The California Pregnancy-Associated Mortality Review

CA-PAMR Report: Pregnancy-Associated Suicide, 2002-2012

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2019

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California Pregnancy-Associated Mortality Review (CA-PAMR) Committee Members – Suicide Review

Listed below are the committee members and their affiliations at the time of CA-PAMR Committee review of the pregnancy-associated suicide cases, with the specialty areas in parentheses.

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Executive Summary

Maternal deaths, although uncommon, are sentinel events that serve as a call to action for public health professionals and maternity care clinicians. While California has seen declines in maternal deaths up to 42 days postpartum, work is needed to address the rise in maternal deaths occurring later in the postpartum period (between 43 and 365 days). Maternal mental health, a marker of maternal well-being and a determinant of an infant's life-long health, is a public health priority. Pregnancy-associated deaths by suicide, occurring during pregnancy or up to one year postpartum, are tragic events that have a profound impact on the children and families who are left behind. Between 2002-2012, suicide as the mechanism of death accounted for 4.3% of all deaths among California women who were pregnant within the prior year (based on linked administrative data). While still rare in this population, suicide risk is significantly increased among women who enter pregnancy with existing mental health conditions and those women who develop new onset conditions during or after pregnancy, such as postpartum depression or psychosis [1, 2].

The Maternal, Child, and Adolescent Health (MCAH) Division in the California Department of Public Health (CDPH) created the California Pregnancy-Associated Mortality Review (CA-PAMR) by investing Title V Maternal and Child Health Block Grant funds in a variety of activities to investigate and improve maternity care and maternal health outcomes. After completing a six-year review of maternal deaths due to obstetric and medical causes from 2002-2007 [3], CA-PAMR focused on suicide among women who were pregnant or within one year postpartum between the years 2002 and 2012. This report presents the findings of an enhanced review of 99 pregnancy-associated deaths from suicide, identified by linking births and fetal deaths to maternal deaths and screening cases of accidental drug overdose as potential suicide. The results of this in-depth review of medical records, coroner reports, and administrative data highlight the magnitude of underreporting of pregnancy-associated suicide cases. Using CA-PAMR's enhanced surveillance methodology yielded a suicide ratio that was more than double the suicide ratio calculated using death certificate data alone (1.7 vs. 0.6 deaths per 100,000 live births).

The CA-PAMR in-depth reviews revealed that suicide preventability is high regardless of maternal mental health history. Further, the committee process identified opportunities for improvement and insights regarding gaps in maternity care and support for women with mental health disorders. Findings from this review are reflected in the recommendations, which were developed in partnership with the CA-PAMR Committee. Translating these recommendations into action will require an interdisciplinary and multi-sector approach. Implementing innovative solutions and assuring their sustainability are critical next steps in California's work to save mothers' lives.

> *"The CA-PAMR in-depth reviews revealed that suicide preventability is high."*

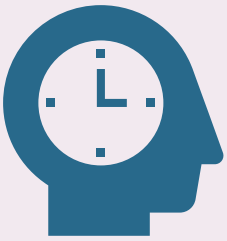
KEY FINDINGS

Between 1999-2016, suicide rates among women of reproductive age (15-49 years) in California remained consistently lower and stable over time while national suicide rates were higher and have continued to rise.

Suicide ratios were lower in the pregnant and postpartum population in California compared with the suicide rates among women of reproductive age who were not pregnant in the prior year. Thus, pregnancy does not appear to be a period of heightened risk for suicide among women.

In the CA-PAMR Pregnancy-Associated Suicide Cohort (99 women):

The majority of the women (83%) died in the late postpartum period, or 43-365 days following the end of pregnancy: 36% died between 43 days and 6 months and 47% died more than 6 months postpartum.



Mental health conditions were highly prevalent: 62% of women had reported mental health conditions before becoming pregnant and 25% had new onset conditions noted during or after pregnancy. Nearly a quarter of women (23%) had a reported family history of mental health conditions.

Depression (54%), psychosis (24%), and bipolar disorder (17%) were the most prevalent diagnostic impressions identified. Substance use, including alcohol and tobacco, was a common co-occurring condition with all mental health disorders.

Nearly one-third (32%) of women used illicit drugs (methamphetamine, cocaine, heroin) or abused prescription opioids during or after pregnancy; heavy alcohol use was noted in 17% of women. Substance use was identified as a precipitating factor to the suicide in 29% of women.

Approximately 85% of women had one or more psychosocial stressors documented near the time of their deaths (e.g., interpersonal conflict with partner, financial hardship, exposure to violence as a child or adult).

Half (51%) of the women had a good-to-strong chance of suicide preventability with missed opportunities to intervene.

Quality improvement opportunities to prevent pregnancy-associated suicide

The predominant themes for alternative approaches to the recognition, diagnosis, treatment or follow-up included:

- Improved obstetric care to better coordinate with psychiatry and mental health regarding treatment when indicated.
- Better screening for mental health conditions during and after pregnancy, as well as screening for substance use, adverse childhood experiences, medical diagnoses, and intimate partner violence.
- Pregnancy and postpartum care and supports related to pregnancy loss or social reproductive loss (i.e., removal of child from mother).
- Partners and family members to have linguistically and culturally appropriate information and support regarding their loved one's mental illness.

Recommendations

Major recommendations arising from this in-depth examination of pregnancy-associated suicide cases are presented below, organized according to the public health framework for prevention. These recommendations reflect the key findings and quality improvement opportunities described in this report as well as the expertise of the CA-PAMR committee members. They are intended as a starting point for improving maternal mental health care and prevention of suicide. Many of these recommendations will require interdisciplinary collaboration across multiple sectors to be successfully implemented.

Primary Prevention

Universal prevention – public messaging

- Increase culturally and linguistically relevant public awareness about maternal mental health risk factors, signs, symptoms, treatment, and recovery.
- Improve data collection on maternal mental health and suicide at the time of death in order to inform better policy through (a) in-depth interview of family and friends; (b) review of medical and mental health records regarding diagnoses and medications used and dosing; and (c) comprehensive toxicological analysis in all cases of suspected suicide or drug overdose.

Selective prevention – targets individuals or subgroups who have a higher risk

- Reduce social isolation during and after pregnancy by increased availability to evidence-based, culturally and linguistically relevant group prenatal care, peer-led support, or home visiting programs.
- Support incentives to routine screening of pregnant and postpartum women for mental health conditions by both obstetric providers and pediatricians during well-child visits.
- Explore gun safety and access issues for people with history of mental health risk factors.

Secondary Prevention

- Improve initial and on-going professional education for healthcare providers regarding assessment and referral to appropriate care of women who have a history of mental health conditions, trauma, or loss.
- For women with mental health conditions, incorporate routine suicide risk assessment using a validated tool.
- For women with high risk of suicide, care providers should develop a safety plan for the patient and her family that includes information on California's Gun Violence Restraining Order, which allows for temporary removal of firearms from the home.

- Improve systems of referral and ensure access to care, including substance use treatment, for women with known risk factors or mental health conditions.
- Improve coordination of care across obstetrics, pediatrics/Neonatal Intensive Care Units (NICUs), mental health services, substance use treatment programs, bereavement support, social services, and public health services.
- Improve interagency coordination specific to foster care, child welfare, criminal justice and referral to public health programs.
- Improve education and training on risk of separation of mothers and babies for all agencies and programs involved in maternal and child health and welfare.
- Mental health professionals should provide support and education for family members of women with mental health conditions.

Tertiary Prevention

- Improve education for obstetric and psychiatric providers regarding perinatal mental health diagnoses and treatment, particularly around management of medications in pregnancy and medical management of psychosis in postpartum patients.
- Educate psychiatric providers on the value of keeping mother and baby together during day treatments or hospitalizations.

The California Department of Public Health is committed to maintaining the momentum toward improved maternal health outcomes for California women and their families, which includes maternal mortality review. This review of pregnancy-associated deaths (while pregnant or within one year after pregnancy termination) focused on suicide. Maternal mental health, a marker of the maternal well-being and a determinant of an infant's life-long health, is a public health priority. Pregnancy-associated suicide is a tragic event that has a profound impact on the child and family who are left behind. Perinatal suicide risk is significantly increased among women who enter pregnancy with existing mental health conditions and those who develop new onset conditions during or after pregnancy, such as postpartum depression or psychosis [1, 2]. Still, many cases of pregnancy-associated suicide are considered to be highly preventable with missed opportunities to intervene, irrespective of mental health status. The CA-PAMR in-depth reviews revealed gaps in maternity care and support in several key areas at the patient, partner/family, provider, facility, and system level and provided alternative strategies to bridge those shortfalls. These insights are reflected in the recommendations for pregnancy-associated suicide prevention, which are intended to be the first step in addressing this important issue. Successful implementation of these recommendations will require interdisciplinary collaboration across multiple sectors. This report intends to shed light on pregnancy-associated suicide and maternal mental health needs as well as to motivate action to reduce the occurrence of this highly preventable cause of death.

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California Department of
PublicHealth

Chapter 1: Background, Aims and Methods

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"National suicide rates have continued to rise; however, California has shown consistently lower, more stable rates of suicide among women of reproductive age."

Scope of the problem: Suicide in California

National vs. California suicide rates among women of reproductive age

Among California women of reproductive age (15-49 years), the average rate of suicide was 4.7 per 100,000 over the period from 1999 to 2016. While the national suicide rates have continued to rise, California has shown consistently lower, more stable rates of suicide among women of reproductive age (Figure 1.1).

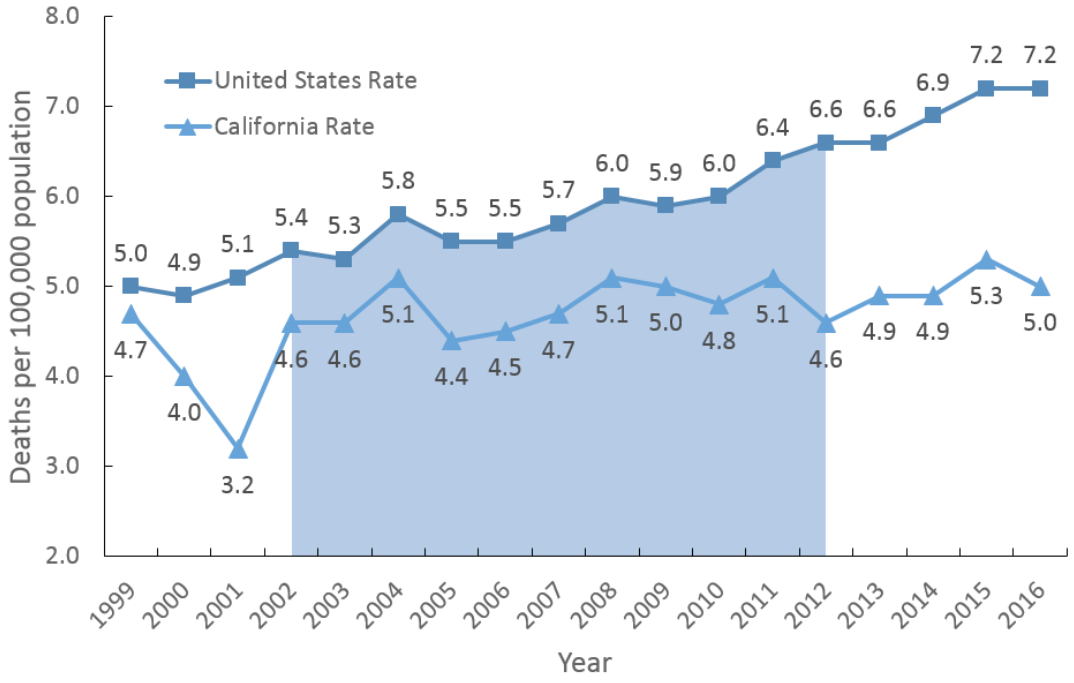


Figure 1.1: United States and California suicide rates among women of reproductive age (15-49), 1999-2016. The shaded area represents the years covered in this report (2002-2012).
Source: CDC Wonder Online Database, accessed at http://wonder.cdc.gov on September 24, 2018. Suicide cases are identified by ICD-10 codes U03, X60-X84, and Y87.0.

The National Strategy for Suicide Prevention in 2012 and the California Strategic Plan for Suicide Prevention in 2008 set forth goals and objectives to reduce suicide rates in the general population [4, 5]. However, these recommendations did not identify women's mental health needs or interventions relevant to the perinatal (i.e., pregnant and postpartum) population. The California Pregnancy-Associated Mortality Review (CA-PAMR) of the Maternal, Child and Adolescent Health (MCAH) Division in the California Department of Public Health (CDPH) conducted in-depth case reviews to identify opportunities for improvement in care and prevention that relate specifically to the drivers of suicide during pregnancy and up to one year postpartum.

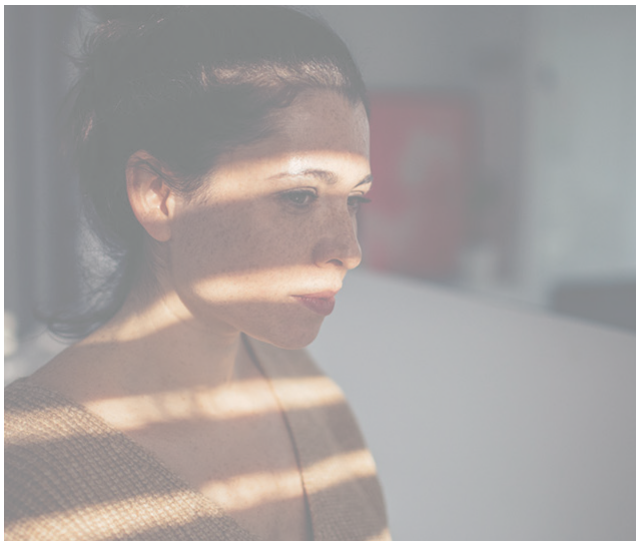
Why is maternal mental health important to reducing pregnancy-associated deaths?

