or self-pay	1	7.7	-	-	-
Unknown	1	7.7	-	-	-
Marital status					
Married	6	46.2	8.1[e]	3.0	17.6
Unmarried: divorced (2) or never married (4)	6	46.2	14.7[e]	5.4	32
Unknown	1	7.7	-	-	-
Body mass index (BMI)[f]					
Underweight	1	7.7	-	-	-
Normal weight	2	15.4	-	-	-
Overweight or obese	10	76.9	15.8[e]	7.6	29
Overweight	4	30.8	-	-	-
Obese	6	46.2	18.4[e]	6.8	40
Prenatal care entry					
1st trimester	11	84.6	11.8	5.9	21.1
Late and none	2	15.4	-	-	-
2nd trimester	0	0.0	-	-	-
3rd trimester	1	7.7	-	-	-
None	1	7.7	-	-	-
Location of residence within Kansas (excluding 1 out of state resident)					
Median household income of maternal residential ZIP Code[g]					
Quartile 1 (poorest)	3	25.0	-	-	-
Quartile 2	3	25.0	-	-	-
Quartile 3	3	25.0	-	-	-
Quartile 4 (wealthiest)	3	25.0	-	-	-
Urban-rural residence[h]					
Metropolitan	8	66.7	11.0[e]	4.8	21.7
Micropolitan	2	16.7	-	-	-
Rural	2	16.7	-	-	-

[a] Percentages might not total 100% due to rounding. Due to rounding some totals may not correspond with the sum of the separate figures.
[b] Number of deaths per 100,000 live births.
[c] Ratios are not reported when number of decedents is <5 or when characteristic response is "unknown". It is denoted by "-".
[d] Includes persons of any race.
[e] Relative standard error (RSE), defined as the estimate divided by its standard error, is an indicator for statistical reliability. Estimates have a RSE greater than 30% and less than or equal to 50% and should be used with caution as they do not meet the standard of reliability or precision.
[f] Body mass index (BMI): a key index for relating a person's body weight to their height. The BMI is a person's weight in pounds times 703 divided by their height in inches squared. Adult BMI ranges underweight: <18.5, normal weight: 18.5-24.9, overweight: 25.0-29.9, and obese: >30.0.
[g] Based on the median household income of the maternal ZIP Code of last residence. Quartiles are defined so that the total Kansas population is evenly distributed. Cut-offs for the quartiles are determined using ZIP Code demographic data obtained from the U.S. Census, American Community Survey, 2014-2018, Table S1903, Median Income in the Past 12 Months (in 2018 inflation-adjusted

dollars). Each ZIP Code was classified into quartiles based on median household income of each ZIP Code. These quartiles are the following: quartile 1: $1 to $46,245; quartile 2: $46,246 to $55,122; quartile 3: $55,123 to $72,461; quartile 4: $72,462 or more.
[h] Counties of last residence are classified into three urbanization levels - metropolitan (large fringe, medium, small) counties, micropolitan counties, noncore (rural) counties - using the 2013 National Center for Health Statistics (NCHS) Rural-Urban Classification Scheme for Counties. Large fringe metropolitan is defined as metropolitan areas with at least 1 million residents (Johnson, Leavenworth, Linn, Miami, Wyandotte). Medium metropolitan is defined as metropolitan areas of 250,000-999,999 residents (Butler, Harvey, Kingman, Sedgwick, Sumner). Small metropolitan is defined as metropolitan areas of less than 250,000 residents (Doniphan, Douglas, Jackson, Jefferson, Osage, Pottawatomie, Riley, Shawnee, Wabaunsee). Micropolitan is defined as micropolitan areas of 10,000-49,999 residents (Atchison, Barton, Cowley, Crawford, Ellis, Finney, Ford, Franklin, Geary, Kearny, Labette, Lyon, McPherson, Montgomery, Ottawa, Reno, Saline, Seward). Noncore (rural) is defined as noncore areas of <10,000 residents (remainder of the state).
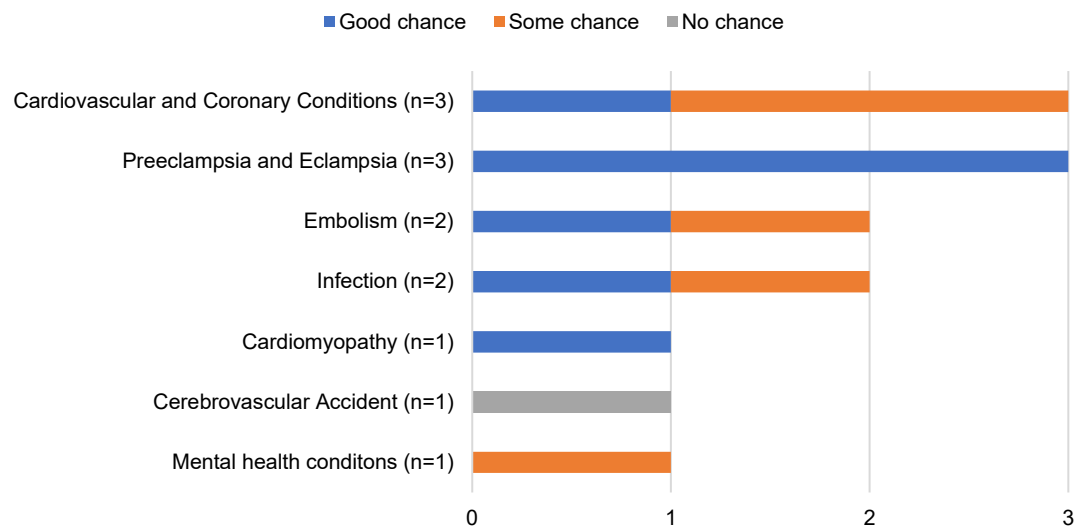
Sources: Kansas Maternal Mortality Review Committee; Kansas Department of Health and Environment, Kansas live births data (occurrence)

Data interpretation example: The row for women who were overweight or obese, based on the ratio of weight to height known as the body mass index (BMI), means that 10 pregnancy-related deaths occurred among women who were overweight or obese in Kansas during 2016-2018. These deaths represented 76.9% of all the pregnancy-related deaths that occurred over that period. Women who were overweight or obese in Kansas experienced pregnancy-related deaths at a ratio of 15.8 deaths per 100,000 live births (i.e., for every 100,000 births among women who were overweight or obese, 16 women who were overweight or obese experienced a pregnancy-related death).

Question 3. Was the death preventable?

A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors (see Appendix 3).[46] Figure 23 displays the preventability of pregnancy-related deaths by underlying cause of death. Twelve of the 13 deaths could have been prevented (92.3%) with seven good chance (58.3%) and five some chance (41.7%). One death was considered an unpreventable death.

Figure 23. Pregnancy-related preventability by underlying cause of death, Kansas, 2016-2018
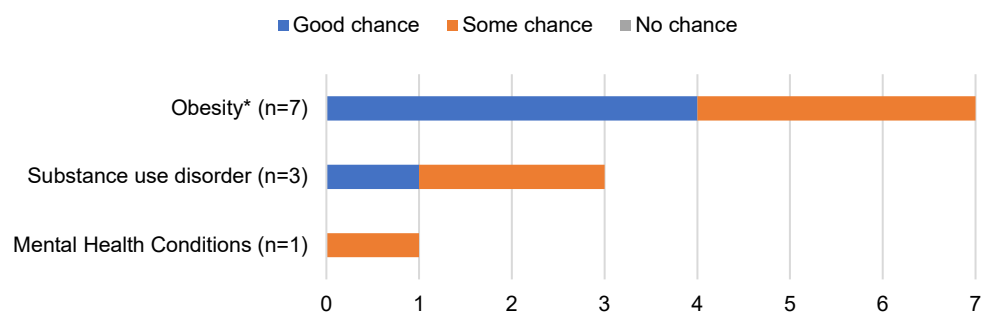

Sources: Kansas Maternal Mortality Review Committee

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[46] Maternal Mortality Review Committee Decisions Form v20. October 13, 2020, op. cit., p. 6

Question 4. What were the factors that contributed to the death?

Committee determinations on circumstances surrounding death were (as specified by the MMRIA form - see Appendix 3): obesity contributed to seven deaths* (including one probably contributed) (53.8%), substance use disorder to three deaths (23.1%), mental health conditions to one death (7.7%). Figure 24 displays the pregnancy-related preventability by circumstances surrounding death (not mutually exclusive).

*This captures whether obesity contributed to the death, not whether the woman was obese / obesity was present, based on the ratio of weight to height known as the body mass index (BMI).

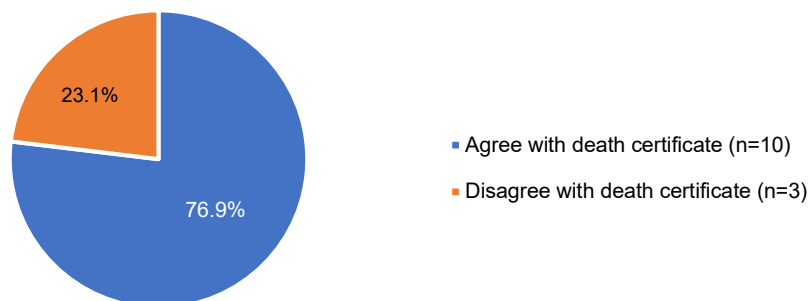Figure 24. Pregnancy-related preventability by circumstances surrounding death, Kansas, 2016-2018

* Includes "one probably contributed"; This captures whether obesity contributed to the death, not whether the woman was obese / obesity was present, based on the ratio of weight to height known as the body mass index (BMI).

Sources: Kansas Maternal Mortality Review Committee

The KMMRC agreed with the underlying cause of death listed on the death certificate in only 76.9% (10 deaths) of the pregnancy-related deaths (Figure 25). As noted on page 38, often, the KMMRC was able to identify a more specific underlying cause of death than was listed on the death certificate. The discrepancy was more substantial for the pregnancy-related deaths than the pregnancy-associated deaths (52 deaths, 91.2%).

Figure 25. Committee agreement with cause of death listed on death certificate, pregnancy-related deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

Table 13 shows the manners of death, as reported on the death certificate, for all 13 pregnancy-related deaths. The vast majority of pregnancy-related deaths (76.9%) were of a natural manner followed by accident (15.4%), and suicide (7.7%).