Poor maternal mental health in the prenatal and postpartum periods can have a profound adverse impact on the well-being of the mother, child, and family as a whole [6, 7]. Women may experience a wide range of mental health conditions, varying in severity and presentation, from conception through one year postpartum. Included among these conditions are depression, anxiety, and psychosis. The key distinguishing feature differentiating *maternal* mental health conditions from other mental health conditions is the timing of the onset of symptoms. The prevention and treatment of maternal mental health conditions rely on specific systems of care. Additionally, women may present with symptoms differently alongside the myriad physiological and emotional changes associated with pregnancy and the postpartum period [8].

Based on linked administrative data from 2002-2012, suicide accounted for 4.3% of pregnancy-associated deaths among California women, or deaths that occurred while pregnant or within one year of the end of the pregnancy. Previous CA-PAMR reviews have demonstrated that death certificates often misclassify the causes of death [9]. Similarly, the current review revealed underreporting of pregnancy-associated suicide (for details, see Chapter 2). In-depth reviews serve as a gold standard for public health investigation and enable a more reliable comparison between the relative magnitude of pregnancy-associated suicide and deaths from obstetric and/or medical causes that occurred while pregnant or within one year postpartum.

"Preventing suicide is a public health problem that requires an interdisciplinary and multi-sector approach to intervene effectively."

Between 5% and 14% of pregnant and postpartum women have thoughts or intentions of self-harm, or suicidal ideation [1, 10, 11] – a strong risk factor for suicide. Furthermore, women with histories of mental health conditions, especially affective disorders (e.g., depression, bipolar disorder), prior suicide attempts, exposure to intimate partner violence (emotional, physical, and/or sexual), as well as those with new onset mental health disorders during or after pregnancy are more likely to express suicidal ideation and, by extension, are at an increased risk for completing a suicide [12, 13]. While suicide rates in California are lower among pregnant and postpartum women than in the general population of reproductive age women, these occurrences of *pregnancy-associated* suicide call attention to a much more pervasive public health problem surrounding the unmet mental health needs unique to pregnancy and postpartum experiences. Therefore, it is critical to understand the underlying contributors of maternal mental health conditions in order to prevent suicide in the pregnant and postpartum population.



Maternal mortality reviews from across the country have found that maternal mental health conditions contributed to a range of pregnancy-associated deaths [14]. While reviews of obstetric causes of death are expanding to include considerations of the woman's mental health status, the identified quality improvement opportunities and prevention strategies are often focused on clinical care interventions, as medical records are usually the easiest to access for retrospective review. A review of pregnancy-associated suicide expands the scope for examining women's mental health and helps to identify a broad range of prevention strategies beyond the clinical sphere. Preventing suicide requires an interdisciplinary and multi-sector approach to intervene effectively [4, 15].

While mental illness is a strong risk factor for suicide, other factors have also been linked to an increased likelihood of a completed suicide, such as a lack of social support or exposure to violence [12]. Mortality reviews need to consider both risk and protective factors within a socio-ecological model of health to identify opportunities for prevention at all levels of influence (societal, community, interpersonal, and individual). This review aimed to capture the wide array of factors relevant to each suicide, synthesize the findings, and develop recommendations for prevention guided by these findings. Chapter 2 presents CA-PAMR findings associated with mental health status, substance use, and other key life circumstances. Chapter 3 describes the committee-derived quality improvement opportunities, which span all three levels of prevention (primary, secondary, and tertiary). The three levels of prevention require interdisciplinary partners to effectively translate the findings into action. The data-driven recommendations presented in Chapter 4 represent the prioritized actions this review identified as having strong opportunity for impact, high implementation feasibility, and sustainable ways to prevent pregnancy-associated suicide.

Aims and objectives of CA-PAMR

The California Pregnancy-Associated Mortality Review (CA-PAMR) is part of the California Department of Public Health's responsibility to monitor and reduce deaths during pregnancy or within one year post-pregnancy and the associated health disparities among California women. The overall objectives of the in-depth case reviews are to:

1. **Improve classifications of cause of death,**
2. **Elucidate the role of pregnancy in a pregnancy-associated death and the degree to which the deaths could have been prevented,**
3. **Examine social determinants of health to better understand health disparities,**
4. **Identify interdisciplinary quality improvement opportunities (QIOs), and**
5. **Facilitate data-driven recommendations to translate QIOs into action.**

Health Equity *is the principle that everyone should have a fair opportunity to achieve their full health potential. This requires removing obstacles to health such as poverty, discrimination, and their consequences, including powerlessness and lack of access to good jobs with fair pay, quality education and housing, safe environments, and health care. For the purposes of measurement, health equity means reducing and ultimately eliminating disparities in health and its determinants that adversely affect excluded or marginalized groups [16].*

Health equity is incorporated throughout the CA-PAMR methodology in various capacities. Data abstraction was designed to systematically capture key social determinants of health including but not limited to the following: access to care, communication barriers, housing inadequacy, poverty indicators, criminal justice system involvement, and exposures to violence. Case materials prepared for committee review included these dimensions of health equity. The committee was composed of individuals representing the major geographic areas and racial/ethnic groups in California: Hispanic, Asian, Black, and White, as well as equitable numbers of men and women.

Health equity principles are also reflected in the approaches for identifying Quality Improvement Opportunities (QIOs). Identification of Quality Improvement Opportunities (QIOs) followed one of two approaches: (1) this death could have been prevented if existing resources and care were provided appropriately or (2) providing additional resources or better systems of care that were otherwise not available could have prevented this death. If a woman's disadvantaged status was known, the second approach to QIOs facilitated identification of opportunities to promote health equity.

Methods: From administrative data to interdisciplinary recommendations

The methodology of CA-PAMR case ascertainment and committee reviews is summarized in Figure 1.2 and has been described in detail elsewhere [3, 17]. For this review, methods were adjusted to be applicable to non-obstetric and non-medical causes of death, particularly suicide.

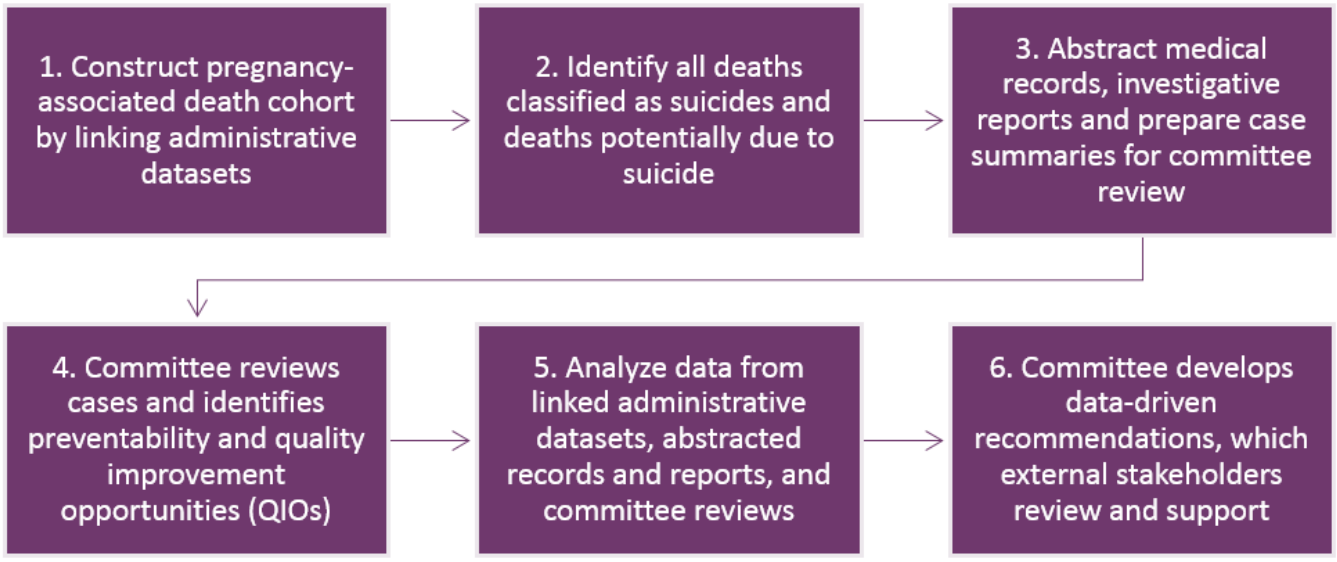


Figure 1.2: Flow chart of the CA-PAMR process.

Key Definitions

Pregnancy-associated death: Death of a woman while pregnant or within one year of the end of a pregnancy from any cause.

Pregnancy-related death: Death of a woman while pregnant or within one year of the end of a pregnancy from any cause related to or aggravated by the pregnancy or its management.

Accidental death: Clear indication that self-harm was not intentional based on either series of events leading to death or toxicology reports.

Suicide: Death caused by self-directed injurious behavior with an intent to die as a result of the behavior.

Methods: What's new?

1. **New data linkage methods to improve case ascertainment of pregnancy-associated deaths potentially due to suicide**
2. **Data abstraction and case review forms tailored for deaths by suicide**
3. **CA-PAMR Committee composition included mental health professionals with expertise in women's health, social work, nursing, emergency/forensic medicine, and public health services**
4. **Data-driven recommendations based on mixed-methods analyses**

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1. New data linkage methods: Cases were defined as pregnancy-associated deaths potentially due to suicide. Case ascertainment was a multi-step process consisting of:

(A) **Constructing a cohort of pregnancy-associated deaths for each birth cohort year using state administrative data files.** Pregnancy-associated death cohorts for birth years 2002-2012 were constructed by linking data from maternal death certificates with hospital discharge data, and fetal death and birth certificates to identify all women who died from any cause while pregnant or within one year postpartum or post-fetal demise. Deaths were assigned to the birth cohort year in which the pregnancy ended. *Note: Cohort years 2002-2007 omitted deaths among women <20 weeks pregnant. New data linkage methods were applied beginning with cohort year 2008 that identified deaths in early pregnancy (<20 weeks).* (See Appendix for details regarding data sources and linkage methods.)

(B) **Identifying all deaths classified as suicide and potential misclassifications.** All coroner reports of pregnancy-associated deaths were reviewed to augment the information from administrative data linkage and to reduce the chances of missing true suicide cases whose deaths may have been attributed to another cause. The final pool of potential suicide cases included one or more of the following:

a) Deaths that were assigned ICD-10 codes X60-X84, Y87.0, U03 on a death certificate

b) Death certificate classified the *manner* of death as a suicide

c) Coroner report noted that the death might be a suicide per family or friends' report

d) Deaths with any mention of a recent history of depression caused or exacerbated by the pregnancy or postpartum period, or related to caring for the infant or pregnancy loss

For some cases of drug overdose, a medical examiner was asked to review de-identified toxicology results to determine whether the CA-PAMR Committee should review a case further.

2. **Data abstraction sources and forms** were expanded and tailored to capture all available information to aid in understanding a woman's experience and health leading to her suicide. Data sources that informed case summaries included investigative reports (coroner, autopsy, toxicology), medical records (prenatal, labor & delivery, postpartum), hospitalizations, psychiatric admissions, online sources (obituaries, news articles, blogs, personal websites, social media), and administrative data, including vital records and hospital discharge data for women hospitalized with a substance abuse or mental health-related diagnosis.

   (A) Two medical epidemiologists abstracted information systematically from a range of data sources using the ***CA-PAMR Suicide Abstraction Form*** (Appendix), developed by the CA-PAMR team with guidance from mental health professionals, and other State Violent Death Review staff (Ohio, Illinois, and Michigan). This form gathers information about the terminal event, medical and mental health history (for decedent and her immediate family), substance abuse, life stressors, psychosocial factors, exposure to violence and clinical information about her prenatal care, birth and postpartum experiences.

   (B) For each case, the following two forms were prepared to facilitate committee reviews: ***CA-PAMR Suicide Case Information Sheet*** (Appendix), containing information on demographic characteristics, hospital admission history, timing of death relative to pregnancy, and cause(s) of death; and the ***CA-PAMR Suicide Case Summary*** (Appendix), including key information from the *CA-PAMR Suicide Abstraction Form* summarized in a narrative. All identifying information about cases was removed.

3. **CA-PAMR Committee composition and review process:** The CA-PAMR Committee members represented the fields of psychiatry, psychology, obstetrics/gynecology, nursing, public health, social work, and emergency and forensic medicine. The committee was responsible for filling out the ***CA-PAMR Pregnancy-Associated Suicide Review Form*** (Appendix), which included the following: whether the death was (a) intentional, accidental, or unable to be determined and (b) pregnancy-related; the chance to alter outcome (or preventability); and quality improvement opportunities (QIOs). Other information collected from committee review related to maternal mental health history, diagnosis, and treatment; and precipitating and mediating factors that likely led to the deaths.

   The CA-PAMR Committee reviewed all potential suicide cases. For each case, committee members were provided with a *CA-PAMR Pregnancy-Associated Suicide Review Form, CA-PAMR Suicide Case Information Sheet*, *CA-PAMR Suicide Case Summary*, and a copy of a de-identified coroner toxicology report when available. Eight in-person committee meetings were convened. Each case was discussed and consensus reached on all items on the *CA-PAMR Pregnancy-Associated Suicide Review Form* (Appendix). The committee reviewed between 15-20 cases at each meeting, for a total of 117 cases.

"The CA-PAMR utilized mixed methods analyses to synthesize findings, guiding recommendations for suicide prevention."

4. **Mixed methods analyses and the recommendation development process:** Mixed methods analyses synthesized the findings from committee reviews, abstracted data, and quality improvement opportunities (QIOs). Results of these analyses guided the recommendation development process and involved the following steps:

   (A) Administrative data, abstracted data, and committee determinations were compiled into a quantitative dataset. Findings are presented in Chapter 2.