Table 13. Manner of death among pregnancy-associated, but not-related deaths, Kansas, 2016-2018
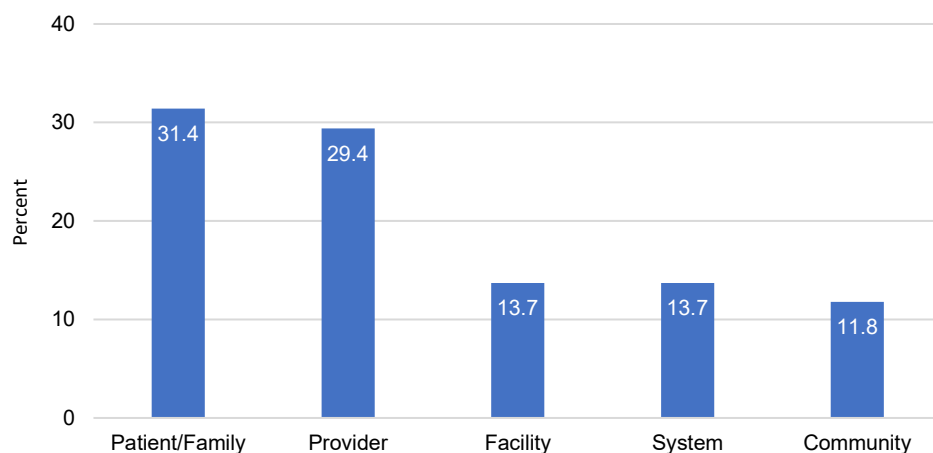
Manner	Number	Percent
Natural	10	76.9
Accident	2	15.4
Suicide	1	7.7
Total	13	100.0

Source: Kansas Department of Health and Environment, Kansas death data (occurrence)

For each of the 12 preventable deaths shown above in Figure 23, the KMMRC identified factors that contributed to each death and categorized them into one of five levels in which change in the outcome could have occurred. The five levels are patient/family, provider, facility, system, and community. Preventable pregnancy-related deaths were multi-factorial events, with contributing factors on multiple levels. The contributing factors helped guide discussion for the KMMRC recommendations to eliminate preventable pregnancy-related deaths.

A total of 51 contributing factors related to the patient/family, health care providers, facilities/hospitals where woman sought care, or to the systems that influence the lifestyle, care, and health services for woman were identified by KMMRC to preventable pregnancy-related deaths. On average, four contributing factors were identified for every preventable pregnancy-related death. The distribution of contributing factors by level among preventable pregnancy-related death is shown in Figure 26. The largest proportion of contributing factors were at the patient/family level (31.4%), followed by the provider level (29.4%), whereas, the facility, systems of care, and community levels had the smallest proportions of factors identified (13.7%, 13.7%, 11.8%, respectively). ***While patient/family and provider factors were the most common, but it is important to acknowledge they were often dependent on facility, systems of care, and community level factors.***

Figure 26. Distribution of levels of contributing factors among preventable pregnancy-related deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

KMMRC identified contributing factors to pregnancy-related deaths using the MMRIA Committee Decision Form (see Appendix 3). Contributing factors are not mutually exclusive - a death may have more than one of the following factors listed below.

The proportion, expressed as a percentage, of each *contributing factor* was:

- 8 (15.7%) lack of continuity of care/care coordination (provider or facility perspective)
- 7 (13.7%) clinical skill/quality of care (provider or facility perspective)
- 6 (11.8%) poor communication/lack of case coordination or management/lack of continuity of care (system perspective)
- 5 (9.8%) delay
- 5 (9.8%) lack of knowledge regarding importance of event or of treatment or follow-up
- 4 (7.8%) cultural/religious or language factors
- 3 (5.9%) lack of access/financial resources
- 3 (5.9%) lack of standardized policies/procedures
- 2 (3.9%) chronic disease
- 2 (3.9%) failure to screen/inadequate assessment
- 1 (2.0%) adherence to medical recommendations
- 1 (2.0%) substance use disorder-alcohol, illicit/prescription drugs
- 1 (2.0%) tobacco use
- 1 (2.0%) social support/isolation - lack of family/friend or support system
- 1 (2.0%) legal
- 1 (2.0%) *other* - unrestrained passenger in car

Question 5. What are the recommendations and actions that address those contributing factors?

Key recommendations based on 12 preventable pregnancy-related deaths are as follows:

- ***Screen, provide brief intervention and referrals*** for:
  - comorbidities and chronic illness
  - Intimate partner violence (IPV)
  - Pregnancy intention
  - Mental health conditions (including postpartum anxiety and depression)
  - Substance use disorder
- ***Better communication and collaboration*** between providers, including referrals
- ***Patient education and empowerment***

Recommendations related to the patient/family, health care providers, facilities/hospitals, systems of care, or community:

- Patient and/or Family Level
  - Patient education and empowerment
    - Education related to risks of childbearing in advanced maternal age
    - Empower patient to be self-advocate
    - Empowering patients in general care
    - Empowering/educating patient and support system to access care
    - Empowering/educating patient and support system to ask for translator
    - Education for patients with chronic illnesses to follow up with specialists and compliance with treatment plans/visits
    - The patient understands the importance of smoking cessation prior to pregnancy
    - Empowering/educating women on the importance of knowing and disclosing all her medical history to all of her providers.
  - Family planning education

- Preconception counseling; optimizing health prior to conception
- Provide family planning education
- Screening for pregnancy intention with One Key Question (OKQ)
- Inter-agency communication and coordination: Education and increased access to Long-Acting Reversible Contraception (LARC) and other highly effective contraception methods
- Provider Level
  - Provider education
    - Assurance of adequate anti-coagulation
    - Educate providers about barriers patients may have and community resources available to which they can refer patient/family
    - Knowledge/clinical skills gap
    - Encourage/educate coordination of care of between physicians across specialties as well as full documentation of care
    - Ensure standard of care is being followed and documented appropriately; peer review for maternal deaths be done at local/regional level
    - Pregnancy intention screening, preconception counseling and reproductive health education as part of a comprehensive well woman exam
    - Comprehensive screening for mental health, substance use (including tobacco and alcohol), social determinants of health, and intimate partner violence as part of a comprehensive well woman exam.
    - Awareness of policies and best practices for those at high risk (such as morbid obesity); close monitoring for post-birth warning signs that would prevent early discharge
  - More consistent use of screening tools, including intimate partner violence and substance use disorder
    - Comprehensive screening at the onset and throughout prenatal care for tobacco, alcohol and other substance use
    - Comprehensive screening at the onset and throughout prenatal care for social determinants of health and other social service connections
    - Comprehensive screening at the onset and throughout prenatal care for intimate partner violence and ensure referrals for services
- Facility Level
  - Use of referrals
    - Use of timely and appropriate referrals to higher level of care; consultation with Maternal Fetal Medicine or other subspecialists
  - Communication and collaboration between health care providers
    - Provide patient with community resources. Ensure that policies and procedures on discharge planning are in place. Ensure a high level of cultural humility, such as providing interpreters. Use a validated external peer review process
    - Ensure collaboration between specialists/sub-specialists involved in patient care obstetrics (pregnancy) remain involved inpatient care in critical care areas
    - Ensure obstetrics providers are present at emergency room visits involving pregnant women
    - Encourage physicians and facilities to not rely solely on EHR for communication between providers
  - Enhanced protocols

- Deep vein thrombosis (DVT)/venous thromboembolism (VTE) prophylaxis protocols
- Clarify mental health laws governing patients at risk
- Improved follow up for preeclampsia; Education for all levels of providers/community on management of hypertension
- Ensure policies are in place for those at high risk (such as morbid obesity) to monitor post-birth warning signs closely to prevent early discharge
- System Level
  - Seatbelt action alert
    - Seatbelt use alert
  - Alliance for Innovation on Maternal Health (AIM) bundle enrollment
    - Apply to become an AIM state
    - Hypertension Bundle
    - Roll out AIM hypertension in pregnancy bundles
  - Improve access to care
    - Provide holistic care coordination/family navigator throughout course of care
    - Offer home health care and/or home visiting services and other social services/social work follow up
    - Ensure access to early postpartum care and the transition from postpartum to preventative well woman care
    - Public service announcements (PSAs) or other education campaigns by insurance, public health or other community organizations educating women on how to be an advocate for their own health
- Community Level
  - Community engagement and education
    - Empowering communities to help control trajectory of healthcare system and access to healthcare (includes PSAs and IPV prevention)
    - Community education on access and cultural humility, including implicit and explicit bias and anti-racism education
    - PSAs or other education campaigns by local/state public health or other community organizations on chronic health conditions such as obesity and how to improve health
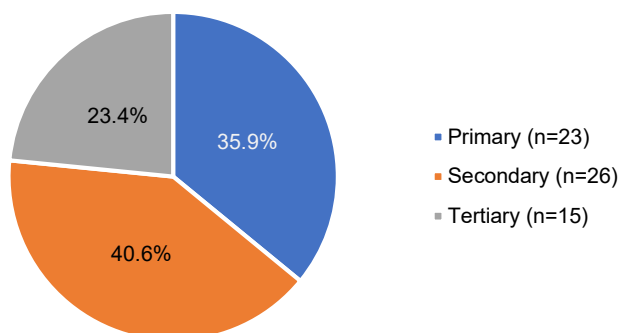
Question 6. What is the expected impact of those actions if implemented?

Based on the Report from Nine Maternal Mortality Review Committees[47], there are two ways the KMMRC captures information related to the potential level of impact their recommendations would have if implemented, in the MMRIA Committee Decision Form (see Appendix 3). First, the KMMRC assigns a specific type of prevention to each recommendation. They determine whether, if implemented, the action would result in what is known in public health literature as primary prevention (actions that prevent the contributing factor before it occurs), secondary prevention (actions that reduce the impact of a contributing factor once it has occurred), or tertiary prevention (actions that reduce the impact or progression of what has become an ongoing contributing factor). Recommendations that support primary prevention may be prioritized over those that support secondary or tertiary prevention. Second, each specific committee recommendation is assigned an expected level of impact if the recommendation was implemented, ranging from small to giant (as specified by the MMRIA form - see Appendix 3).

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[47] Report from nine maternal mortality review committees, op. cit., p. 15

For the recommendations of the KMMRC, 35.9% were identified as primary type of prevention, 40.6% as secondary, and 23.4% as tertiary. There were 64 responses from the KMMRC for the type of prevention for 2016-2018 (Figure 27).

Figure 27. Type of prevention for recommendations for pregnancy-related deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

The level of impact if the recommendation was implemented was estimated to be large, extra large or giant for 66.1% of recommendations. The level of expected impact was either small or medium for 33.9% of recommendations (Figure 28).

Figure 28. Expected impact of actions if implemented for pregnancy-related deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

The expected level of impact varies across recommendations themes. For example, recommendations for enhanced protocols was expected to have a small impact; recommendations for more consistent use of screening tools, including intimate partner violence and substance use disorder, or patient education and empowerment would have a medium to large impact; whereas, communication and collaboration between health care providers, community engagement and education, family planning education, seatbelt action alert, or use of referrals would likely have a larger impact for prevention (Table 14).

Table 14. Recommendation themes for action and expected potential for impact if implemented for pregnancy-related deaths, Kansas, 2016-2018

Recommendation	Impact level (%)	
	Small to Medium	Large to Giant
Alliance for Innovation on Maternal Health (AIM) bundle enrollment	0.0	100.0
Communication and collaboration between health care providers	0.0	100.0
Community engagement and education	0.0	100.0
Enhanced protocols	90.0	10.0
Family planning education	0.0	100.0
Improve access to care	50.0	50.0
More consistent use of screening tools, including intimate partner violence and substance use disorder	80.0	20.0
Patient education and empowerment	38.0	62.5
Provider education	20.0	80.0
Seatbelt action alert	0.0	100.0
Use of referrals	0.0	100.0

Source: Kansas Maternal Mortality Review Committee

The expected level of impact for recommendations also varies by cause of death (Figure 29). Recommendations with large and extra large potential impacts represent more than two-thirds of recommendations for the two leading causes of pregnancy-related death. Assessing both the recommendations and their level of impact, family planning education, patient education and empowerment, and community engagement and education are the themes that may have the biggest level of impact for preventing future deaths due to cardiovascular and coronary conditions. In contrast, provider education (knowledge and clinical skills gap) and communication and collaboration between health care providers are themes that may have the biggest impact on preventing future deaths due to preeclampsia and eclampsia.
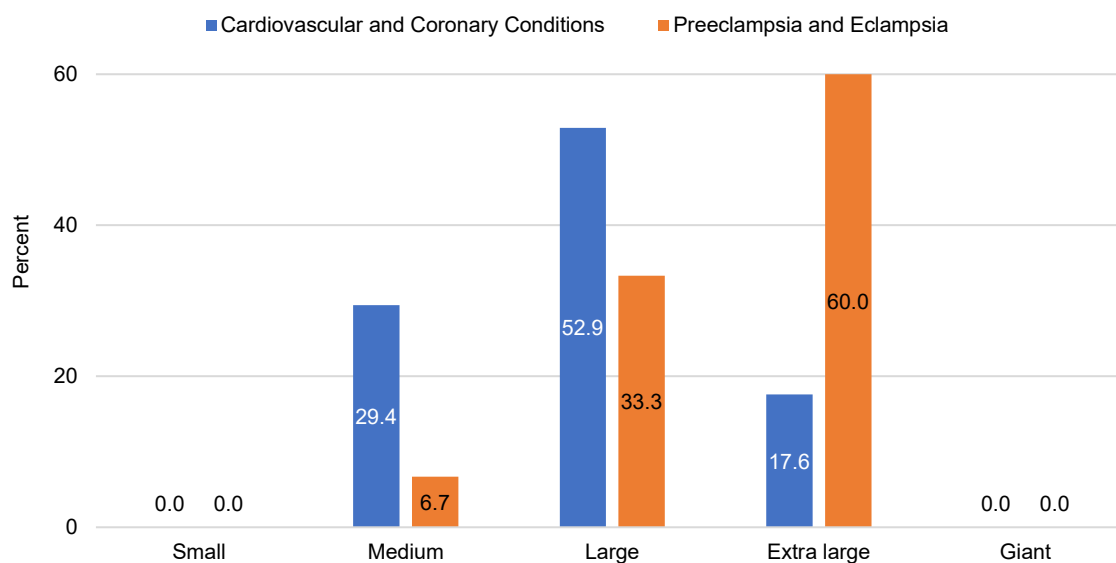
Figure 29. Expected impact of actions if implemented for pregnancy-related deaths, Kansas, 2016-2018
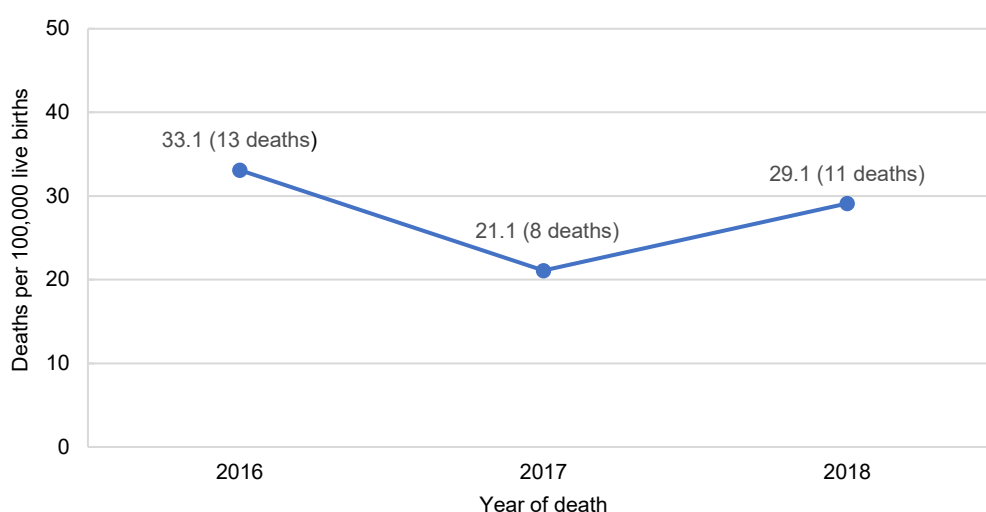

Source: Kansas Maternal Mortality Review Committee

Pregnancy-Associated, But **Not-Related** Deaths (32 deaths)

Pregnancy-associated, but not-related refers to the death of a women during pregnancy or within one year of the end of pregnancy from a cause that is not-related to pregnancy.[48] Among the 57 pregnancy-associated deaths in Kansas from 2016 through 2018, 32 (56.1%) deaths were determined not to be pregnancy-related. While pregnancy was not found to have contributed to their deaths, studying them is still important to understand the experiences of and threats to a vulnerable population of women and their families.[49] Furthermore, pregnancy and postpartum include occasions when a woman may have more contact with medical and social services and thus more opportunity for identification of issues and connection to treatment or support services.[50]

Figure 30 shows the number and mortality ratio for pregnancy-associated, but not-related deaths by year. The annual number of pregnancy-associated, but not-related deaths were fewer than 20. The mortality ratio based on fewer than 20 deaths does not meet the requirement for a minimum degree of accuracy and should be interpreted with caution.

Figure 30. Number and mortality ratio of pregnancy-associated, but not-related deaths, Kansas, 2016-2018

Sources: Kansas Maternal Mortality Review Committee; Kansas Department of Health and Environment, Kansas live births data (occurrence)

During 2016-2018, in Kansas, *about one in every two deaths* of women during or within one year of pregnancy *were determined to be pregnancy-associated, but not-related* (32 deaths, 56.1%). This translated to a mortality ratio of 28 deaths per every 100,000 live births that occurred in Kansas. *More than half of deaths occurred within 43 days to one year after the end of pregnancy* (17 deaths, 53.1%), 12 occurred during pregnancy (37.5%), and three occurred 42 days of the end of pregnancy (9.4%) (Figure 31).

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[48] Maternal Mortality Review Committee Decisions Form v20. October 13, 2020, op. cit., p. 6
[49] A Report on Pregnancy-Associated Deaths in Ohio 2008-2016, op. cit., p. 7
[50] ibid.

Figure 31. Timing of pregnancy- associated, but not-related death, Kansas 2016-2018

- Pregnant at the time of death (n=12)
- Pregnant within 42 days of death (n=3)
- Pregnant 43 to 365 days of death (n=17)

37.5%

9.4%

53.1%

Source: Kansas Maternal Mortality Review Committee

Timing of pregnancy-associated, but not-related deaths varied by race and ethnicity (Table 15). For non-Hispanic White women, the largest proportion of pregnancy-associated, but not-related deaths occurred within 43 to 365 days after the end of pregnancy. For non-Hispanic Black women, all pregnancy-associated, but not-related deaths occurred during pregnancy. For Hispanic women, all pregnancy-associated, but not-related occurred during pregnancy or within 43 to 365 days after the end of pregnancy.

Table 15. Timing of pregnancy-associated, but not-related by race and ethnicity, Kansas, 2016-2018

Race and Ethnicity	Timing of pregnancy-associated, but not-related death number (%)		
	Pregnant	Within 42 days	Within 43 to 365 days
Non-Hispanic White	6 (28.6)	1 (4.8)	14 (66.7)
Non-Hispanic Black	2 (100.0)	0 (0.0)	0 (0.0)
Non-Hispanic other	1 (50.0)	1 (50.0)	0 (0.0)
Hispanic	3 (42.9)	1 (14.3)	3 (42.9)

Source: Kansas Maternal Mortality Review Committee

The most common causes of pregnancy-associated, but not-related deaths were injury-related (25 deaths, 78.1%), including nine (28.1%) unintentional motor vehicle crashes, seven (21.9%) homicide deaths, five (15.6%) unintentional poisoning/overdoses, two (6.3%) fire/burn-related deaths, and two (6.3%) suicide deaths. Other causes included infection (3 deaths, 9.4%), malignancies (2 deaths, 6.3%), autoimmune diseases (1 death, 3.1%), and seizure disorders (1 death, 3.1%). The number of cases in Kansas from any individual cause is so small that determining trends for specific causes of pregnancy-associated, but not-related death is not possible.

Timing of pregnancy-associated, but not-related deaths varied somewhat by cause (Table 16). Motor vehicle crash deaths occurred during pregnancy or within 43-365 days after the end of pregnancy. The majority of homicide and all of suicide deaths occurred during pregnancy. Deaths due to poisoning/overdose, fire or burns, or malignancies occurred in the late postpartum period (within 43-365 days after the end of pregnancy).
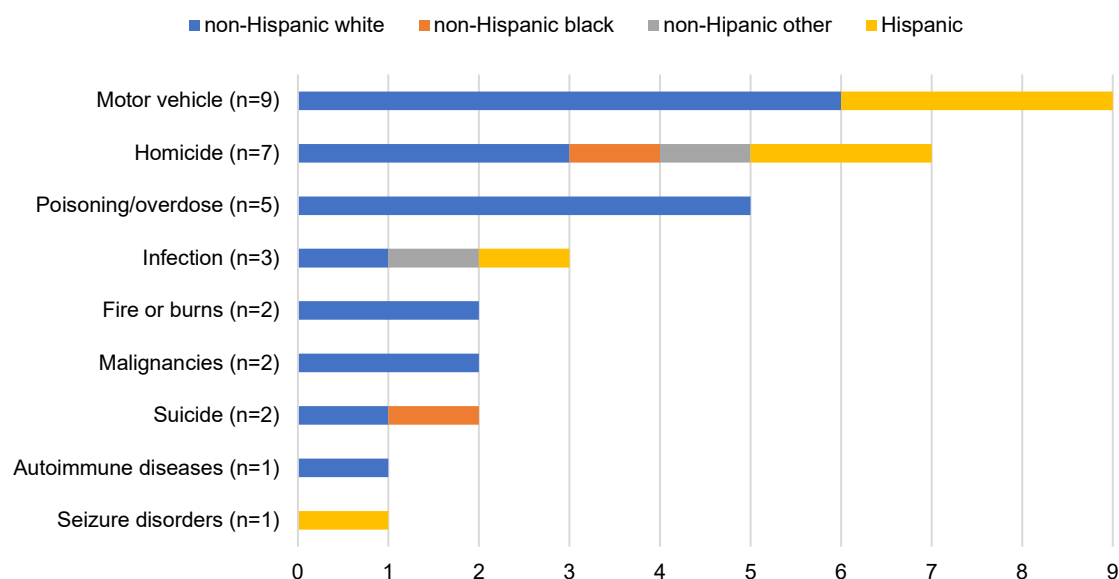
Table 16. Timing of pregnancy-associated, but not-related death by underlying causes of death, Kansas, 2016-2018

Underlying cause of death	Timing of pregnancy-associated, but not-related death number (%)		
	Pregnant	Within 42 days	Within 43 to 365 days
Motor vehicle crash	4 (44.4)	0 (0.0)	5 (55.6)
Homicide	5 (71.4)	1 (14.3)	1 (14.3)
Poisoning/overdose	0 (0.0)	1 (20.0)	4 (80.0)
Infection	1 (33.3)	1 (33.3)	1 (33.3)
Fire or burns	0 (0.0)	0 (0.0)	2 (100.0)
Malignancies	0 (0.0)	0 (0.0)	2 (100.0)
Suicide	2 (100.0)	0 (0.0)	0 (0.0)
Autoimmune diseases	0 (0.0)	0 (0.0)	1 (100.0)
Seizure disorders	0 (0.0)	0 (0.0)	1 (100.0)

Source: Kansas Maternal Mortality Review Committee

The distribution of underlying causes of death of pregnancy-associated, but not-related death by race and ethnicity varied (Figure 32). Rates of death by race and ethnicity are not calculated because the numbers of deaths in most groups are very small. Twenty-one pregnancy-associated, but not-related deaths occurred in non-Hispanic White women (65.6%), seven Hispanic women (21.9%), two non-Hispanic Black women (6.3%), and two involved non-Hispanic women of other races (6.3%). The proportion of deaths that occurred among Hispanic women (21.9%) somewhat exceeded their representation among the population of women giving birth (16.2%) in Kansas (Figure 14).