   (B) QIOs derived from the committee and select ethnographic notes comprised the qualitative dataset. QIOs were coded for (1) theoretical and emergent themes, (2) primary, secondary, or tertiary levels of prevention, and (3) partners for implementing each QIO. Findings are presented in Chapter 3.

   (C) A modified version of the Nominal Group Technique, a structured decision-making process, guided the development of recommendations. The goals of this process were to generate a list of consensus recommendations that (a) were informed by results from quantitative and qualitative analyses and (b) could be assessed in terms of feasibility, sustainability, and impact. The CA-PAMR project team, committee members, and external stakeholders all contributed. Methods for this process and final recommendations are presented in Chapter 4.

Limitations

Interpretation of findings using these methods is limited by (1) potentially missed cases of pregnancy-associated suicide, (2) the scope and quality of available data for each case, and (3) lack of comparison populations.

- **Case ascertainment:** Improvements in data linkage methods for case ascertainment (described above) allowed for better identification of potential pregnancy-associated suicide cases. Although the methods for ascertaining cases are meticulous, it is possible that some cases are not captured. For instance, women of childbearing age who terminated their pregnancies and did not have hospital discharge data would have been missed. Significant underascertainment of cases would lead to underestimated pregnancy-associated suicide ratios.
- **Medical records and investigative reports:** Medical records varied in completeness and breadth of documented information, especially information related to mental health and treatments. Some prenatal providers did not assess for mental health conditions or only checked a box on a form for "depression" and did not expand on the woman's psychosocial circumstances or whether she was accessing mental health services. Psychiatric medication names and dosages were often not recorded in the records. Also, a few psychiatric facilities refused to provide medical records, due to institutional confidentiality policies, though most requests for records were fulfilled. Likewise, coroner and autopsy reports varied in quality and completeness. Toxicology reports were sometimes not done or were incomplete; some investigative reports failed to include interviews with family members or those closest to the decedent at the time of her death. The quality of the CA-PAMR Committee's case reviews depends heavily on the scope and quality of the available data; therefore, the nuances of clinical decision-making or the decedent's life circumstances may have been missed due to gaps in data.
- **Comparison populations:** Lack of comparison populations precluded assessment of risk factors for suicide in the pregnant and postpartum population. For example, although the committee identified the decedents' mental health histories, there was no comparison group to assess whether pregnancy-associated suicide cases were more likely to have histories of mental health conditions compared with the general population of women of reproductive age. Likewise, the prevalence of various life stressors identified among pregnancy-associated suicide cases could not be compared to the prevalence of these factors among other women of reproductive age. Comparisons of cases to other populations of reproductive age women (i.e., pregnant and postpartum women who did not die by suicide, reproductive age women who died by suicide but were not pregnant in the year prior to death) would have allowed for stronger conclusions to be drawn regarding risk factors for suicide, including the pregnancy itself.

Case Study Vignette

Dawn's Story*

Dawn was a White woman in her late 30s, pregnant with her second child. She was known to have a family and personal history of severe depression, triggered by the unexpected death of her sister 10 years prior, but no exposure to violence or substance use. She had a healthy pregnancy and no issues with the birth except some challenges breastfeeding, for which she was referred to a lactation counselor. At her postpartum check-up, she assured her obstetrician that she was not having problems eating or sleeping, nor was she depressed. However, her score on the screening test for depression (validated for use in primary care) was concerning. She was referred to a behavioral health specialist, but it is unknown whether she went. She later saw a primary care physician, shared her symptoms of stress and insomnia, and was prescribed an antidepressant. A week before her death, she saw the doctor again, and reported having panic attacks, anxiety and inability to sleep. The medical records noted that she was no longer breastfeeding, and that she denied suicidal ideation or plans. She was advised to continue the medication and get a good night's sleep with someone else taking care of the baby. During this week she also called a mental health hotline requesting to see a psychologist. The night before her death, her mother cared for the children, yet Dawn was still unable to sleep. In the morning, she left the house to go shopping. When she did not return, her husband reported her missing and learned she had died by jumping from a tall office building.

Insight

The review committee determined that Dawn's death had a strong chance of preventability because her condition—likely **postpartum psychosis**—had not been properly diagnosed. In reviewing the the type of medication and dosage prescribed to Dawn, the committee observed that it activates, rather than alleviates, anxiety and insomnia, and would not be appropriate treatment for those symptoms. The committee agreed that had the physician consulted with, or referred Dawn to a perinatal psychiatrist, her anxiety and panic attacks likely would have been recognized as risk factors for suicide, despite her denial of suicidality. Compounding the lack of accurate diagnosis and appropriate treatment, Dawn's inability to sleep for several days was also a risk factor noted by the committee. Their professional expertise with women who are generally well educated and high-functioning, and who cycle through short periods of feeling normal and then feeling like they cannot cope, was consistent with this scenario. In cases like Dawn's, families and husbands are caring and want to be supportive, but would benefit from education about how to recognize signs and symptoms of worsening mental health status, and what to do. Women who suffer from postpartum psychosis and receive appropriate treatment and care for postpartum psychosis respond well to appropriate and timely treatment.

* NOTE: Names and details have been changed to protect the privacy of the women whose deaths are reviewed in this report. These stories represent composites of the reviewed pregnancy-associated suicide cases.

Case Study Vignette

Alisha's Story*

Alisha was a married African-American woman in her mid 20s, who worked in a real estate office. Unexpectedly, her second baby was born two months premature, with serious, life-threatening complications and was cared for in the neonatal intensive care unit (NICU). Distraught over her baby's poor health and prognosis, Alisha became deeply depressed. In the week prior to her death, she attempted suicide multiple times by different means. There was no indication that Alisha sought treatment for her depression. About three months postpartum, her husband returned home from work to find the bedroom locked. He pried open the door and found Alisha's body hanging in the closet.

Insight

In this and other similar types of cases, the review committee determined that her death had a strong chance of preventability. The committee felt strongly that Alisha's condition would likely have been identified if she had been screened for **depression and anxiety** in the postpartum period by her maternity care provider or in the NICU, by a social worker. It was unclear whether Alisha was screened or how much support she and her husband had while caring for their older child and spending time in the NICU with their unexpectedly premature baby. Like many families in these situations, where grief and anguish are normal emotions, her husband may not have known what to do or where to go for help when Alisha's symptoms and behaviors intensified. When postpartum women engage in self-harm, it is important to seek appropriate and timely care. Mothers of babies in intensive care are particularly vulnerable to mental health conditions, and family/partner education is a key component of preventability, as is being screened and referred to a perinatal psychiatrist or other professional knowledgeable about postpartum mental health who can provide appropriate treatment.

* NOTE: Names and details have been changed to protect the privacy of the women whose deaths are reviewed in this report. These stories represent composites of the reviewed pregnancy-associated suicide cases.

Chapter 2:
Description of the California Pregnancy-Associated Suicide Cohort

Chapter 2: Description of the California Pregnancy-Associated Suicide Cohort

Classification of cause of death

The CA-PAMR committee reviewed 117 pregnancy-associated potential suicide cases: 86 deaths were classified as suicide on the death certificate and 31 were suspected cases of suicide classified as accidental or other deaths on the death certificate (see Chapter 1 for case ascertainment details). Of the 31 suspected cases, 22 were originally coded as accidental drug overdoses, 4 as injuries of undetermined intent, 2 obstetric deaths, 1 pedestrian hit by motor vehicle accident, 1 drowning, and 1 undetermined cause. Following committee review, 99% (85 of 86) of the suicide cases and 45% (14 of 31) of the accidental or other deaths were determined to be deaths from suicide (Figure 2.1). This finding illustrates that suicide is underreported in public health surveillance that relies solely on death certificate data.

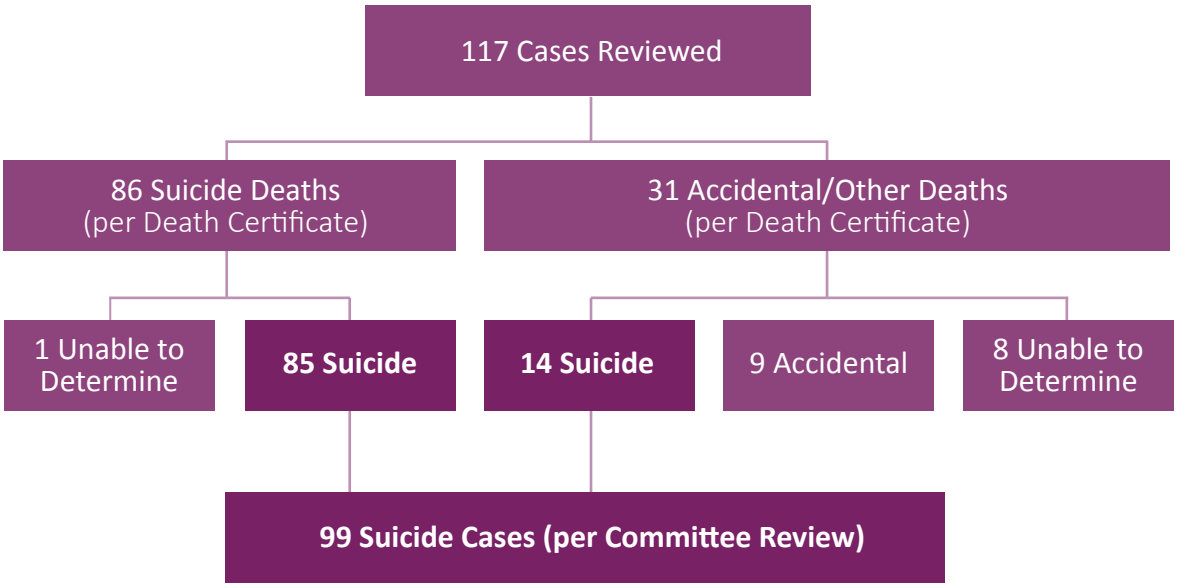


Figure 2.1. Flow chart of pregnancy-associated potential suicide cases and committee classification of cause of death.

Differences in pregnancy-associated suicide ratios by data source

"Death certificates alone grossly under-identify pregnancy-associated suicide; linkage with administrative data identifies more, but committee review of potential suicide due to drug overdose yielded an additional 14 cases of pregnancy-associated suicide."

The magnitude of suicide underreporting is exemplified further by comparing pregnancy-associated suicide ratios according to data source (Figure 2.2). Death certificates alone grossly under-identify pregnancy-associated suicide; linkage with administrative data identifies more, but committee review of potential suicide due to drug overdose yielded an additional 14 cases of pregnancy-associated suicide. Suicide ratios based on CA-PAMR suicide determinations were more than double the suicide ratios based on death certificates alone for any given 3-year moving average. For example, in 2008-2010, the pregnancy-associated suicide ratio estimated using deaths identified through CA-PAMR case selection, and subsequently reviewed by the CA-PAMR Committee, was 2.0 deaths per 100,000 live births. In contrast, pregnancy-associated suicide ratios based on death certificates alone (pregnancy-associated deaths were identified by pregnancy checkbox) and those based on linked administrative data (maternal death certificates linked to birth or fetal death certificates) were notably lower: 0.6 deaths per 100,000 live births based on death certificates alone and 1.4 deaths per 100,000 live births based on linked administrative data. These discrepancies in suicide ratios by method of case ascertainment underscore the importance of performing in-depth case reviews.

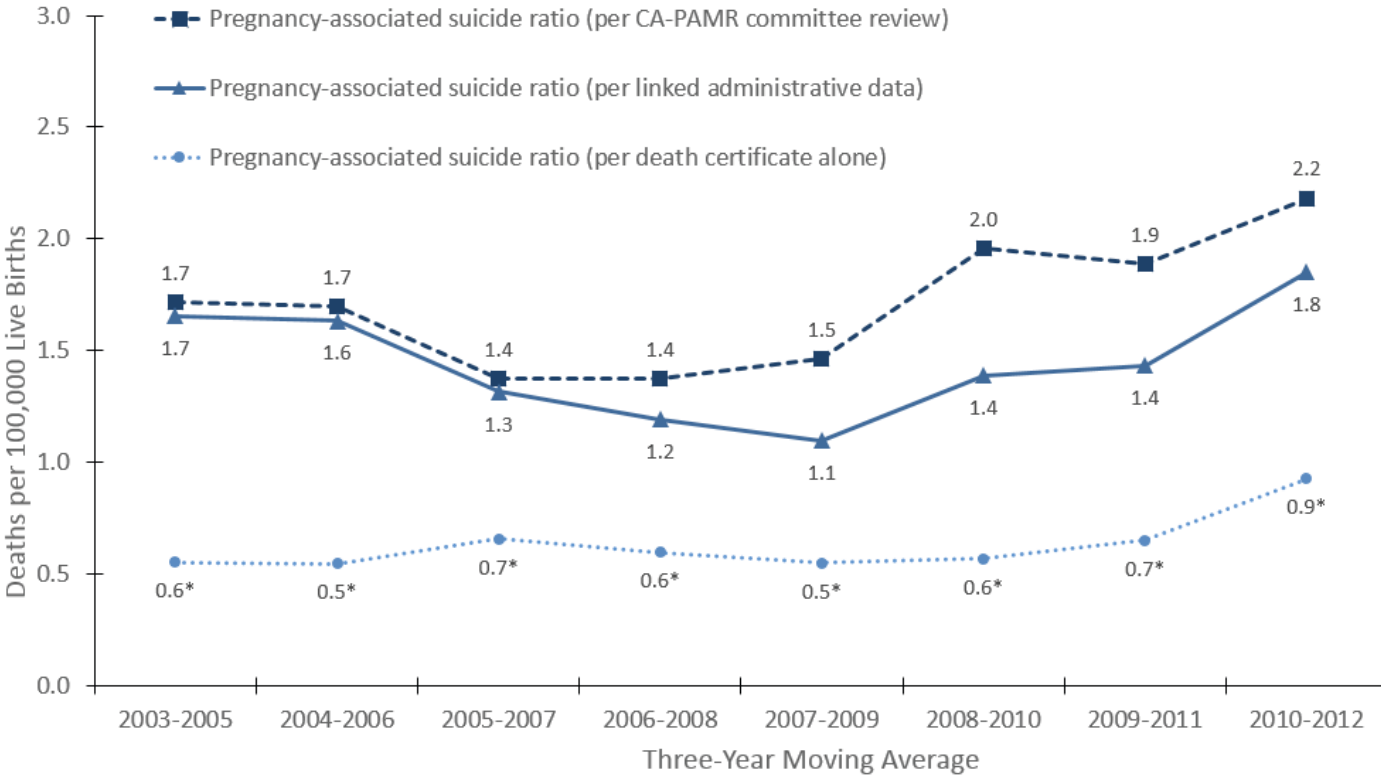


Figure 2.2. Moving average of pregnancy-associated suicide ratios for California women of reproductive age (15-49), 2003-2012

*Rate is unreliable when calculated with numerator less than 20

Pregnancy-associated suicide ratio = Number of pregnancy-associated suicide / 100,000 Live births

Source: California Department of Public Health, Birth and Death Statistical Master Files, 2003-2012. 2002 suicide cases are excluded because pregnancy-associated suicide cases identified through death certificate only are not available. ICD 10 codes U03, X60-X84, and Y87.0 are used to identify pregnancy-associated suicide, through death certificate and/or linked administrative data. Pregnancy-associated suicide per CA-PAMR committee review is determined by review committee.

This report focuses on the 99 cases of pregnancy-associated suicide identified through CA-PAMR's case ascertainment and review process regardless of pregnancy-related status. Unlike CA-PAMR's previous review of obstetric deaths, determining pregnancy-relatedness for suicide was decidedly more challenging primarily due to the limited scope of information on critical and contributing factors that preceded these deaths. For deaths due to conditions that are not unique to pregnancy, such as psychiatric disorders, numerous factors must be weighed critically to establish a plausible causal argument for pregnancy-relatedness. These factors might include timing of death relative to pregnancy; whether there is sufficient evidence that the pregnancy aggravated pre-existing mental health conditions or induced new onset mental health conditions; and whether the woman received appropriate care during and after pregnancy to adequately meet her mental health needs. Furthermore, the committee agreed that quality improvement opportunities (QIOs) were relevant to all pregnancy-associated cases reviewed, irrespective of pregnancy-relatedness. Chapter 3 provides a thorough examination and discussion of pregnancy-relatedness, preventability, and quality improvement opportunities among 99 pregnancy-associated suicide cases.

Suicide ratios in pregnant/postpartum vs. non-pregnant/ postpartum populations

"While the suicide ratio for pregnancy-associated deaths is notably lower than that among other reproductive age women, this is a time of intense engagement with the medical system, so there are multiple opportunities for recognition and treatment, and preventing suicide."

Between 2002 and 2012, the average suicide ratio among California women who were pregnant within the prior year was 0.3 times the ratio among reproductive age women who were not pregnant within the year prior to death (1.4 per 100,000 live births vs. 4.9 per 100,000 population). The suicide ratios in both populations were stable over time, with no statistically significant upward or downward inflections (Figure 2.3). The 3-year moving

averages of pregnancy-associated suicide ratios ranged between 1.1 and 1.8 deaths per 100,000 live births during 2002-2012; in contrast, the non-pregnancy-associated suicide ratios (among women not pregnant within a year prior to death) were between 4.7 and 5.1 deaths per 100,000 population. While the suicide ratio for pregnancy-associated deaths is notably lower than that among other reproductive age women, this is a time of intense engagement with the medical system (an average of 20 visits between obstetrican and pediatric providers), so there are multiple opportunities for recognition and treatment, and preventing suicide.

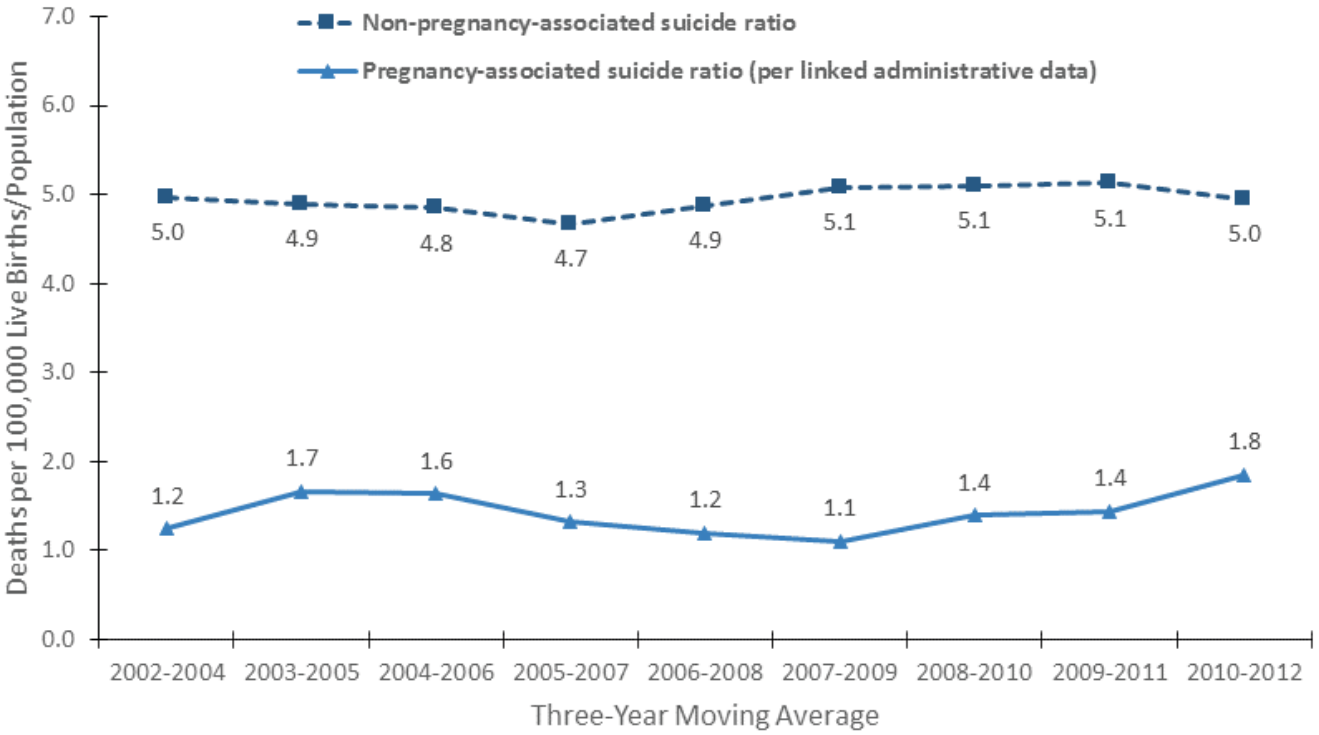


Figure 2.3. Moving average of suicide ratios for California women of reproductive age (15-49), 2002-2012

Pregnancy-associated suicide ratio = Number of pregnancy-associated suicide cases/100,000 Live births
Non-pregnancy-associated suicide ratio = Number of non-pregnancy-associated suicide cases/ 100,000 Population of Women ages 15-49 years (excluding live births)

Source: California Department of Public Health, Birth and Death Statistical Master Files, 2002-2012. EpiCenter: Population Data: http://epicenter.cdph.ca.gov. Suicide cases are identified with ICD-10 codes U03, X60-X84, and Y87.0. Women who died in 2002 and delivered in 2001, as well as those who died in 2013 and delivered in 2012 are excluded.

Mann-Kendall test for trend (Kendall Tau b test) was conducted to determine whether data points were consistent over time; $p<0.05$ indicated a significant upward or downward trend.

"Hispanic women had the lowest rate of suicide compared with other racial/ethnic groups in the pregnant and postpartum population as well as among the general population of reproductive age women."

Hispanic women had the lowest rate of suicide compared with other racial/ethnic groups in the pregnant and postpartum population as well as among the general population of reproductive age women. The suicide ratio was approximately 0.3 times the ratios for all other racial/ethnic groups in the pregnant and postpartum population (Figure 2.4), following similar trends observed in the general population of reproductive age women. Suicide ratios ranged between 2.5 and 2.6 deaths per 100,000 live births among White, African-American, and Asian women compared with 0.8 deaths per 100,000 live births among Hispanic women in the pregnant and postpartum population. In the general population of reproductive age women who were not pregnant within one year of their deaths, suicide rate was highest among White women, at 8.3 deaths per 100,000 women and lowest among Hispanic women, at 2.2 deaths per 100,000 women. The reasons for racial/ethnic disparities in suicide rates are unknown and should be explored further, also considering how much social determinants of health contribute to these differences.

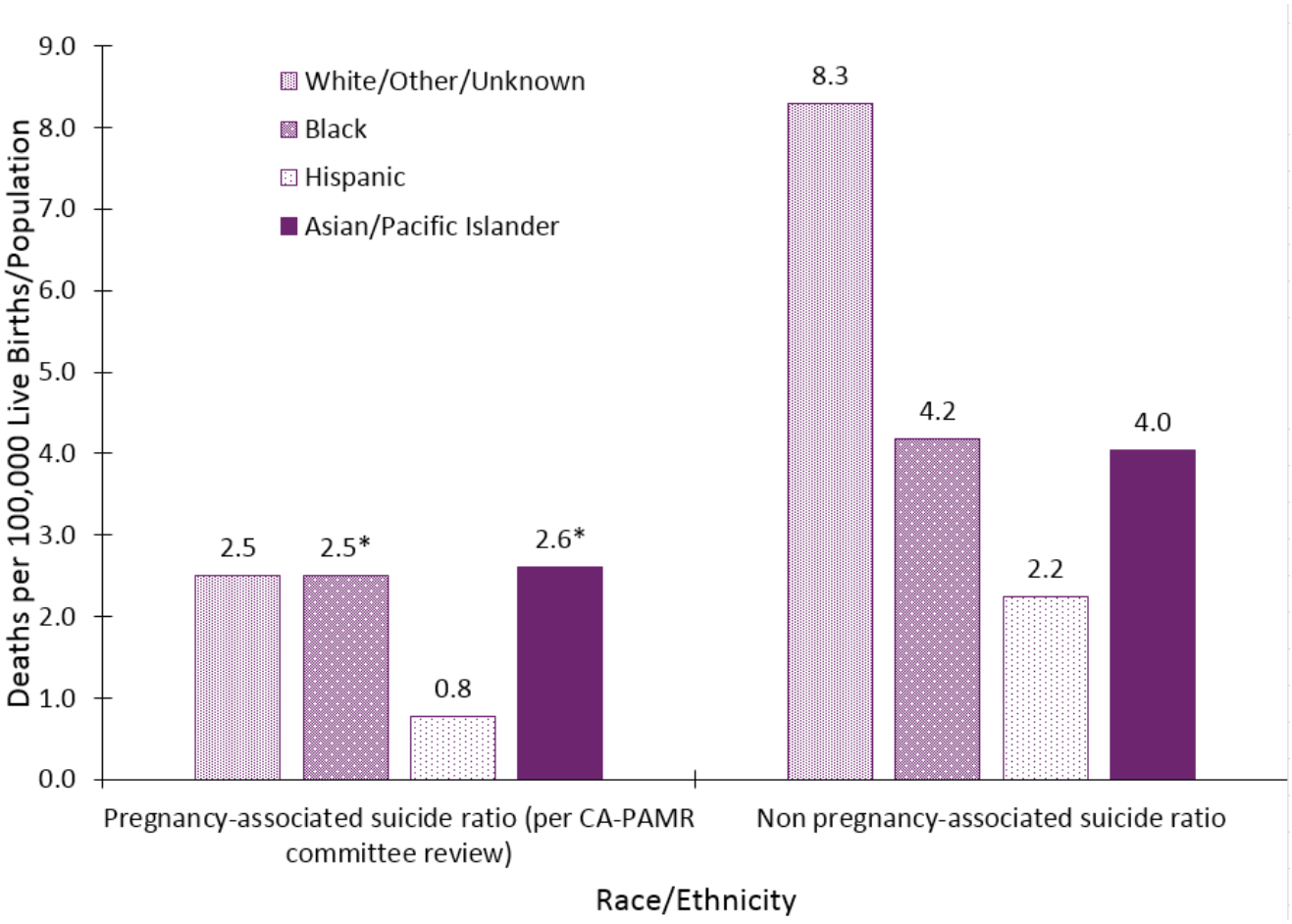


Figure 2.4. Suicide ratios among California women of reproductive age (15-49) by race/ethnicity, 2002-2012

*Rate is unreliable when calculated with numerator less than 20

Pregnancy-associated suicide ratio = Number of pregnancy-associated suicide cases / 100,000 Live births

Non-pregnant/non-postpartum suicide ratio = Number of non-pregnant/non-postpartum suicide cases/ 100,000 Population of Women ages 15-49 years (live births)

Source: California Department of Public Health, Birth and Death Statistical Master Files, 2002-2012. EpiCenter: Population Data: http://epicenter.cdph.ca.gov. Non-pregnancy-associated suicide cases are identified with ICD 10 codes U03, X60-X84, and Y87.0. Women who died in 2002 and delivered in 2001, as well as those who died in 2013 and delivered in 2012 are excluded. Pregnancy-associated suicide cases are determined by CA-PAMR committee.