Figure 32. Underlying causes of pregnancy-associated, but not-related deaths by race and ethnicity, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

Table 17 describes the demographic characteristics of women who experienced a pregnancy-associated, but not-related death. Both the number of women who died within each demographic group, and the mortality ratios are displayed when number of decedents is >=5.

Ratios based on fewer than 20 deaths should be interpreted with caution. The number of deaths and the mortality ratio were greatest among women 20-24. Mortality ratios were also higher among women with a high school education or lower, women not of non-Hispanic White, unmarried women, and women living in non-Metropolitan areas. Note that in contrast to pregnancy-related deaths, there was no racial disparity in deaths that were pregnancy-associated, but not-related to pregnancy.

Table 17. Characteristics of women experienced a pregnancy-associated, but not-related death, Kansas, 2016-2018

Demographics	Number	Percent[a] of all pregnancy-associated, but not-related deaths	Pregnancy-associated, but not-related mortality ratio		
			Ratio[b]	95% conference interval	
All women	32	100.0	27.8	19.0	39.3
Age in years at time of death					
<20	3	9.4	-[c]	-	-
20-24	14	43.8	56.0	30.6	93.9
25-29	8	25	22.2[e]	9.6	43.7
30-34	5	15.6	15.6[e]	5.1	36.5
35-39	2	6.3	-	-	-
≥40	0	0.0	0.0	0.0	150.2
Race and ethnicity					
Non-Hispanic White	21	65.6	26.1	16.2	40.0
Racial/ethnic minorities	11	34.4	31.8	15.9	56.9
Hispanic[d]	7	21.9	37.5[e]	15.1	77.2
Non-Hispanic Black	2	6.3	-	-	-
Non-Hispanic, other races	2	6.3	-	-	-
Education					
High school or less	25	78.1	62.1	40.2	91.7
More than high school	7	21.9	9.4[e]	3.8	19.4
Some college	6	18.8	24.9[e]	9.1	54.3
Associate or bachelor's degree	1	3.1	-	-	-
Advanced degree	0	0.0	0.0	0.0	28.5
Health insurance during pregnancy or for delivery					
Medicaid	17	53.1	48.5	28.2	77.6
Private	8	25	12.3[e]	5.3	24.2
Uninsured or self-pay	2	6.3	-	-	-
Unknown	5	15.6	-	-	-
Marital status					
Married	10	31.3	13.5[e]	6.5	24.8
Unmarried: divorced (1) or never married (21)	22	68.8	53.9	33.8	81.6
Unknown	0	0.0	-	-	-
Body mass index (BMI)[f]					
Underweight	0	0.0	0.0	0.0	113.7
Normal weight	12	37.5	25.1	13.0	43.8
Overweight or obese	12	37.5	18.9	9.8	33.0
Overweight	5	15.6	16.2[e]	5.3	37.8
Obese	7	21.9	21.5[e]	8.6	44.2
Unknown	8	25.0	-	-	-
Prenatal care entry					
1st trimester	18	56.3	19.3	11.4	30.5
Late and none	9	28.1	42.2[e]	19.3	80.1
2nd trimester	6	18.8	35.9[e]	13.2	78.1
3rd trimester	1	3.1	-	-	-

None	2	6.3	-	-	-
Unknown	5	15.6	-	-	-
Location of residence within Kansas (excluding 3 out of state resident)					
Median household income of maternal residential ZIP Code[g]					
Quartile 1 (poorest)	14	48.3	50.6	27.7	84.9
Quartile 2	7	24.1	26.3[e]	10.6	54.3
Quartile 3	4	13.8	-	-	-
Quartile 4 (wealthiest)	4	13.8	-	-	-
Urban-rural residence[h]					
Metropolitan	17	58.6	23.4	13.7	37.5
Non-Metropolitan	12	41.4	35.2	18.2	61.5
Micropolitan	7	24.1	32.7[e]	13.1	67.3
Rural	5	17.2	39.5[e]	12.8	92.1

[a] Percentages might not total 100% due to rounding. Due to rounding some totals may not correspond with the sum of the separate figures.
[b] Number of deaths per 100,000 live births.
[c] Ratios are not reported when number of decedents is <5 or when characteristic response is "unknown". It is denoted by "-".
[d] Includes persons of any race.
[e] Relative standard error (RSE), defined as the estimate divided by its standard error, is an indicator for statistical reliability. Estimates have a RSE greater than 30% and less than or equal to 50% and should be used with caution as they do not meet the standard of reliability or precision.
[f] Body mass index (BMI): a key index for relating a person's body weight to their height. The BMI is a person's weight in pounds times 703 divided by their height in inches squared. Adult BMI ranges underweight: <18.5, normal weight: 18.5-24.9, overweight: 25.0-29.9, and obese: >30.0.
[g] Based on the median household income of the maternal ZIP Code of last residence. Quartiles are defined so that the total Kansas population is evenly distributed. Cut-offs for the quartiles are determined using ZIP Code demographic data obtained from the U.S. Census, American Community Survey, 2014-2018, Table S1903, Median Income in the Past 12 Months (in 2018 inflation-adjusted dollars). Each ZIP Code was classified into quartiles based on median household income of each ZIP Code. These quartiles are the following: quartile 1: $1 to $46,245; quartile 2: $46,246 to $55,122; quartile 3: $55,123 to $72,461; quartile 4: $72,462 or more.
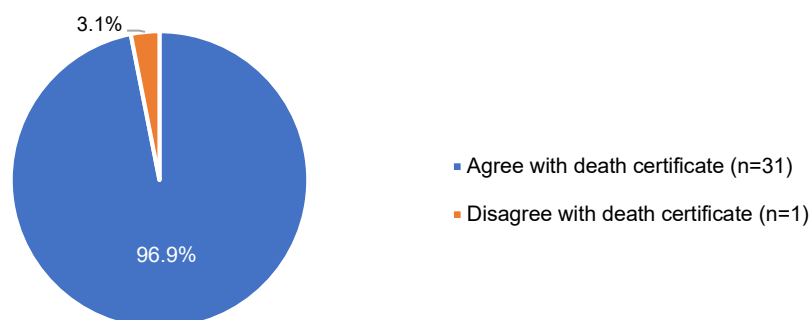[h] Counties of last residence are classified into three urbanization levels - metropolitan (large fringe, medium, small) counties, micropolitan counties, noncore (rural) counties - using the 2013 National Center for Health Statistics (NCHS) Rural-Urban Classification Scheme for Counties. Large fringe metropolitan is defined as metropolitan areas with at least 1 million residents (Johnson, Leavenworth, Linn, Miami, Wyandotte). Medium metropolitan is defined as metropolitan areas of 250,000-999,999 residents (Butler, Harvey, Kingman, Sedgwick, Sumner). Small metropolitan is defined as metropolitan areas of less than 250,000 residents (Doniphan, Douglas, Jackson, Jefferson, Osage, Pottawatomie, Riley, Shawnee, Wabaunsee). Micropolitan is defined as micropolitan areas of 10,000-49,999 residents (Atchison, Barton, Cowley, Crawford, Ellis, Finney, Ford, Franklin, Geary, Kearny, Labette, Lyon, McPherson, Montgomery, Ottawa, Reno, Saline, Seward). Noncore (rural) is defined as noncore areas of <10,000 residents (remainder of the state).

Sources: Kansas Maternal Mortality Review Committee; Kansas Department of Health and Environment, Kansas live births data (occurrence)

Data interpretation example: The row referring to high school or less means that of the 32 deaths that occurred during 2016-2018 that were pregnancy-associated, but not-related, 25 of them occurred to a woman who had a high school education or less. These deaths represented 78.1% of all the pregnancy-associated, but not-related deaths that occurred over that period. The mortality ratio among women who had a high school education or less was 62.1 deaths per 100,000 live births (i.e., for every 100,000 births among women who had a high school education or less, 62 women who had a high school education or less experienced a pregnancy-associated, but not-related death).

The KMMRC agreed with the underlying cause of death listed on the death certificate in 96.9% (31 deaths) of the 32 pregnancy-associated, but not-related deaths (Figure 33). As noted on page 39, often, the KMMRC was able to identify a more specific underlying cause of death than was listed on the death certificate. This contrasts with the pregnancy-related deaths, where there was only a 76.9% agreement between the KMMRC and the death certificate.

Figure 33. Committee agreement with cause of death listed on death certificate, pregnancy-associated, but not-related deaths, Kansas, 2016-2018

3.1%

96.9%

■ Agree with death certificate (n=31)

■ Disagree with death certificate (n=1)

Source: Kansas Maternal Mortality Review Committee

Table 18 shows the manners of death, as reported on the death certificate, for all 32 pregnancy-associated, but not-related deaths. The most common manner of deaths as reported on the death certificate for deaths that were pregnancy-associated, but not-related was accident (50.0%) followed by homicide (21.9%), natural (18.8%), and suicide (6.3%). This pattern contrasts with the manners of death among pregnancy-related deaths, where 76.9% were natural.

Table 18. Manner of death among pregnancy-associated, but not-related deaths, Kansas, 2016-2018

Manner	Number	Percent
Natural	6	18.8
Accident	16	50.0
Homicide	7	21.9
Suicide	2	6.3
Could not be determined	1	3.1
Total	32	100.0

Due to rounding, percent totals may not equal 100.