Demographic characteristics in CA Pregnancy-Associated Cohort, CA Birth Cohort, and CA Non Pregnancy-Associated Cohort

One in eight births in the United States occurs in California [18]. To date, the CA-PAMR project is the largest statewide in-depth review of pregnancy-associated suicide in the nation. The demographic characteristics of women in the California Pregnancy-Associated Suicide Cohort (CA P-A Suicide Cohort) were compared with (1) the general California birthing population (CA Birth Cohort) and (2) California women of reproductive age (15-49 years) who were not pregnant within the year prior to their suicide (CA Non P-A Suicide Cohort) to identify potentially vulnerable sub-populations.

CA P-A Suicide Cohort compared to CA Non P-A Suicide Cohort. Compared to reproductive age women who were not pregnant within a year prior to suicide (the CA Non P-A Suicide Cohort), those in the CA P-A Suicide Cohort were younger (Median age 28 vs. 38 years) and more likely to be married or living with a partner (48% vs. 30%). Also, slightly higher proportions of women in the CA P-A Suicide Cohort were Hispanic (26% vs. 17%) or East Asian (Chinese or Korean) (11% vs. 5.1%). Both cohorts were similar with respect to educational attainment and birthplace, with over 75% born in the United States.

CA P-A Suicide Cohort compared to CA Birth Cohort. The CA P-A Suicide Cohort was similar to the CA Birth Cohort with respect to age, educational attainment, and payer source. However, the CA P-A Suicide Cohort had higher proportions of White (45% vs. 29%) or East Asian (11% vs. 3.6%) women. Women in the CA P-A Suicide Cohort were also more likely to be born in the United States (77% vs. 56%)

Table 2.1. Demographic characteristics in the CA Pregnancy-Associated (P-A) Suicide Cohort, the CA Non-Pregnancy-Associated (Non-PA) Suicide Cohort[1], and the CA Birth Cohort[2] 2002-2012

	CA P-A Suicide Cohort (N=99)		CA Non P-A Suicide Cohort (N=4,675)		CA Birth Cohort (N=5,908,797)	
Maternal Characteristic	**n**	**%**	**n**	**%**	**n**	**%**
Age, years						
15-19	7	7.1	343	7.3	524,602	8.9
20-24	23	23.2	496	10.6	1,308,510	22.1
25-29	29	29.3	497	10.6	1,561,919	26.4
30-34	17	17.2	571	12.2	1,469,651	24.9
35-39	13	13.1	715	15.3	827,046	14.0
40-49	10	10.1	2,053	43.9	217,069	3.7
Birthplace						
US	76	76.8	3,804	81.4	3,288,379	55.7
Outside US	23	23.2	830	17.8	2,614,523	44.2

Table 2.1 (*continued*)

	CA P-A Suicide Cohort (N=99)		CA Non P-A Suicide Cohort (N=4,675)		CA Birth Cohort (N=5,908,797)	
Maternal Characteristic	**n**	**%**	**n**	**%**	**n**	**%**
Race/Ethnicity						
White	45	45.4	3,041	65.1	1,702,420	28.8
Hispanic	26	26.3	782	16.7	3,000,159	50.8
African-American	8	8.1	254	5.4	341,229	5.8
Asian/Pacific Islander	19	19.2	547	11.7	745,884	12.6
Chinese or Korean	*11*	*11.1*	*240*	*5.1*	*212,187*	*3.6*
Other Asian[3]	*8*	*8.1*	*284*	*6.1*	*502,507*	*8.5*
Pacific Islander	*0*	*0.0*	*23*	*0.5*	*31,190*	*0.5*
American Indian	1	1.0	46	1.0	26,443	0.5
Education attainment						
No high school diploma (<12 y)	23	23.2	700	15.0	1,548,090	26.2
High school diploma/GED (12 y)	29	29.3	1,400	30.0	1,511,495	25.6
Some college (13-15 y)	20	20.2	1,491	31.9	1,260,691	21.3
Bachelor or higher (≥16 y)	24	24.3	1,013	21.7	1,403,086	23.8
Payer source[4]						
Medi-Cal or other government	48	52.2	-	-	2,859,377	48.4
Private Insurance	40	43.5	-	-	2,843,340	48.1
Self-pay/Uninsured	4	4.3	-	-	187,306	3.2
Marital status[5]						
Married/Domestic partner	47	47.5	1,395	29.8	-	-
Unmarried					-	-
Single/Never married	43	43.4	2,141	45.8	-	-
Divorced/Separated/Widowed	9	9.1	1,094	23.4	-	-

1. 15-49 years old women who died by suicide (Data Source: California Department of Public Health, Death Statistical Master Files, 2002-2012).
2. Live births and fetal deaths, 15-49 years old (Data Source: California Department of Public Health, Birth Cohort Files, 2002-2012).
3. Other Asian includes persons having origins in the Far East, Southeast Asia, or the Indian subcontinent including Cambodia, India, Indonesia, Japan, Laos, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam; excluded from this category are persons with origins in China or Korea.
4. Payer source at delivery or prenatal care (n=92 cases); 7 cases with no source data.
5. Marital staus data are not available for the CA Birth Cohort; not collected on birth and fetal death certificates.

Timing of death

Timing of death is an important indicator to understanding the context of a pregnancy-associated death. While timing is often strongly related to whether a death is considered pregnancy-related, it can also provide key insights to opportunities for intervention or improvement to care. Recent national efforts have set forth revised standards for optimizing postpartum care, including extending postpartum follow-up beyond the current standard of six weeks [19].

"Most pregnancy-associated suicide in California (83%) occurred between six weeks and one year postpartum."

Most pregnancy-associated suicide in California (83%) occurred between six weeks and one year postpartum. Overall, nearly half of women (47%) died more than 6 months after their pregnancies ended; 36% died between 43 days and 6 months after pregnancy (Table 2.2). The timing of death among pregnancy-associated suicide cases differed overwhelmingly from the previous CA-PAMR review of obstetric deaths, in which most women (88%) died during pregnancy or within 42 days (6 weeks) postpartum [3]. The standard postpartum follow-up visit is usually completed 6 weeks after giving birth; however, most pregnancy-associated deaths from suicide occurred well beyond the 6-week postpartum period.

Table 2.2. Timing of death, CA P-A Suicide Cohort 2002-2012, N=99

Timing of Death	n	%
While pregnant	9	9.1
≤42 days postpartum (or fetal demise)	8	8.1
43-180 days postpartum (or fetal demise)	36	36.4
181-365 days postpartum (or fetal demise)	46	46.5

Mechanism of suicide

The current national strategy for suicide prevention includes a goal to reduce access to lethal mechanisms of suicide for individuals with suicide risk through both routine assessment of access and changes to gun or medication safety protocols [4]. While identifying pregnant and postpartum women at risk for suicide is the first step in prevention, recognizing the most common mechanisms of suicide in this vulnerable population is also vital to preventing pregnancy-associated suicide. Between 2002 and 2012, the top three mechanisms of suicide among U.S. women of reproductive age were drug poisoning, firearms, and suffocation [20].

In the U.K. pregnant and postpartum population, hanging was the most common mechanism of suicide [21].

In California, hanging, drug overdose, and firearms were the top three mechanisms of suicide, accounting for over three-quarters of deaths by suicide among women who were pregnant or within a year postpartum (77%) and in the general population of reproductive age women who were not pregnant in the prior year (82%) (Table 2.3). There was one homicide-suicide case in which the mother took the life of her infant in addition to her own.

Table 2.3. Mechanisms of Suicide in CA P-A Suicide Cohort and CA Cohort, 2002-2012

	CA P-A Suicide Cohort (N=99)		CA Non P-A Suicide Cohort (N=4,675)	
Mechanism of Suicide	**n**	**%**	**n**	**%**
Hanging	38	38.8	1,412	30.2
Drug overdose[1]	23	23.5	1,616	34.6
Firearms	15	15.3	824	17.6
Jumping	5	5.1	233	5.0
Oncoming traffic or train	5	5.1	145	3.1
Stabbing/Cutting	3	3.1	77	1.6
Drowning	3	3.1	93	2.0
Self-immolation/Burning	3	3.1	30	0.6
Carbon monoxide poisoning	3	3.1	97	2.1
Other	0	0.0	148	3.2
Undetermined	1	-	-	-

1. 13 of the 23 drug overdose suicide cases had positive toxicology screens for opioids (11 for prescription opioids and 2 for heroin).
Note: Percentage totals may not add up to 100 due to rounding.

Mental health history, diagnostic impressions and treatment

Women have a higher risk of psychiatric illness and mental health distress during pregnancy and up to one year after pregnancy compared to women of the same age who are not pregnant or postpartum [8, 22]. While there is heightened attention on the importance of screening for depression during and after pregnancy, these efforts are not effective unless complemented with a system of care to adequately refer and care for the woman [23, 24]. Moreover, depression is only one maternal mental health condition in an array of diagnoses. The CA-PAMR Committee assessed each woman's mental health history, perinatal diagnostic impressions, and adequacy of treatment based on available data (see Chapter 1 for details).

"Over 60% of women in the CA P-A Suicide Cohort had documented mental health conditions prior to pregnancy, and another 25% had new onset mental health conditions noted during or after pregnancy. Only eight women (9%) had no history of mental health conditions."

Mental health history. Over 60% of women in the CA P-A Suicide Cohort had documented mental health conditions prior to pregnancy, and another 25% had new onset mental health conditions noted during or after pregnancy (Table 2.4). Only eight women (9.0%) had no history of mental health conditions; five of these self-identified as Asian. Family history of mental health conditions was documented in 23% of cases. Moreover, 40% of the women had a prior suicide attempt, 67% of which occurred within the six months prior to death (data not shown).

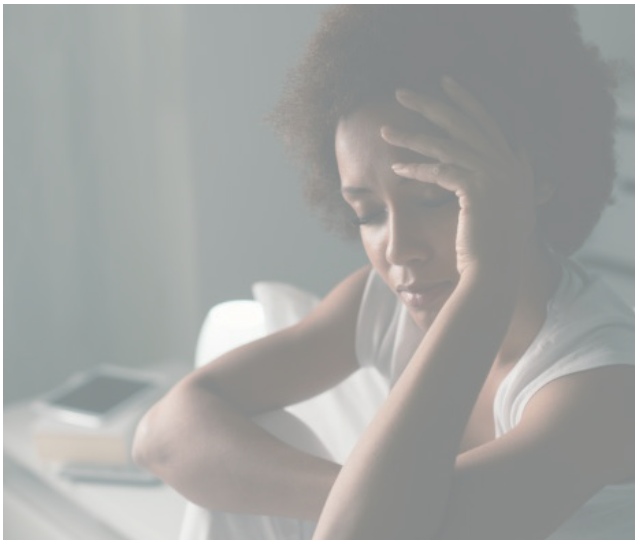


Table 2.4. History of mental health conditions in CA P-A Suicide Cohort, N=89

Mental Health History[1]	n	%
Severe mental health conditions prior to pregnancy	36	40.5
Mild-to-moderate depression or anxiety prior to pregnancy	19	21.3
Prior suicide attempt only (no other mental health history noted)	4	4.5
New onset maternal mental health condition	22	24.7
No mental health history noted (records available)	8	9.0

1. The CA-PAMR committee designated these mental health history categories based on available records; 10 women of the 99 cases reviewed were excluded due to insufficient information to adequately assess mental health histories.

Diagnostic impressions were based on available information that described women's emotional states, behaviors, and any indication of diagnosed or treated mental illness during the perinatal period. The committee identified two or more diagnostic impressions among 54% of women and one diagnostic impression in 34% of women; only 12% of cases had no impressions (Table 2.5). Depression, substance abuse, psychosis, and bipolar disorder were the top four diagnostic impressions among pregnancy-associated suicide cases. Over a third of women suffered from mood disorders with co-occurring mental health issues but no psychosis (37%); 26% of cases had indications of psychosis (16% with co-occurring mental health conditions); and another 20% had depressive symptoms only. Substance abuse was a common co-occurring condition alongside all disorders. Only 4% of women solely abused substances with no mental health conditions noted.

Table 2.5. Perinatal mental health diagnostic impressions in CA P-A Suicide Cohort, N=99

Mental Health Diagnostic Impression	n	%
Mutually exclusive combinations:		
Psychosis with other mental health conditions including substance abuse[1]	16	16.2
Psychosis only, no substance abuse	10	10.1
Mood disorders with other mental health conditions including substance abuse[2]	37	37.4
Depression only, no substance abuse	20	20.2
Substance abuse only	4	4.0
None noted/Unable to determine	12	12.1
Individual categories (not mutually exclusive):		
Depression	55	55.6
Substance abuse	32	32.3
Psychosis	24	24.2
Bipolar disorder	17	17.2

Table 2.5 (*continued*)

Mental Health Diagnostic Impression	n	%
Individual categories (not mutually exclusive)		
Anxiety	8	8.1
Personality Disorder	6	6.1
Post-Traumatic Stress Disorder (PTSD)	4	4.0
Schizophrenia	4	4.0
Other mental health condition(s)	7	7.1
None noted/Unable to determine	12	12.1

1. Also includes Schizophrenia with or without psychosis noted separately.
2. Mood disorders include the following: Bipolar disorder, Borderline personality disorder, Depression with anxiety, Depression with PTSD, Depression with substance abuse, Depression with other mental health condition; other mental health conditions included grief-related disorder, mood disorder, personality disorder (type not specified), acute stress response, identity/spiritual crisis, brain injury; also included 1 case with only grief-related disorder noted.

Despite the high prevalence of mental health conditions in the CA P-A Suicide Cohort, less than half of women with identified diagnostic impressions (and available data on treatments) were taking psychiatric medication at the time of death (33 out of 74 took medication). Furthermore, only 4 of the 33 women who were taking psychiatric medication received *appropriate* medication in terms of drug class and/or dosages.