Source: Kansas Department of Health and Environment, Kansas death data (occurrence)

The KMMRC also discussed circumstances surrounding the pregnancy-associated, but not-related deaths and determined if obesity, mental health conditions other than substance use disorder, and substance use disorder (SUD) contributed to each death (as specified by the MMRIA form - see Appendix 3). Of the 32 pregnancy-associated, but not-related deaths, obesity contributed to 3.1% (1 death), mental health conditions other than substance use disorder contributed to 21.9% (7 deaths, including three probably contributed), and substance use disorder contributed to 31.3% (10 deaths, including one probably contributed). Mental health and/or substance use disorder serves as an underlying factor that may result in suicide, accidental death, and death due to accidental drug intoxication or homicide.[51]

Note: The KMMRC's determinations of preventability, on chance to alter outcome, and contributing factors are captured for only pregnancy-related deaths in Kansas.
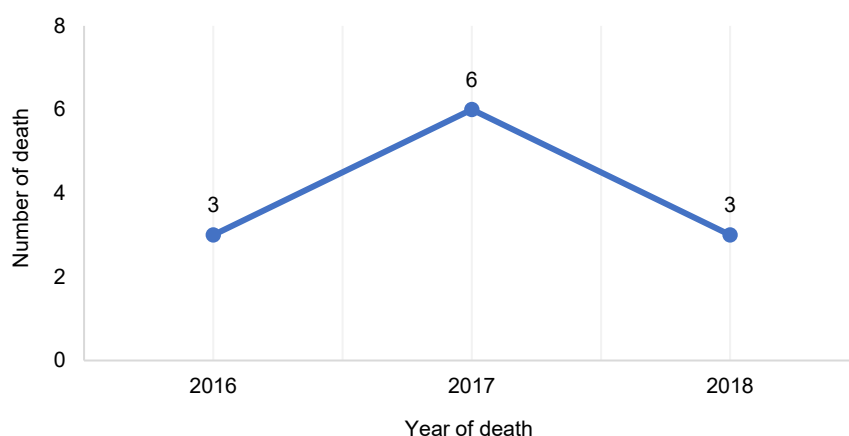
[51] Report from nine maternal mortality review committees, op. cit., p. 15

Pregnancy-Associated But **Unable to Determine** Pregnancy-Relatedness Deaths (12 deaths)

A pregnancy-associated but unable to determine pregnancy-relatedness death, refers to the death of a women during pregnancy or within one year of the end of pregnancy from a cause that is unable to determine pregnancy-relatedness (i.e., if the death occurred due to a pregnancy complication, chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy). Among the 57 pregnancy-associated deaths in Kansas during 2016-2018, 12 (21.1%) deaths were unable to determine pregnancy-relatedness. Examples of when the KMMRC could not determine the pregnancy relatedness of a death include, lack of medical records, unknown reason of a suicide or homicide, or unable to determine the likelihood that a woman would experience a disease outside of pregnancy.

The annual number of pregnancy-associated, but unable to determine pregnancy-relatedness deaths determined by KMMRC in Kansas during 2016-2018 were fewer than 20 (Figure 34).
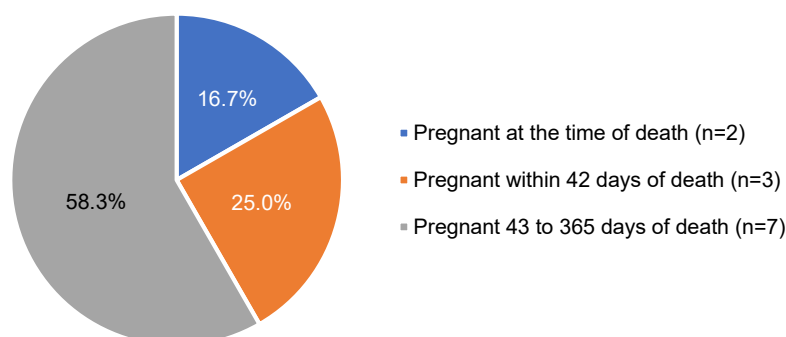
Figure 34. Number of pregnancy-associated but unable to determine pregnancy-relatedness deaths, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

During 2016-2018, in Kansas, *about one in every five deaths* of women during or within one year of pregnancy *were unable to determine pregnancy-relatedness* (12 deaths, 21.1%). This translated to a mortality ratio of 10 deaths per every 100,000 live births that occurred in Kansas. *Nearly two in three deaths occurred within 43 days to one year after the end of pregnancy* (7 deaths, 58.3%), 2 occurred during pregnancy (16.7%), and three occurred 42 days of the end of pregnancy (25.0%) (Figure 35).

Figure 35. Timing of pregnancy-associated but unable to determine the pregnancy-relatedness death, Kansas 2016-2018

Source: Kansas Maternal Mortality Review Committee

Timing of pregnancy-associated but unable to determine pregnancy-relatedness deaths varied by race and ethnicity (Table 19). For non-Hispanic White women, the largest proportion of pregnancy-associated, but not-related deaths occurred within 43 to 365 days after the end of pregnancy. For non-Hispanic Black women, the largest proportion of pregnancy-associated, but not-related deaths occurred within 42 days after the end of pregnancy. For Hispanic women, all pregnancy-associated but unable to determine the pregnancy-relatedness occurred in the late postpartum period (within 43 to 365 days after the end of pregnancy).

Table 19. Timing of pregnancy-associated but unable to determine pregnancy-relatedness by race and ethnicity, Kansas, 2016-2018

Race and Ethnicity	Timing of pregnancy-associated but unable to determine pregnancy-relatedness death number (%)		
	Pregnant	Within 42 days	Within 43 to 365 days
Non-Hispanic White	1 (16.7)	0 (0.0)	5 (83.3)
Non-Hispanic Black	1 (33.3)	2 (66.7)	0 (0.0)
Non-Hispanic other	0 (0.0)	1 (100.0)	0 (0.0)
Hispanic	0 (0.0)	0 (0.0)	2 (100.0)

Source: Kansas Maternal Mortality Review Committee

Half of pregnancy-associated but unable to determine pregnancy-relatedness deaths were injury-related (6 deaths, 50.0%), including two (16.7%) unintentional motor vehicle crashes, two (16.7%) suicides, one (8.3%) unintentional poisoning/overdoses, and one (8.3%) homicide death. The other half were medical-related, including embolism (2 deaths, 16.7%), hematoma (2 deaths, 16.7%), blood disorders (1 death, 8.3%), and cardiovascular and coronary conditions (1 deaths, 8.3%). The number of cases in Kansas from any individual cause is so small that determining trends for specific causes of pregnancy-associated, but unable to determine pregnancy-relatedness death is not possible.

Timing of pregnancy-associated but unable to determine pregnancy-relatedness deaths varied somewhat by cause (Table 20). Motor vehicle crash and suicide deaths occurred within 43-365 days after the end of pregnancy. Homicide death occurred during pregnancy. Deaths due to poisoning/overdose, embolism or blood disorders occurred within 42 days after the end of pregnancy.
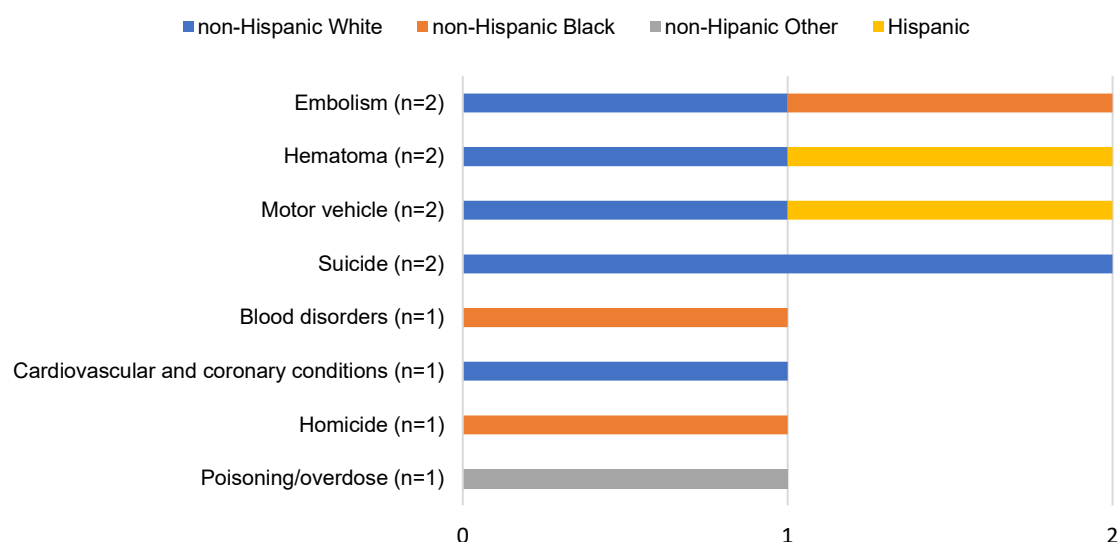
Table 20. Timing of pregnancy-associated but unable to determine pregnancy-relatedness death by underlying causes of death, Kansas, 2016-2018

Underlying cause of death	Timing of pregnancy-associated but unable to determine pregnancy-relatedness death number (%)		
	Pregnant	Within 42 days	Within 43 to 365 days
Embolism	0 (0.0)	1 (50.0)	1 (50.0)
Hematoma	1 (50.0)	0 (0.0)	1 (50.0)
Motor vehicle crash	0 (0.0)	0 (0.0)	2 (100.0)
Suicide	0 (0.0)	0 (0.0)	2 (100.0)
Blood disorders	0 (0.0)	1 (100.0)	0 (0.0)
Cardiovascular and coronary conditions	0 (0.0)	0 (0.0)	1 (100.0)
Homicide	1 (100.0)	0 (0.0)	0 (0.0)
Poisoning/overdose	0 (0.0)	1 (100.0)	0 (0.0)

Source: Kansas Maternal Mortality Review Committee

The distribution of underlying causes of death of pregnancy-associated but unable to determine the pregnancy-relatedness death by race and ethnicity varied (Figure 36). Rates of death by race and ethnicity are not calculated because the numbers of deaths in most groups are very small. six pregnancy-associated but unable to determine the pregnancy-relatedness deaths occurred in non-Hispanic White women (50.0%), three non-Hispanic Black women (25.0%), two Hispanic women (16.7%), and one involved a non-Hispanic woman of other race (8.3%). The proportion of deaths that occurred among non-Hispanic Black women (25.0%) far exceeded their representation among the population of women giving birth (7.1%) in Kansas (Figure 14).

Figure 36. Number of underlying causes of death of pregnancy-associated but unable to determine pregnancy-relatedness death by race and ethnicity, Kansas, 2016-2018

Source: Kansas Maternal Mortality Review Committee

Table 21 describes the demographic characteristics of women who experienced a pregnancy-associated but unable to determine pregnancy-relatedness death. Both the number of women who died within each demographic group, and the mortality ratios are displayed when number of decedents is >=5. Ratios based on fewer than 20 deaths should be interpreted with caution.

Most deaths occurred among women aged 20-29, with a high school education or lower, who were never married, who had Medicaid during pregnancy or for delivery, and who lived in medium metropolitan counties (mostly southcentral public health region).

Table 21. Characteristics of women experienced a pregnancy-associated but unable to determine pregnancy-relatedness death, Kansas, 2016-2018

Demographics	Number	Percent[a] of all pregnancy-associated but unable to determine pregnancy- relatedness deaths	pregnancy-associated but unable to determine pregnancy-relatedness mortality ratio		
			Ratio[b]	95% conference interval	
All women	12	100.0	10.4	5.4	18.2
Age in years at time of death					
<20	1	8.3	-[c]	-	-
20-24	4	33.3	-	-	-
25-29	4	33.3	-	-	-
30-34	3	25.0	-	-	-
35-39	0	0.0	0.0	0.0	27.8
≥40	0	0.0	0.0	0.0	150.2
Race and ethnicity					
Non-Hispanic White	6	50.0	7.5[e]	2.7	16.3
Racial/ethnic minorities	6	50.0	17.3[e]	6.4	37.7
Hispanic[d]	2	16.7	-	-	-
Non-Hispanic Black	3	25.0	-	-	-
Non-Hispanic, other races	1	8.3	-	-	-
Education					
High school or less	7	58.3	17.4[e]	7.0	35.8
More than high school	5	41.7	6.7[e]	2.2	15.7
Some college	5	41.7	20.8[e]	6.7	48.5
Associate or bachelor's degree	0	0.0	0.0	0.0	9.9
Advanced degree	0	0.0	0.0	0.0	28.5
Health insurance during pregnancy or for delivery					
Medicaid	9	75.0	25.7[e]	11.7	48.7
Private	3	25.0	-	-	-
Uninsured or self-pay	0	0.0	-	-	-
Unknown	0	0.0	-	-	-
Marital status					
Married	2	16.7	-	-	-
Unmarried: divorced (1) or never married (9)	10	83.3	24.5[e]	11.7	45.0
Body mass index (BMI)[f]					
Underweight	1	8.3	-	-	-
Normal weight	3	25.0	-	-	-
Overweight or obese	6	50.0	9.5[e]	3.5	20.6
Overweight	1	8.3	-	-	-
Obese	5	41.7			
Unknown	2	16.7	-	-	-
Prenatal care entry					
1st trimester	8	66.7	8.6[e]	3.7	16.9
Late and none	3	25.0	-	-	-
2nd trimester	2	16.7	-	-	-
3rd trimester	0	0.0	-	-	-
None	1	8.3	-	-	-
Unknown	1	8.3	-	-	-
Location of residence within Kansas (excluding 2 out of state resident)					

Median household income of maternal residential ZIP Code[g]					
Quartile 1 (poorest)	4	40.0	-	-	-
Quartile 2	1	10.0	-	-	-
Quartile 3	4	40.0	-	-	-
Quartile 4 (wealthiest)	1	10.0	-	-	-
Urban-rural residence[h]					
Metropolitan	6	60.0	8.3[e]	3.0	18.0
Non-Metropolitan	4	40.0	-	-	-
Micropolitan	2	20.0	-	-	-
Rural	2	20.0	-	-	-

[a] Percentages might not total 100% due to rounding. Due to rounding some totals may not correspond with the sum of the separate figures.
[b] Number of deaths per 100,000 live births.
[c] Ratios are not reported when number of decedents is <5 or when characteristic response is "unknown". It is denoted by "-".
[d] Includes persons of any race.
[e] Relative standard error (RSE), defined as the estimate divided by its standard error, is an indicator for statistical reliability. Estimates have a RSE greater than 30% and less than or equal to 50% and should be used with caution as they do not meet the standard of reliability or precision.
[f] Body mass index (BMI): a key index for relating a person's body weight to their height. The BMI is a person's weight in pounds times 703 divided by their height in inches squared. Adult BMI ranges underweight: <18.5, normal weight: 18.5-24.9, overweight: 25.0-29.9, and obese: >30.0.
[g] Based on the median household income of the maternal ZIP Code of last residence. Quartiles are defined so that the total Kansas population is evenly distributed. Cut-offs for the quartiles are determined using ZIP Code demographic data obtained from the U.S. Census, American Community Survey, 2014-2018, Table S1903, Median Income in the Past 12 Months (in 2018 inflation-adjusted dollars). Each ZIP Code was classified into quartiles based on median household income of each ZIP Code. These quartiles are the following: quartile 1: $1 to $46,245; quartile 2: $46,246 to $55,122; quartile 3: $55,123 to $72,461; quartile 4: $72,462 or more.
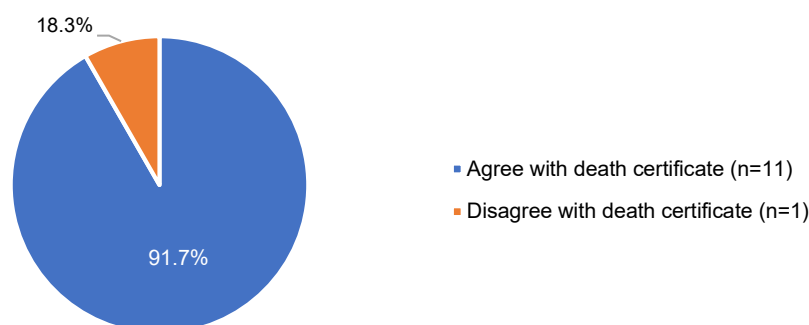[h] Counties of last residence are classified into three urbanization levels - metropolitan (large fringe, medium, small) counties, micropolitan counties, noncore (rural) counties - using the 2013 National Center for Health Statistics (NCHS) Rural-Urban Classification Scheme for Counties. Large fringe metropolitan is defined as metropolitan areas with at least 1 million residents (Johnson, Leavenworth, Linn, Miami, Wyandotte). Medium metropolitan is defined as metropolitan areas of 250,000-999,999 residents (Butler, Harvey, Kingman, Sedgwick, Sumner). Small metropolitan is defined as metropolitan areas of less than 250,000 residents (Doniphan, Douglas, Jackson, Jefferson, Osage, Pottawatomie, Riley, Shawnee, Wabaunsee). Micropolitan is defined as micropolitan areas of 10,000-49,999 residents (Atchison, Barton, Cowley, Crawford, Ellis, Finney, Ford, Franklin, Geary, Kearny, Labette, Lyon, McPherson, Montgomery, Ottawa, Reno, Saline, Seward). Noncore (rural) is defined as noncore areas of <10,000 residents (remainder of the state).

Sources: Kansas Maternal Mortality Review Committee; Kansas Department of Health and Environment, Kansas live births data (occurrence)

Data interpretation example: The row referring to high school or less means that of the 12 deaths that occurred during 2016-2018 that were pregnancy-associated but unable to determine pregnancy-relatedness, 7 of them occurred to a woman who had a high school education or less. These deaths represented 58.3% of all the pregnancy-associated but unable to determine pregnancy-relatedness deaths that occurred over that period. The mortality ratio among women who had a high school education or less was 17.4 deaths per 100,000 live births (i.e., for every 100,000 births among women who had a high school education or less, 17 women who had a high school education or less experienced a pregnancy-associated but unable to determine pregnancy-relatedness death).

The KMMRC agreed with the underlying cause of death listed on the death certificate in 91.7% (11 deaths) of the 12 pregnancy-associated but unable to determine pregnancy-relatedness deaths (Figure 37). As noted on page 39, often, the KMMRC was able to identify a more specific underlying cause of death than was listed on the death certificate. This contrasts with the pregnancy-related deaths, where there was only a 76.9% agreement between the KMMRC and the death certificate.

Figure 37. Committee agreement with cause of death listed on death certificate, pregnancy-associated but unable to determine the pregnancy-relatedness deaths, Kansas, 2016-2018

18.3%

91.7%

■ Agree with death certificate (n=11)

■ Disagree with death certificate (n=1)

Source: Kansas Maternal Mortality Review Committee

Table 22 shows the manners of death, as reported on the death certificate, for all 12 pregnancy-associated but unable to determine the pregnancy-relatedness deaths. The most common manner of deaths as reported on the death certificate for deaths that were pregnancy-associated but unable to determine the pregnancy-relatedness was natural (41.7%) followed by accident (25.0%), suicide (16.7%), and homicide (8.3%).

Table 22. Manner of death among pregnancy-associated but unable to determine pregnancy-relatedness deaths, Kansas, 2016-2018

Manner	Number	Percent
Natural	5	41.7
Accident	3	25.0
Suicide	2	16.7
Homicide	1	8.3
Could not be determined	1	8.3
Total	12	100.0

Due to rounding, percent totals may not equal 100.

Source: Kansas Department of Health and Environment, Kansas death data (occurrence)

The KMMRC also discussed circumstances surrounding the pregnancy-associated but unable to determine pregnancy-relatedness deaths and determined if obesity, mental health conditions other than substance use disorder, and substance use disorder (SUD) contributed to each death (as specified by the MMRIA form - see Appendix 3). Of the 12 pregnancy-associated but unable to determine pregnancy-relatedness deaths, obesity contributed to 8.3% (1 death), mental health conditions other than substance use disorder contributed to 25.0% (1 death, including 2 probably contributed), and substance use disorder contributed to 33.3% (4 deaths). Mental health and/or substance use disorder serves as an underlying factor that may result in suicide, accidental death, and death due to accidental drug intoxication or homicide.[52]

Note: The KMMRC's determinations of preventability, on chance to alter outcome and contributing factors, are captured for only pregnancy-related deaths in Kansas.

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[52] Report from nine maternal mortality review committees, op. cit., p. 15

Appendix 1. Diagnosis and Procedure Codes Used to Define 21 Indicators of Severe Maternal Morbidity and Corresponding ICD-10-CM/PCS Codes During Delivery Hospitalization as Specified by the Centers for Disease Control and Prevention.[53,54,55,56]

Severe maternal morbidity indicator	Diagnosis or procedure	ICD-10-CM/PCS code
1. Acute myocardial infarction	DX	I21.xx, I22.x
2. Aneurysm*	DX	I71.xx*; I79.0*No I71.7 code exists, so ICD-10 list encompasses all possible I71 codes
3. Acute renal failure	DX	N17.x, O90.4
4. Adult respiratory distress syndrome	DX	J80, J95.1, J95.2, J95.3, J95.82x, J96.0x, J96.2x R09.2
5. Amniotic fluid embolism	DX	O88.1x
6. Cardiac arrest/ventricular fibrillation*	DX	I46.x, I49.0x
7. Conversion of cardiac rhythm	PR	5A2204Z, 5A12012
8. Disseminated intravascular coagulation	DX	D65, D68.8, D68.9, O72.3
9. Eclampsia	DX	O15. X
10. Heart failure/arrest during surgery or procedure	DX	I97.12x, I97.13x, I97.710, I97.711
11. Puerperal cerebrovascular disorders	DX	I60.xx- I68.xx, O22.51, O22.52, O22.53, I97.81x, I97.82x, O87.3; I62.9 – included but should not be captured if this is not a valid code.
12. Pulmonary edema / Acute heart failure	DX	J81.0, I50.1, I50.20, I50.21, I50.23, I50.30, I50.31, I50.33, I50.40, I50.41, I50.43, I50.9
13. Severe anesthesia complications	DX	O74.0, O74.1, O74.2, O74.3, O89.0x, O89.1, O89.2
14. Sepsis	DX	O85, O86.04, T80.211A, T81.4XXA, T81.44xx, or R65.20 or A40.x, A41.x, A32.7
15. Shock	DX	O75.1, R57.x, R65.21, T78.2XXA, T88.2 XXA, T88.6 XXA, T81.10XA, T81.11XA, T81.19XA
16. Sickle cell disease with crisis	DX	D57.0x, D57.21x, D57.41x, D57.81x
17. Air and thrombotic embolism	DX	I26.x, O88.0x, O88.2x, O88.3x, O88.8x
18. Blood products transfusion	PR	30233 Peripheral vein, percutaneous (7th digit: x=1: nonautologous); 30240 Central Vein, open ((7th digit: x=1: nonautologous)); 30243 Central Vein, percutaneous (7th digit: x=1: nonautologous x=0: autologous) + blood product transfusion codes
19. Hysterectomy	PR	0UT90ZZ, 0UT94ZZ, 0UT97ZZ, 0UT98ZZ, 0UT9FZZ
20. Temporary tracheostomy*	PR	0B110Z, 0B110F, 0B113, 0B114
21. Ventilation	PR	5A1935Z, 5A1945Z, 5A1955Z

Abbreviations: ICD-10-CM/PCS, International Classification of Diseases, tenth Revision, Clinical Modification/Procedure Coding System

For all pregnancy related codes O00-O9A: Are only applicable to maternity patients aged 12-55 years inclusive; Use a code under Z3A (Z3A.20-Z3A.42) to document the exact week during the pregnancy; *Due to rare prevalences, the following indicators are combined for reporting purposes: 1) Acute myocardial infarction and aneurysm; 2) cardiac arrest/ventricular fibrillation and conversion of cardiac rhythm; and 3) temporary tracheostomy and ventilation. Blood products transfusion was excluded in the analysis due to known coding issues in ICD-10-CM (i.e., which decreased significantly overall with the transition from ICD-9-CM to ICD-10-CM/PCS coding and may not always indicate severe morbidity in the absence of other codes).