Suicidal communications. Suicidal ideation is more common among pregnant and postpartum women compared to their non-pregnant/postpartum counterparts [25]. The majority of women in the CA P-A Suicide Cohort (87%) had suicidal communications noted within three months of death (Table 2.6). Over half (55%) of these women expressed at least one type of suicidal communication.

Table 2.6: Suicidal communications noted within 3 months of death, CA P-A Suicide Cohort, N=85

Suicidal communications noted[1]	n	%
Verbalized emotional distress[2]	53	62.4
Suicidal ideation	35	41.2
Verbalized a suicide plan	16	18.8
None mentioned	11	12.9

1. Suicidal communications categories are not mutually exclusive; 14 suicide cases were excluded due to missing or inadequate data.
2. Examples of emotional distress included women indicating depression due to financial problems, giving baby up for adoption, being upset about recent separation from partner, stress regarding children living in foster care, acting erratic and giving away personal possessions.

Reproductive history and loss

A woman's reproductive history in relation to her state of mind at the time of her suicide was a recurring theme in case reviews. Noteworthy elements of her reproductive health included age at first birth, suboptimal interpregnancy intervals, and the impact of experiencing a reproductive loss (pregnancy loss, loss of a child) [26]. Assessing a woman's reproductive history, together with other risk factors, such as having a history of mental health conditions, provides a more complete picture of a potentially vulnerable period in a woman's life. A woman's psychological health is closely related to her reproductive life and "exists not as a series of isolated events, but as a psychological continuum across her lifespan" [27].

"Compared to women who gave birth in California, women who died by suicide within one year of pregnancy were more likely to be adolescents at the time of their first birth and receive less than adequate prenatal care during their most recent pregnancy."

Reproductive history. Compared to women who gave birth in California, women who died by suicide within one year of pregnancy were more likely to be adolescents (i.e., <20 years) at the time of their first birth and receive less than adequate prenatal care during their most recent pregnancy (e.g., started prenatal care late, had fewer than optimal visits). Specifically, 29% of women in the CA P-A Suicide Cohort were adolescents at their first birth compared with 19% in the CA Birth Cohort (Table 2.7). A third of women (34%) who died by suicide received inadequate prenatal care compared with just 20% of women in the California birthing population. Both cohorts were similar with regard to interpregnancy intervals, with nearly half of the women within an optimal range of 18-59 months.

Table 2.7. Reproductive history in the CA P-A Suicide Cohort and CA Birth Cohort, 2002-2012

	CA P-A Suicide Cohort (N=99)		CA Birth Cohort (N=5,908,797)	
Reproductive characteristic	**n**	**%**	**n**	**%**
Age at first birth (years)				
<20	27	29.3	427,185	18.8
20-24	26	28.3	639,792	28.0
25-29	19	20.7	540,702	23.6
30-34	10	10.9	434,330	19.0
35-39	6	6.5	194,298	8.5
40+	4	4.3	48,689	2.1
Interpregnancy interval (IPI)[1]				
<18 months (suboptimal)	7	16.3	922,409	27.5
18-59 months (optimal)	21	48.9	1,618,727	48.2
≥60 months (suboptimal)	15	34.9	815,727	24.3
Prenatal care utilization (Kotelchuck Index)[2]				
Inadequate	27	33.8	1,165,952	20.4
Adequate	53	66.3	4,549,499	79.6

1. Interpregnancy interval (IPI) was defined as the number of months between a live birth and the conception of the next live birth; suboptimal IPI was defined as <18 months or ≥60 months, and optimal IPI was 18-59 months. Primigravida women were excluded [28].
2. Prenatal care utilization, or the Kotelchuck Index, was derived from gestational age when prenatal care visits started and the total number of visits; data were not available for pregnancies <20 weeks [29].

Reproductive loss. Overall, 54% of the women in the CA P-A Suicide Cohort experienced a social or pregnancy/infant loss at some point in their lives (Table 2.8); nearly one-quarter had a recent loss.

Table 2.8. Reproductive loss in the CA P-A Suicide Cohort, N=99

Definition of loss[1]	n	%
Pregnancy/Infant loss (associated with most recent pregnancy – miscarriage, Sudden Infant Death Syndrome (SIDS), stillborn/fetal demise, abortion, severely ill infant)	10	10.1
Social loss (associated with most recent pregnancy - foster care, Child Protective Services (CPS), adoption, child living with another adult)	14	14.1
Prior pregnancy loss (fetal demise from prior pregnancy)	29	29.3
No reproductive loss (ever)	46	46.5

1. Categories are mutually exclusive and reflect the most recent event, if a woman had more than one type of loss noted.

Psychosocial factors

While psychosocial factors, such as interpersonal conflict and financial stress, are commonly experienced in the general population, combinations of stressors during or after pregnancy, particularly if paired with preexisting mental health conditions, may exacerbate distress that culminates in a suicide [12]. In contrast to reviews of obstetric deaths, in which the principal information needed relates to the type and quality of medical care provided, pregnancy-associated suicide reviews required additional sources of information to supplement medical records, and relied heavily on data that provided insights into the psychological, social, economic and environmental factors throughout a woman's life.

"Approximately 85% of the women who died by suicide while pregnant or within a year of pregnancy had one or more psychosocial stressors documented. Interpersonal conflict, substance use, financial hardship, exposure to violence as a child or adult, and recent reproductive loss were particularly pervasive."

Approximately 85% of the women who died by suicide while pregnant or within a year of pregnancy had one or more psychosocial stressors documented (Table 2.9). Interpersonal conflict, substance use, financial hardship, exposure to violence as a child or adult, and recent reproductive loss were particularly pervasive in this cohort, each stressor affecting between 24% and 64% of the women. Investigative reports cited recent arguments with an intimate partner or close family member as precipitating events leading to the death in 64% of the cases. A quarter of the women had documented histories of sexual or physical abuse or violence (7 had been sexually abused as a child and 19 were victims of physical violence as an adult). Women with a history of abuse/violence, compared to those with no histories, were more likely to have had a severe mental health condition (67% vs. 33%) and to have used substances (88% vs. 37%) (data not shown). Underreporting of psychosocial factors was highly probable given the lack of systematic documentation of these and other psychosocial factors in patient records. These findings should be interpreted with caution.

Table 2.9. Psychosocial factors identified near the time of death in the CA P-A Suicide Cohort[1], N=99

Psychosocial factor[2]	n	%
Interpersonal conflict/arguments	63	63.6
Intimate partner conflict	*39*	*39.4*
Family conflict	*13*	*13.1*
Substance use (illicit drugs[3], abused prescription opioids, or heavy alcohol use only)	33	39.2
Financial hardship[4]	27	27.3
Exposure to abuse/violence (as a child or adult)[5]	25	25.3
Reproductive loss in recent pregnancy	24	24.2
Loss of a loved one (as a child or adult, excluding reproductive loss)	16	16.2
Housing issues[6]	14	14.1
Lack of social support[7]	13	13.1
Incarceration of decedent, partner	11	11.1
Communication barriers[8]	6	6.1

1. Data regarding substance use were available for 84 out of 99 cases; percents were calculated based on available data. NOTE: These psychosocial factors were present near the time of death unless otherwise specified.
2. Psychosocial factors were derived from medical records and coroner reports; categories are not mutually exclusive.
3. Illicit drugs included methamphetamine, cocaine, or heroin.
4. Financial hardship indicators included unemployed decedent or partner of decedent, inability to pay bills or rent, lack of transportation, and/or inadequate housing or infant equipment.
5. Exposure to abuse/violence included experiencing sexual, physical, or emotional abuse or violence in childhood or adulthood, or witnessing violence as a child.
6. Housing issues included homelessness, living in crowded or unsafe conditions, being institutionalized.
7. Lack of social support was noted if no one was present at the woman's labor and delivery or if the woman's partner and/or family were not involved.
8. Communication barriers included being monolingual in a language other than English, having cognitive, social, or other developmental/behavioral impairments.

"Nearly 65% of women who died by suicide within one year of pregnancy experienced a precipitating factor in the form of a stressful life event, specifically an interpersonal conflict or a significant loss. Substance use was another precipitating factor noted in 29% of cases."

Committee-determined critical factors. The case review process included identification of critical factors (precipitating and mediating) that were present in a woman's life near the time of her suicide. Maternal mortality reviews typically assess multiple underlying factors that are present in each case to determine which are contributory to the death. In reviews of pregnancy-associated suicide, however, the underlying factors and social determinants in women's lives were identified as "critical" factors, rather than specifically "contributing," due to data limitations and the complexity of circumstances in each case.

Nearly 65% of women who died by suicide within one year of pregnancy experienced a precipitating factor in the form of a stressful life event, specifically an interpersonal conflict or a significant loss (either infant loss or loss of a loved one). Substance use was another precipitating factor noted in 29% of cases. Severe mental health issues were identified as the most common mediating factors affecting approximately 20% of women. The range of critical factors demonstrates that the suicide cases were influenced by circumstances in addition to an individual's mental health status.

Substance use

Substance use among women in the general population is closely linked to turbulent life circumstances and the presence of mental health conditions. Contentious relationships with intimate partners and family members, experiences of domestic violence, childhood physical or sexual abuse, financial hardships, racial/ethnic discrimination, and a general lack of social support are some of the factors that may influence a woman to turn to illicit substances or alcohol to cope with her circumstances [30]. Depression, anxiety, and post-traumatic stress disorder (PTSD) are among the mental health conditions often associated with an increased risk for developing substance use disorders [30]. These life circumstances and mental health conditions were also commonly present among women in the P-A Suicide Cohort.

"Nearly one-third (32%) of women in the P-A Suicide Cohort used illicit drugs or abused prescription opioids during or after pregnancy; heavy alcohol use was noted in 17% of women."

Nearly one-third (32%) of women in the P-A Suicide Cohort used illicit drugs (methamphetamine, cocaine, heroin) or abused prescription opioids during or after pregnancy; heavy alcohol use was noted in 17% of women (7.1% were heavy alcohol users but did not use illicit drugs or abuse prescription opioids) (Table 2.10). Methamphetamine was the most commonly abused illicit drug during or after pregnancy, followed by opioids (19 cases had positive toxicology screens for methamphetamine and 12 for opioids). Most of the opioids abused were prescription drugs used for chronic pain (9 of the 12 prescription opioid-users had chronic pain or surgery noted in medical record); 3 women reportedly used heroin. Alcohol use did not change notably between the pregnancy and post-pregnancy periods (13% vs. 14%, respectively). In contrast, the use of illicit substances and abused prescription opioids was markedly lower during pregnancy and increased after pregnancy (13% during vs. 29% after pregnancy).

Table 2.10. Substance use during and/or after pregnancy, in the CA P-A Suicide Cohort[1], N=84

	During or After Pregnancy		During Pregnancy		After Pregnancy	
Substance use patterns:	**n**	**%**	**n**	**%**	**n**	**%**
Mutually exclusive combinations:						
Illicit drugs[2] and/or abused prescription opioids (any use) with or without alcohol (heavy use only), tobacco or marijuana use	27	32.1	12	14.0	23	29.1
Alcohol (heavy use only) with or without tobacco or marijuana use	6	7.1	7	8.1	4	4.7
Tobacco or marijuana use only	8	9.5	10	11.6	8	10.1
None noted	43	51.2	57	66.3	44	55.7
Unknown	15	-	13	-	20	-
Individual categories (not mutually exclusive)[3]:						
Illicit drugs[2] and/or abused prescription opioids (any use)	27	31.0	12	13.2	23	28.8
Alcohol (heavy use only)	16	17.4	12	13.0	12	14.0
Tobacco (any use)	21	23.6	17	19.5	20	24.1
Marijuana (any use)	12	13.2	5	5.8	9	10.8

1. Information about substance use patterns during and after pregnancy was extracted from medical records, coroner reports, and autopsies that included toxicology screens; 15 women were excluded due to incomplete data on substance use.
2. Illicit drugs included methamphetamine, cocaine, or heroin.
3. Available data for individual types of substances varied between n=87 to 92 during pregnancy and n=80 to 86 after pregnancy (9 women died while still pregnant).

Compared with non-users, users of illicit substances or abused prescription opioids were more likely to be recipients of Medi-Cal or another government program rather than having private insurance (78% users vs. 39% non-users on Medi-Cal or other government program) (data not shown). Users of illicit substances or abused prescription opioids were also overwhelmingly more likely to have experienced physical or sexual violence during their lifetimes (54% vs. 7.3%) and reproductive loss, particularly a loss involving Child Protective Services (CPS) (37% users vs. 7.0% non-users with any reproductive loss).

Summary

Suicide is a complex interplay and outcome of biological, behavioral, psychological, social, and environmental factors. The CA-PAMR findings demonstrate the multitude of factors experienced throughout a woman's life that may have contributed to her suicide, including her mental health status, social connectedness, economic status, reproductive history, interpersonal support, substance use, and exposure to violence. This review identified an additional 14 deaths from suicide from those originally deemed accidental on the death certificate, underscoring the need for multiple data sources beyond administrative datasets as essential to classifying women who died by suicide more accurately and completely. This review also demonstrates the role of critical factors that may have precipitated or mediated their deaths. While comparative data to isolate the effects of pregnancy on a death by suicide are limited for this case review analysis, key findings from the present review of pregnancy-associated suicide informed the translation of case data to opportunities for improvement and recommendations for action as presented in Chapters 3 and 4.