[53] Fingar, Hambrick, Heslin and Moore, op. cit., p. 21
[54] CDC. Severe Morbidity Indicators and Corresponding ICD-10-CM/PCS Codes during Delivery Hospitalizations, op. cit., p. 21
[55] Maternal and Child Health Bureau. FAD, op. cit., p. 21
[56] Council on Patient Safety in Women's Health Care. https://safehealthcareforeverywoman.org/aim-data/. https://safehealthcareforeverywoman.org/wp-content/uploads/2020/06/FINAL_ANNOTATED_AIM-SMM-Updated-Code-List-clean_06272020.xlsx. Updated 6/29/2020.

Appendix 2. Enhanced Delivery Hospitalization Identification Method[57,58,59]

Description	Codes
Outcome of delivery diagnosis	Z37x (short form code for live birth; includes Z37.0 through Z37.9)
Normal delivery diagnosis	O75.82 (onset (spontaneous) of labor after 37 completed weeks of gestation but before 39 completed weeks of gestation, with delivery by (planned) cesarean section) O80 (encounter for full-term uncomplicated delivery) O82 (encounter for cesarean delivery without indication)
DRG delivery codes	MS-DRG = 765 (cesarean section with CC/MCC) MS-DRG = 766 (cesarean section without CC/MCC) MS-DRG = 767 (vaginal delivery with sterilization and/or D&C) MS-DRG = 768 (vaginal delivery with OR procedure(s) except sterilization and/or D&C) MS-DRG = 774 (vaginal delivery with complicating diagnoses) MS-DRG = 775 (vaginal delivery without complicating diagnoses) MS-DRG = 783 (cesarean section with sterilization with MCC) MS-DRG = 784 (cesarean section with sterilization with CC) MS-DRG = 785 (cesarean section without CC/MCC) MS-DRG = 786 (cesarean section without sterilization with MCC) MS-DRG = 787 (cesarean section without sterilization with CC) MS-DRG = 788 (cesarean section without sterilization without CC/MCC) MS-DRG = 796 (vaginal delivery with sterilization and/or D&C with MCC) MS-DRG = 797 (vaginal delivery with sterilization and/or D&C with CC) MS-DRG = 798 (vaginal delivery with sterilization and/or D&C without CC/MCC) MS-DRG = 805 (vaginal delivery without sterilization and/or D&C with MCC) MS-DRG = 806 (vaginal delivery without sterilization and/or D&C with CC) MS-DRG = 807 (vaginal delivery without sterilization and/or D&C with CC/MCC)
Selected delivery related procedures	10D00Z0-10D00Z2 (extraction of products of conception, open approach, includes classical, low cervical, and extraperitoneal) 10D07Z3-0D07Z8 (extraction of products of conception via natural or artificial opening) 10E0XZZ (delivery of products of conception, external approach)
Exclusions	O00.x (ectopic pregnancy) O01.x (hydatidiform mole) O02.x (other abnormal products of conception) O03.x (spontaneous abortion) O04.x (complications following (induced) termination of pregnancy) O07.x (failed attempted termination of pregnancy) O08.x (complications following ectopic and molar pregnancy) Any procedure starting with '10A0' (Abortion of products of conception) 10A00ZZ 10A03ZZ 10A04ZZ 10A07Z6 10A07ZW 10A07ZX 10A07ZZ 10A08ZZ

Abbreviations: ICD-10-CM, International Classification of Diseases, tenth Revision, Clinical Modification; DRG, diagnosis-related group; MS-DRG, Medicare severity diagnosis-related group; CC, complicating or comorbid condition; MCC, major complicating or comorbid condition; D&C, dilation and curettage

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[57] Fingar, Hambrick, Heslin and Moore, op. cit., p. 21
[58] Maternal and Child Health Bureau. FAD, op. cit., p. 21
[59] Council on Patient Safety in Women's Health Care. Op. cit., p70

Appendix 3. Maternal Mortality Review Committee Decisions Form, v20[60]

MMRIA

MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v20   1

REVIEW DATE

Month/Day/Year

RECORD ID #

PREGNANCY-RELATEDNESS: SELECT ONE

☐ PREGNANCY-RELATED
A death during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy

☐ PREGNANCY-ASSOCIATED, BUT NOT-RELATED
A death during pregnancy or within one year of the end of pregnancy from a cause that is not related to pregnancy

☐ PREGNANCY-ASSOCIATED BUT UNABLE TO DETERMINE PREGNANCY-RELATEDNESS

☐ NOT PREGNANCY-RELATED OR-ASSOCIATED
(i.e. false positive, was not pregnant within one year of death)

ESTIMATE THE DEGREE OF RELEVANT INFORMATION (RECORDS) AVAILABLE FOR THIS CASE:

☐ COMPLETE
All records necessary for adequate review of the case were available

☐ SOMEWHAT COMPLETE
Major gaps (i.e. information that would have been crucial to the review of the case)

☐ MOSTLY COMPLETE
Minor gaps (i.e. information that would have been beneficial but was not essential to the review of the case)

☐ NOT COMPLETE
Minimal records available for review (i.e. death certificate and no additional records)

☐ N/A

DOES THE COMMITTEE AGREE WITH THE UNDERLYING* CAUSE OF DEATH LISTED ON DEATH CERTIFICATE?   ☐ YES   ☐ NO

COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH

IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING* CAUSE OF DEATH
Refer to page 3 for PMSS-MM cause of death list.

TYPE	OPTIONAL: CAUSE (DESCRIPTIVE)
UNDERLYING*	
CONTRIBUTING	
IMMEDIATE	
OTHER SIGNIFICANT	

COMMITTEE DETERMINATIONS ON CIRCUMSTANCES SURROUNDING DEATH

DID OBESITY CONTRIBUTE TO THE DEATH?   ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWN

DID DISCRIMINATION CONTRIBUTE TO THE DEATH?   ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWN

DID MENTAL HEALTH CONDITIONS OTHER THAN SUBSTANCE USE DISORDER CONTRIBUTE TO THE DEATH?   ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWN

DID SUBSTANCE USE DISORDER CONTRIBUTE TO THE DEATH?   ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWN

MANNER OF DEATH

WAS THIS DEATH A SUICIDE?   ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWN

WAS THIS DEATH A HOMICIDE?   ☐ YES ☐ PROBABLY ☐ NO ☐ UNKNOWN

IF ACCIDENTAL DEATH, HOMICIDE, OR SUICIDE, LIST THE MEANS OF FATAL INJURY
☐ FIREARM
☐ SHARP INSTRUMENT
☐ BLUNT INSTRUMENT
☐ POISONING/ OVERDOSE
☐ HANGING/ STRANGULATION/ SUFFOCATION
☐ FALL
☐ PUNCHING/ KICKING/BEATING
☐ EXPLOSIVE
☐ DROWNING
☐ FIRE OR BURNS
☐ MOTOR VEHICLE
☐ INTENTIONAL NEGLECT
☐ OTHER, SPECIFY:

IF HOMICIDE, WHAT WAS THE RELATIONSHIP OF THE PERPETRATOR TO THE DECEDENT?
☐ NO RELATIONSHIP
☐ PARTNER
☐ EX-PARTNER
☐ OTHER RELATIVE
☐ ACQUAINTANCE
☐ OTHER, SPECIFY:
☐ UNKNOWN
☐ NOT APPLICABLE
☐ UNKNOWN
☐ NOT APPLICABLE

*Underlying cause refers to the disease or injury that initiated the chain of events leading to death or the circumstances of the accident or violence which produced the fatal injury.

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[60] Maternal Mortality Review Committee Decisions Form v20. October 13, 2020, op. cit., p. 6

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MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v20　　2

COMMITTEE DETERMINATION OF PREVENTABILITY

A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors.

WAS THIS DEATH PREVENTABLE?　☐ YES　☐ NO

CHANCE TO ALTER OUTCOME
☐ GOOD CHANCE　☐ SOME CHANCE
☐ NO CHANCE　☐ UNABLE TO DETERMINE

CONTRIBUTING FACTORS AND RECOMMENDATIONS FOR ACTION (Entries may continue to grid on page 5)

CONTRIBUTING FACTORS WORKSHEET
What were the factors that contributed to this death?
Multiple contributing factors may be present at each level.

RECOMMENDATIONS OF THE COMMITTEE
If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events?

DESCRIPTION OF ISSUE (enter a description for EACH contributing factor listed)	CONTRIBUTING FACTORS (choose as many as needed below)	LEVEL	COMMITTEE RECOMMENDATIONS [Who?] should [do what?] [when?] Map recommendations to contributing factors.	LEVEL	PREVENTION TYPE (choose below)	EXPECTED IMPACT (choose below)

CONTRIBUTING FACTOR KEY (DESCRIPTIONS ON PAGE 4)

- Access/financial
- Adherence
- Assessment
- Childhood abuse/trauma
- Chronic disease
- Clinical skill/quality of care
- Communication
- Continuity of care/care coordination
- Cultural/religious
- Delay
- Discrimination
- Environmental
- Equipment/technology
- Interpersonal racism
- Knowledge
- Law Enforcement
- Legal
- Mental health conditions
- Outreach
- Policies/procedures
- Referral
- Social support/isolation
- Structural racism
- Substance use disorder - alcohol, illicit/prescription drugs
- Tobacco use
- Unstable housing
- Violence
- Other

DEFINITION OF LEVELS

- **PATIENT/FAMILY:** An individual before, during or after a pregnancy, and their family, internal or external to the household, with influence on the individual
- **PROVIDER:** An individual with training and expertise who provides care, treatment, and/or advice
- **FACILITY:** A physical location where direct care is provided – ranges from small clinics and urgent care centers to hospitals with trauma centers
- **SYSTEM:** Interacting entities that support services before, during, or after a pregnancy – ranges from healthcare systems and payors to public services and programs
- **COMMUNITY:** A grouping based on a shared sense of place or identity – ranges from physical neighborhoods to a community based on common interests and shared circumstances

PREVENTION TYPE

- **PRIMARY:** Prevents the contributing factor before it ever occurs
- **SECONDARY:** Reduces the impact of the contributing factor once it has occurred (i.e. treatment)
- **TERTIARY:** Reduces the impact or progression of what has become an ongoing contributing factor (i.e. management of complications)

EXPECTED IMPACT

- **SMALL:** Education/counseling (community- and/or provider-based health promotion and education activities)
- **MEDIUM:** Clinical intervention and coordination of care across continuum of well-woman visits (protocols, prescriptions)
- **LARGE:** Long-lasting protective intervention (improve readiness, recognition and response to obstetric emergencies/LARC)
- **EXTRA LARGE:** Change in context (promote environments that support healthy living/ensure available and accessible services)
- **GIANT:** Address social determinants of health (poverty, inequality, etc.)

IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING CAUSE OF DEATH* PMSS-MM

* PREGNANCY-RELATED DEATH: DEATH DURING PREGNANCY OR WITHIN ONE YEAR OF THE END OF PREGNANCY FROM A PREGNANCY COMPLICATION, A CHAIN OF EVENTS INITIATED BY PREGNANCY, OR THE AGGRAVATION OF AN UNRELATED CONDITION BY THE PHYSIOLOGIC EFFECTS OF PREGNANCY.

Code	Description
10	Hemorrhage (excludes aneurysms or CVA)
10.1	Hemorrhage – rupture/laceration/intra-abdominal bleeding
10.2	Placental abruption
10.3	Placenta previa
10.4	Ruptured ectopic pregnancy
10.5	Hemorrhage - uterine atony/postpartum hemorrhage
10.6	Placenta accreta/increta/percreta
10.7	Hemorrhage due to retained placenta
10.8	Hemorrhage due to primary DIC (obsolete)
10.9	Other hemorrhage/NOS
20	Infection
20.1	Postpartum genital tract (e.g. of the uterus/pelvis/perineum/necrotizing fasciitis)
20.2	Sepsis/septic shock
20.4	Chorioamnionitis/antepartum infection
20.5	Non-pelvic infections (e.g. pneumonia, TB, meningitis, HIV)
20.6	Urinary tract infection
20.9	Other infections/NOS
30	Embolism – thrombotic (non-cerebral)
30.9	Other embolism/NOS
31	Embolism – amniotic fluid
40	Preeclampsia
50	Eclampsia
60	Chronic hypertension with superimposed preeclampsia
70	Anesthesia complications
80	Cardiomyopathy
80.1	Postpartum/peripartum cardiomyopathy
80.2	Hypertrophic cardiomyopathy
80.9	Other cardiomyopathy/NOS
82	Hematologic
82.1	Sickle cell anemia
82.9	Other hematologic conditions including thrombophilias/TTP/HUS/NOS
83	Collagen vascular/autoimmune diseases
83.1	Systemic lupus erythematosus (SLE)
83.9	Other collagen vascular diseases/NOS
85	Conditions unique to pregnancy (e.g. gestational diabetes, hyperemesis, liver disease of pregnancy)
88	Injury
88.1	Intentional (homicide)
88.2	Unintentional
88.9	Unknown/NOS
89	Cancer
89.1	Gestational trophoblastic disease (GTD)
89.3	Malignant melanoma
89.9	Other malignancies/NOS
90	Cardiovascular conditions
90.1	Coronary artery disease/myocardial infarction (MI)/atherosclerotic cardiovascular disease
90.2	Pulmonary hypertension
90.3	Valvular heart disease congenital and acquired
90.4	Vascular aneurysm/dissection (non-cerebral)
90.5	Hypertensive cardiovascular disease
90.6	Marfan Syndrome
90.7	Conduction defects/arrhythmias
90.8	Vascular malformations outside head and coronary arteries
90.9	Other cardiovascular disease, including CHF, cardiomegaly, cardiac hypertrophy, cardiac fibrosis, non-acute myocarditis/NOS
91	Pulmonary conditions (excludes ARDS–Adult respiratory distress syndrome)
91.1	Chronic lung disease
91.2	Cystic fibrosis
91.3	Asthma
91.9	Other pulmonary disease/NOS
92	Neurologic/neurovascular conditions (excluding CVAs)
92.1	Epilepsy/seizure disorder
92.9	Other neurologic diseases/NOS
93	Renal disease
93.1	Chronic renal failure/End-stage renal disease (ESRD)
93.9	Other renal disease/NOS
95	Cerebrovascular accident (hemorrhage/thrombosis/aneurysm/malformation) not secondary to hypertensive disorders of pregnancy
96	Metabolic/endocrine
96.1	Obesity
96.2	Diabetes mellitus
96.9	Other metabolic/endocrine disorders
97	Gastrointestinal disorders
97.1	Crohn's disease/ulcerative colitis
97.2	Liver disease/failure/transplant
97.9	Other gastrointestinal diseases/NOS
100	Mental health conditions
100.1	Depression
100.9	Other psychiatric conditions/NOS
999	Unknown COD

CONTRIBUTING FACTOR DESCRIPTIONS

LACK OF ACCESS/FINANCIAL RESOURCES
Systemic barriers, e.g. lack or loss of healthcare insurance or other financial duress, as opposed to noncompliance, impacted their ability to care for themself (e.g. did not seek services because unable to miss work or afford postpartum visits after insurance expired). Other barriers to accessing care: insurance non-eligibility, provider shortage in their geographical area, and lack of public transportation.

ADHERENCE TO MEDICAL RECOMMENDATIONS
The provider or patient did not follow protocol or failed to comply with standard procedures (i.e. non adherence to prescribed medications).

FAILURE TO SCREEN/INADEQUATE ASSESSMENT OF RISK
Factors placing the individual at risk for a poor clinical outcome recognized, and they were not transferred/transported to a provider able to give a higher level of care.

CHILDHOOD SEXUAL ABUSE/TRAUMA
The patient experienced rape, molestation, or one or more of the following: sexual exploitation during childhood plus persuasion, inducement, or coercion of a child to engage in sexually explicit conduct; physical or emotional abuse or violence other than that related to sexual abuse during childhood.

CHRONIC DISEASE
Occurrence of one or more significant pre-existing medical conditions (e.g. obesity, cardiovascular disease, or diabetes).

CLINICAL SKILL/QUALITY OF CARE (PROVIDER OR FACILITY PERSPECTIVE)
Personnel were not appropriately skilled for the situation or did not exercise clinical judgment consistent with current standards of care (e.g. error in the preparation or administration of medication or unavailability of translation services).

POOR COMMUNICATION/LACK OF CASE COORDINATION OR MANAGEMENT/ LACK OF CONTINUITY OF CARE (SYSTEM PERSPECTIVE)
Care was fragmented (i.e. uncoordinated or not comprehensive) among or between healthcare facilities or units, (e.g. records not available between inpatient and outpatient or among units within the hospital, such as Emergency Department and Labor and Delivery).

LACK OF CONTINUITY OF CARE (PROVIDER OR FACILITY PERSPECTIVE)
Care providers did not have access to individual's complete records or did not communicate their status sufficiently. Lack of continuity can be between prenatal, labor and delivery, and postpartum providers.

CULTURAL/RELIGIOUS, OR LANGUAGE FACTORS The provider or patient demonstrated that any of these factors was either a barrier to care due to lack of understanding or led to refusal of therapy due to beliefs (or belief systems).

DELAY
The provider or patient was delayed in referring or accessing care, treatment, or follow-up care/action.

DISCRIMINATION
Treating someone less or more favorably based on the group, class or category they belong to resulting from biases, prejudices, and stereotyping. It can manifest as differences in care, clinical communication and shared decision-making. (Smedley et al, 2003 and Dr. Rachel Hardeman)

ENVIRONMENTAL FACTORS
Factors related to weather or social environment.

INADEQUATE OR UNAVAILABLE EQUIPMENT/TECHNOLOGY
Equipment was missing, unavailable, or not functional, (e.g. absence of blood tubing connector).

INTERPERSONAL RACISM
Discriminatory interactions between individuals based on differential assumptions about the abilities, motives, and intentions of others and resulting in differential actions toward others based on their race. It can be conscious as well as unconscious, and it includes acts of commission and acts of omission. It manifests as lack of respect, suspicion, devaluation, scapegoating, and dehumanization. (Jones, CP, 2000 and Dr. Cornelia Graves).

KNOWLEDGE – LACK OF KNOWLEDGE REGARDING IMPORTANCE OF EVENT OR OF TREATMENT OR FOLLOW-UP
The provider or patient did not receive adequate education or lacked knowledge or understanding regarding the significance of a health event (e.g. shortness of breath as a trigger to seek immediate care) or lacked understanding about the need for treatment/follow-up after evaluation for a health event (e.g. needed to keep appointment for psychiatric referral after an ED visit for exacerbation of depression).

INADEQUATE LAW ENFORCEMENT RESPONSE
Law enforcement response was not in a timely manner or was not appropriate or thorough in scope.

LEGAL
Legal considerations that impacted outcome.

MENTAL HEALTH CONDITIONS
The patient carried a diagnosis of a psychiatric disorder. This includes postpartum depression.

INADEQUATE COMMUNITY OUTREACH/RESOURCES
Lack of coordination between healthcare system and other outside agencies/organizations in the geographic/cultural area that work with maternal health issues.

LACK OF STANDARDIZED POLICIES/PROCEDURES
The facility lacked basic policies or infrastructure germane to the individual's needs (e.g. response to high blood pressure, or a lack of or outdated policy or protocol).

LACK OF REFERRAL OR CONSULTATION
Specialists were not consulted or did not provide care; referrals to specialists were not made.

STRUCTURAL RACISM
The systems of power based on historical injustices and contemporary social factors that systematically disadvantage people of color and advantage white people through inequities in housing, education, employment, earnings, benefits, credit, media, health care, criminal justice, etc. –   (Adapted from Bailey ZD, Lancet. 2017 and Dr. Carla Ortique)

SOCIAL SUPPORT/ISOLATION – LACK OF FAMILY/ FRIEND OR SUPPORT SYSTEM
Social support from family, partner, or friends was lacking, inadequate, and/or dysfunctional.

SUBSTANCE USE DISORDER – ALCOHOL, ILLICIT/ PRESCRIPTION DRUGS
Substance use disorder is characterized by recurrent use of alcohol and/or drugs causing clinically and functionally significant impairment, such as health problems or disability. The committee may determine that substance use disorder contributed to the death when the disorder directly compromised their health status (e.g. acute methamphetamine intoxication exacerbated pregnancy– induced hypertension, or they were more vulnerable to infections or medical conditions).

TOBACCO USE
The patient's use of tobacco directly compromised the patient's health status (e.g. long-term smoking led to underlying chronic lung disease).

UNSTABLE HOUSING
Individual lived "on the street," in a homeless shelter, or in transitional or temporary circumstances with family or friends.

VIOLENCE AND INTIMATE PARTNER VIOLENCE (IPV)
Physical or emotional abuse perpetrated by current or former intimate partner, family member, friend, acquaintance, or stranger.

OTHER
Contributing factor not otherwise mentioned. Please provide description

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CONTRIBUTING FACTORS AND RECOMMENDATIONS FOR ACTION (Continued from page 2)

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