Case Study Vignette

Meredith's Story*

Meredith was a White woman diagnosed with depression and Post Traumatic Stress Disorder (PTSD) after she was raped as a young teen. In her 20s, she was admitted to residential treatment for alcohol dependence multiple times, and was prescribed anti-anxiety medication. Meredith stopped drinking alcohol shortly after finding out she was pregnant. During her delivery admission, she was diagnosed with dysthymic disorder, a type of chronic depression. Meredith resumed drinking heavily about one month postpartum. Meredith's family contacted Child Protective Services out of concern for the baby's safety. Consequently, Meredith was hospitalized for two days, attended individual and group counseling sessions, and was prescribed medication for anxiety and insomnia. At discharge, she was referred to an Alcoholics Anonymous support group and had a psychiatry appointment scheduled (unknown if she went). Around five months postpartum, Meredith started binge drinking again. The next week, she and her husband argued, and he left the house for a while. Upon his return, he found Meredith threatening to kill herself with a loaded handgun. As her husband secured the baby's safety and called 911, Meredith ran outside and shot herself.

Insight

The review committee determined that deaths from suicide like Meredith's have a good chance of preventability, despite a pre-existing history of severe mental health issues, including **PTSD from rape**. A history of trauma and resulting mental health conditions greatly increased her risk for mental health issues during pregnancy and postpartum. The committee found it significant that Meredith's depression had not been addressed until her admission to labor and delivery at which time she was prescribed medications. For women with histories of sexual violence, the birth of a baby can trigger PTSD. In the course of case reviews, it was often unclear whether women were prescribed optimal medication or accessed treatment. The committee noted that many women without appropriate mental health care resume using substances postpartum as a form of self-medication. They observed that the lack of documentation tracking the history and progression of Meredith's illness presented challenges for health care professionals to assess her condition over time and provide appropriate treatment. Meredith's family likely did not recognize the severity of her worsening mental health status, and subsequently may not have restricted her access to firearms. As well, families are often unaware of perinatal day treatment programs available in their county. These programs are county-subsidized yet are open to anyone, regardless of insurance-type, and women can bring their infants with them during treatment.

* NOTE: Names and details have been changed to protect the privacy of the women whose deaths are reviewed in this report. These stories represent composites of the reviewed pregnancy-associated suicide cases.

Case Study Vignette

Bao's Story*

Bao was a well-educated Chinese woman who moved to the U.S. to live with her husband and his family. After a few years, she became pregnant, and gave birth to her first baby via cesarean for post term pregnancy. All of Bao's family lived in China, and she had no social network in California other than her husband's family. The night before her death, about eight months after the birth of her child, Bao argued with her mother-in-law, who had been very critical of Bao in the previous few weeks. The following morning, her husband found Bao's lifeless body sitting in the car in the garage with the car running. Bao left a note that stated she was lonely and had no one to talk to. While she had no mental health history on record, her sister-in-law indicated that Bao appeared isolated and depressed. Bao had a history of an unspecified thyroid condition, for which she was not taking medication.

Insight

The review committee determined that Bao's death had a strong chance of preventability. The committee noted that **thyroid conditions** during and after pregnancy can affect mood, and, when effectively managed, may alleviate underlying depression. Bao's case records did not mention any screening for depression or anxiety during pregnancy or postpartum. While women like Bao access prenatal care, without culturally relevant screening, their mental health conditions may not be identified. Thus, many women who would benefit do not access treatment and other resources, such as home visiting, culturally appropriate community support groups and marital counseling. It is important to explore barriers to accessing psychosocial services, and educate women and their families about maternal mental health.

* NOTE: Names and details have been changed to protect the privacy of the women whose deaths are reviewed in this report. These stories represent composites of the reviewed pregnancy-associated suicide cases.

Chapter 3:
Relationship of Suicide to Pregnancy and Preventability

Chapter 3: Relationship of Suicide to Pregnancy and Preventability

Challenges in assessing pregnancy-relatedness for deaths from suicide

Maternal mortality review committees in the U.S. typically assess whether a woman's death was related to her pregnancy by asking whether the death occurred *while she was pregnant or within one year of termination of the pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by her pregnancy or its management, but not from accidental or incidental causes* [31]. Deaths caused by conditions and procedures unique to pregnancy are, by definition, causally related to pregnancy and should, therefore, be classified as pregnancy-related. Examples of such conditions are hypertensive disorders of pregnancy – including preeclampsia and eclampsia, hyperemesis, amniotic fluid embolism, and placental conditions. Likewise, deaths from complications of ectopic or molar pregnancy, abortion, or cesarean delivery are pregnancy-related. For deaths due to conditions that are not unique to pregnancy, such as psychiatric disorders, if the condition that caused death is one that is affected by pregnancy and if the timing of the condition, pregnancy, and death suggest causality, then the deaths would be classified as pregnancy-related. Some conditions are more common, can worsen, or become more serious when a woman is pregnant or postpartum. However, the more months that pass following the birth, the harder it is to make the plausible causal link with pregnancy. Finally, because the rate of suicide is lower among women who were pregnant within the year prior to death than that among reproductive age women who were not pregnant within the prior year, determining pregnancy-relatedness becomes very challenging.

"An alternative that is under discussion nationally is to understand that the defintions of the term, 'pregnancy-related', may not fit well with mental health disorders and to simply use timing to define 'pregnancy-associated deaths from suicide.'"

In reviewing the CA-PAMR deaths, the committee found it difficult to determine pregnancy-relatedness primarily because the case data contained less information about critical and contributing factors preceding a pregnancy-associated suicide compared to previously reviewed deaths due to obstetric and/or medical causes. In contrast to reviews of obstetric deaths, the CA-PAMR experts reviewing deaths by suicide did not have critical diagnostic information to assess maternal mental health and psychosocial factors in the woman's life from available records. Coroner investigative reports, which varied in scope and quality, were the primary data source for mental health history and psychosocial factors.

Many experts think that the determination of pregnancy-relatedness is not relevant to assessing preventability in accidental or violent deaths since there is a number of critical factors beyond medical treatment that impact the type and nature of quality improvement opportunities identified. In the CA-PAMR data, similar patterns of social and critical factors were observed across all pregnancy-associated suicide cases, suggesting that prevention strategies would benefit all women who die by suicide in the year after their pregnancy. An alternative that is under discussion nationally is to understand that the defintions of the term, "pregnancy-related", may not fit well with mental health disorders and to solely use timing of the death to define "pregnancy-associated deaths from suicide": *deaths from suicide while pregnant or within one year of termination of the pregnancy, irrespective of the duration and site of the pregnancy* (personal communication with William Callaghan, MD, MPH of the Division of Reproductive Health, Centers for Disease Control and Prevention [CDC]).

Pregnancy-relatedness and suicide in California

To address the range of ways that a woman's suicide might be classified as pregnancy-related, the CA-PAMR project team and committee developed a multi-criteria definition (Table 3.1). The first criteria closely mirrors the standard definition of pregnancy-related deaths, by centering biomedical and mental health diagnoses and treatment. The remaining criteria for classifying a death from suicide as pregnancy-related were added after preliminary analyses of the case data and consultation with the expert committee. These additional criteria expanded the classification of pregnancy-relatedness by incorporating the psychosocial complexities of women's reproductive and maternal experiences, and how these complexities contribute to maternal suicide.

Table 3.1. Criteria for pregnancy-relatedness in pregnancy-associated suicide cases

Criteria for pregnancy-relatedness in pregnancy-associated suicide cases
1. Underlying mental health issues aggravated by pregnancy or its management (including withdrawal, changes to, or suboptimal dosing of psychiatric medications, complication of pregnancy triggering further mental health distress)
2. Severe postpartum depression/ postpartum psychosis/ other conditions unique to pregnancy
3. Related to pregnancy or neonatal loss, including removal of the infant/child from the mother
4. Unwanted pregnancy
5. Within 42 days postpartum/fetal demise (and no other dimensions apply)
6. Other

The committee applied their expertise and information available for each case to determine pregnancy-relatedness based on the above criteria, included on the CA-PAMR Pregnancy-Associated Suicide Review Form (Appendix; see Chapter 1 for committee review process details). Incomplete information on cases, such as missing mental health histories or life circumstances leading up to the death, were limitations that ultimately influenced final decisions regarding pregnancy-relatedness. These case reviews revealed that pregnancy-relatedness was one, but not the only, factor that the committee thought was critical to identifying opportunities for quality improvement to prevent pregnancy-associated suicide.

The pregnancy-relatedness criteria are not mutually exclusive; however, the individual criterion applied to any one case was determined by the committee to be the 'best fit' given the data available. For example, women whose deaths were determined to be pregnancy-related due to underlying mental health issues aggravated by pregnancy or its management, also may have had a loss (criterion 3), but that was not the principal criterion the committee felt applied to the case overall. The criterion, "Within 42 days post-partum/fetal demise" is one of exclusion, to be used to meet the WHO criteria for maternal deaths, which include deaths by suicide in this time frame. Table 3.2 shows the distribution of criteria among the pregnancy-related deaths.

Table 3.2. Pregnancy-relatedness of pregnancy-associated suicide, CA P-A Suicide Cohort, N=99

Pregnancy-Related Criteria	n	%
Pregnancy-related	**58**	**58.6**
Underlying mental health issues aggravated by pregnancy or its management (including withdrawal, changes to, or suboptimal dosing of psychiatric medications, complication of pregnancy triggering further mental health distress)	24	41.4*
Withdrawal, changes to, or suboptimal dosing of psychiatric medication	*14*	*58.3***
Severe postpartum depression/ postpartum psychosis/ other conditions unique to pregnancy	23	40.0*
Pregnancy or neonatal loss, including removal of the infant/child from the mother	5	8.6*
Unwanted pregnancy	3	5.2*
Intimate partner violence	2	3.4*
Within 42 days post-partum/fetal demise	1	1.7*
Not pregnancy-related	**19**	**19.2**
Unable to determine	**22**	**22.2**

* Percentage out of 58 pregnancy-related suicide cases.
** Percentage out of 24 pregnancy-related suicide cases with underlying mental health issues aggravated by pregnancy or its management.

The committee deemed 58% of the cases in the CA P-A Suicide Cohort (58 out of 99) to be pregnancy-related; 19% were not pregnancy-related; and the committee was unable to determine pregnancy-relatedness for 22% of the cases (Table 3.2). The most frequently applied criterion was underlying mental health conditions aggravated by pregnancy or its management (41%, 24 out of 58); of these, 58% (14 out of 24) were due to withdrawal, changes to, or suboptimal dosing of psychiatric medications. Four women had no changes to medications, one was not taking any, and there were no data for 5 cases (data not shown). Among the 24 women whose deaths were determined to have been pregnancy-related due to underlying mental health issues aggravated by pregnancy or its management: 17 (71%) women had a history of severe mental health condition prior to pregnancy; 4 had a history of mild to moderate depression prior to pregnancy; and 3 had a new onset maternal mental health condition (data not shown).

The next most frequently applied criterion was severe postpartum depression/postpartum psychosis/ other conditions unique to pregnancy (40%, 23 out of 58). Among the 23 women whose deaths were determined to have been pregnancy-related due to severe postpartum depression, postpartum psychosis, or other conditions unique to pregnancy: 17 (71%) had a new onset maternal mental health condition; 2 had a history of mild to moderate depression prior to pregnancy, 2 had no mental health history noted in the record; 1 had a history of severe mental health condition prior to pregnancy; and 1 had a prior suicide attempt only (data not shown).

Although reproductive loss was present in more than half of the cases (see Chapter 2), this criterion was the basis for pregnancy-relatedness in only 5 cases. Other criteria applied by the committee to determine pregnancy-relatedness included unwanted pregnancy (3 cases), intimate partner violence (2 cases), and the timing of death within 42 days postpartum (1 case).

Pregnancy-relatedness and mental health history

As noted in Chapter 2, mental health history and diagnostic impressions were based on all available information that described women's emotional states, behaviors, and any indication of diagnosed and treated mental illness during the perinatal period. Figure 3.1 below shows the distribution of maternal mental health history by pregnancy-relatedness. Of the 58 cases determined to be pregnancy-related, 38% were among women who had a new onset maternal mental health condition, 36% were among women with a severe mental health condition prior to pregnancy, and 18% among women with a mild to moderate mental health condition prior to pregnancy. Conversely, among the 19 suicide cases that were not pregnancy-related, only 6% had a new onset condition while 25% had no history of mental health conditions noted (vs. 5% among pregnancy-related suicide cases). Half of the non-pregnancy-related cases had a severe mental health condition and 13% had a mild to moderate mental health condition noted prior to pregnancy.

Deaths from suicide were deemed pregnancy-related for 22 of 26 women with any psychosis (85%), 12 of 20 women with depression only (60%), and 22 of 41 women with mood disorders and/or substance abuse (54%); meanwhile, only two deaths among the 12 women with no identified diagnostic impressions were judged to be pregnancy-related. Diagnostic impressions were based on committee determinations.

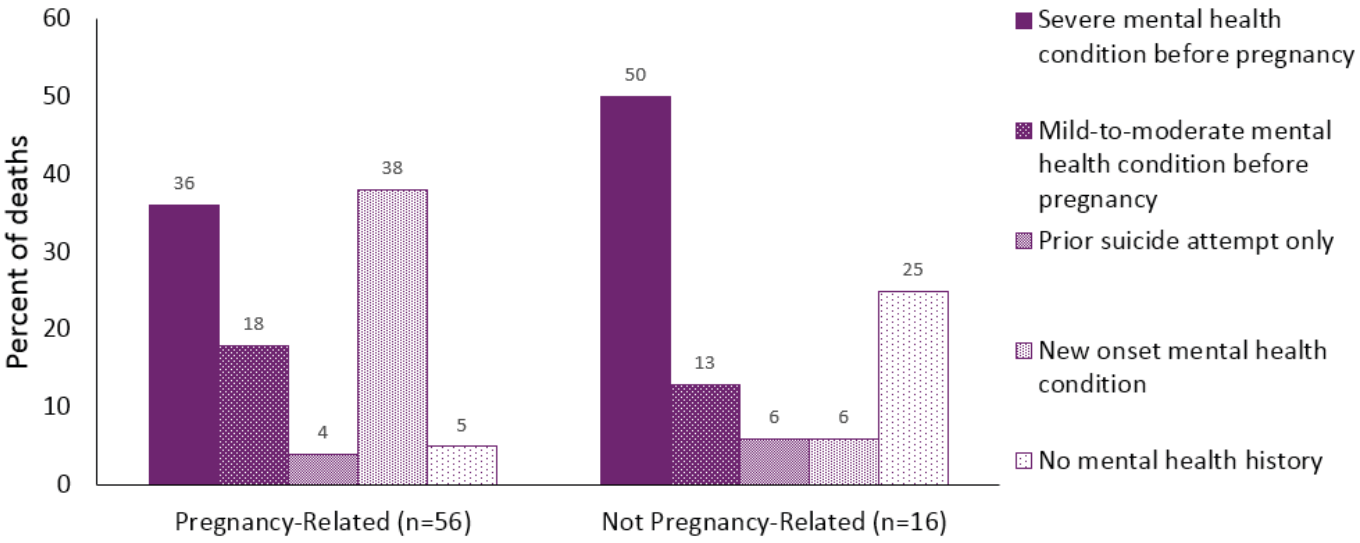


Figure 3.1. Maternal health history by pregnancy-relatedness, CA P-A Suicide Cohort, 2002-2012, N=72. Twenty-seven out of the 99 pregnancy-associated suicide cases are not represented in this figure; excluded were cases with no pregnancy-relatedness determinations (n=22) and those with no mental health history data available (n=5).
Note: Percentage totals may not add up to 100 due to rounding.

Pregnancy-relatedness and timing of death

Pregnancy-relatedness was examined in relation to the timing of the death. Figure 3.2 shows that most pregnancy-*related* deaths from suicide occurred within 180 days (6 months) postpartum, contrary to those that were not pregnancy-related or for which pregnancy-relatedness could not be determined. Specifically, 8 of 9 deaths from suicide that occurred during pregnancy (89%), all 8 deaths in the 0-42 days postpartum period (100%), and 23 of 36 the deaths 43-180 days after pregnancy (64%) were identified as pregnancy-related. In contrast, only 41% of the 46 deaths from suicide that occurred more than 180 days postpartum were deemed pregnancy-related. Suicide that occurred closer in time to pregnancy was more likely to be identified as pregnancy-related.

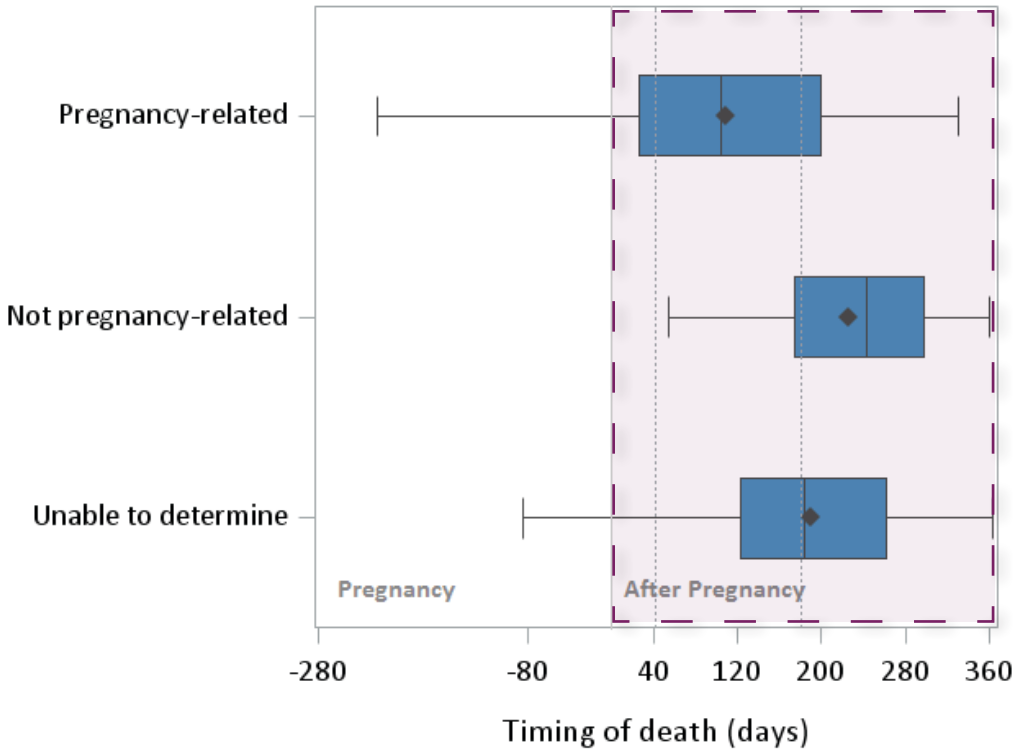


Figure 3.2. Timing of death in days by pregnancy-relatedness, CA P-A Suicide Cohort, 2002-2012, N=99. Whiskers include minimum and maximum values; the box itself represents the interquartile range (i.e., from the 25th to the 75th percentile); inside each box, the diamond symbol denotes the Mean while the vertical line shows the Median. Negative values on the x-axis indicate time during pregnancy.

Preventability of pregnancy-associated suicide

"Just over half (51%) of the deaths were determined to have a good-to-strong chance of preventability."

Preventability: Committee members were asked to assess the preventability of each death. The case was considered to have had an overall chance to alter the outcome when specific and feasible actions, if implemented, might have changed the course of the woman's trajectory and led to a non-fatal outcome. The degree to which specific actions, if they had been implemented, may have altered the fatal chain of events were weighted along a continuum: Strong, Good, Some, or None. Because there was only one case for which the committee determined there was no chance to alter the outcome and one case for which the committee was unable to determine preventability due to lack of information about the case, a dichotomous variable was constructed, with strong-to-good and some-to-none chance to alter the outcome.

Just over half (51%) of the deaths were judged to have a good-to-strong chance of preventability while 47% were thought to have some-to-no chance of preventability, reflecting the belief that suicide is a preventable cause of death when proper treatment and support are available. Like pregnancy-relatedness, preventability is a subjective assessment, complicated by the lack of information surrounding many of the cases.

Preventability and pregnancy-relatedness

"Pregnancy-related suicide cases were significantly more likely to be considered preventable compared to not-pregnancy-related deaths."

There was a notable relationship between pregnancy-relatedness and preventability. Pregnancy-related suicide cases tended to be considered preventable more often than suicide cases that were not pregnancy-related. (Figure 3.3).

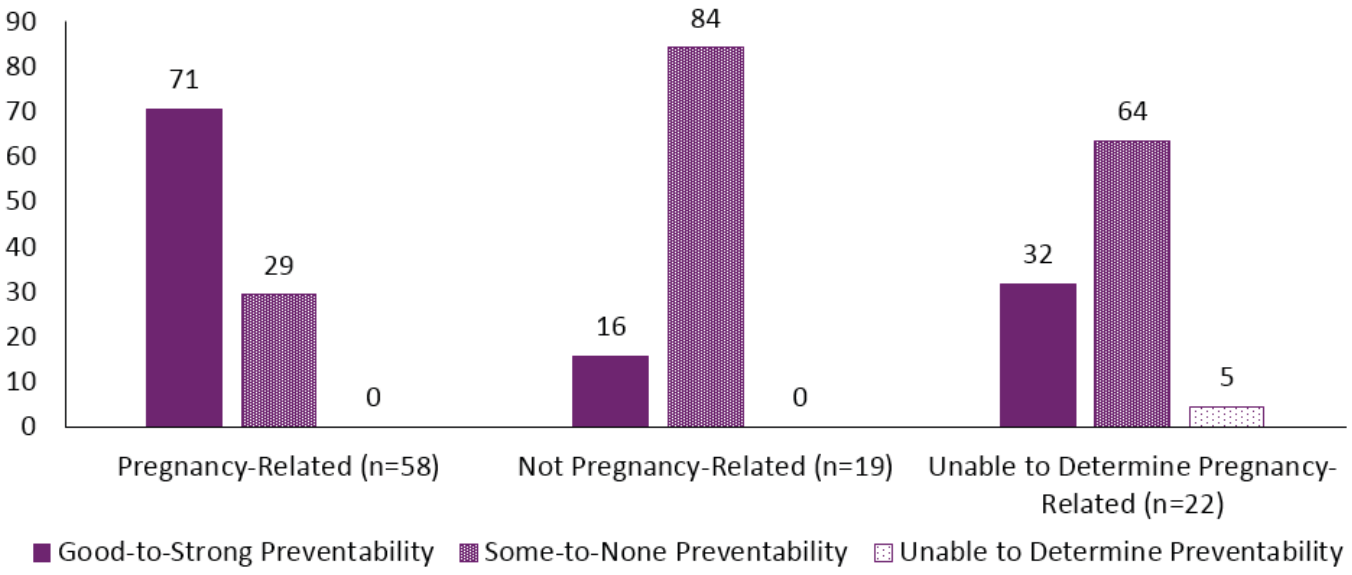


Figure 3.3. Preventability by pregnancy-relatedness, CA P-A Suicide Cohort, 2002-2012, N=99

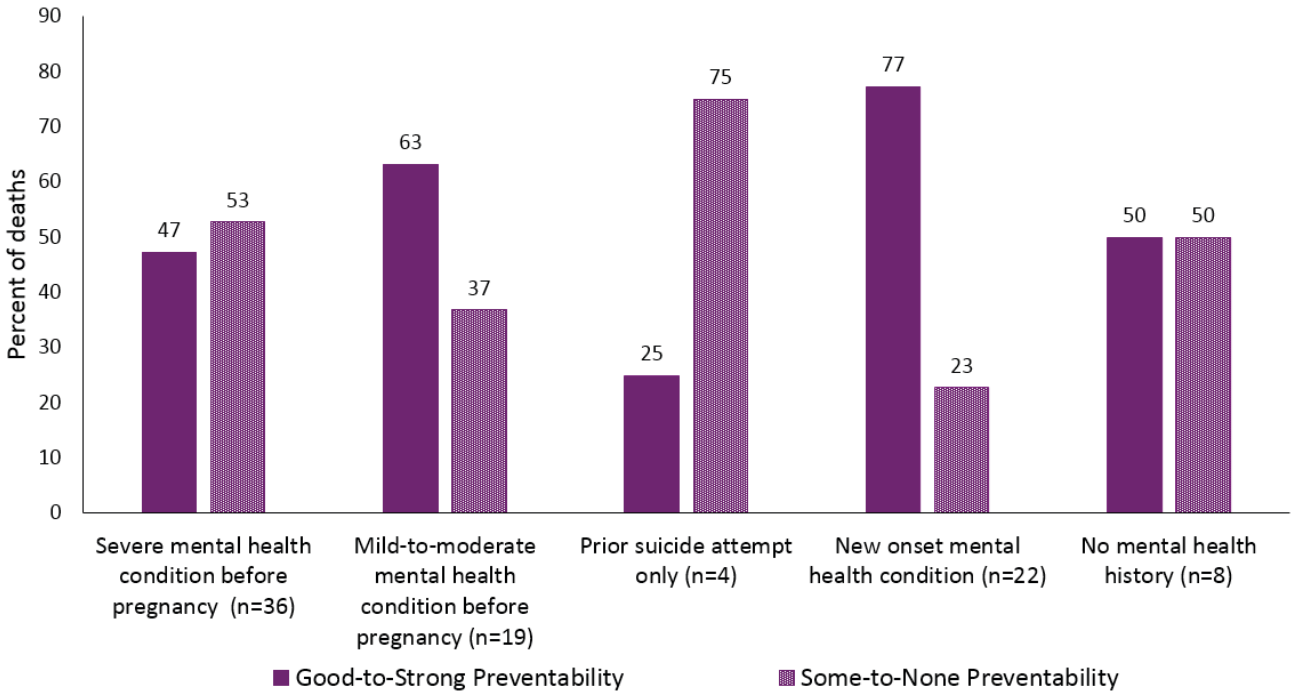


Figure 3.4. Preventability by maternal mental health history, CA P-A Suicide Cohort, 2002-2012, N=89. Excluded were 9 cases that did not have mental health history data and 1 case for which preventability could not be determined.

Another way to look at the preventability of pregnancy-associated suicide is to examine its relationship with maternal mental health history. Figure 3.4 shows that the most preventable deaths were among women who experienced a new onset mental health condition during or after pregnancy; 77% of deaths (17 out of 22) among women with new onset mental health conditions were considered highly preventable. The committee determined that 63% of deaths from suicide (12 out of 19) among women with a history of mild to moderate mental health conditions had a good to strong chance of preventability. The committee also determined that for women with pre-existing severe mental health conditions and significant substance use disorders (data not shown), the chance to alter outcome was less strong, but possible if there were more opportunities to treat women with mental health conditions and substance use addictions in a coordinated manner.

Quality Improvement Opportunities among pregnancy-associated suicide cases

"The committee identified QIOs in all but 3 of the 99 cases."

The CA-PAMR committee assessed Quality Improvement Opportunities (QIOs) for all cases. Throughout the review, committee members offered open-ended responses to the question, "In this particular case, what alternative approaches to recognition, diagnosis, treatment or follow up, at the system, provider, and/or patient levels, may have led to better patient care and/or a better outcome?" The QIOs were confirmed by committee review and consensus. The committee identified QIOs in all but 3 of the 99 cases. The number of QIOs per case varied, with the average being 2.74 QIOs per case (median = 3.0).

"Pregnancy-associated suicide prevention requires better coordination between primary obstetric care providers and psychiatric and mental health professionals."

The QIO data were coded according to concepts that were identified in advance of the analysis (theoretical) and those that emerged directly from the data (emergent) to identify themes (Table 3.3). The predominant themes included coordination of care, screening, pregnancy and postpartum support, partner and family support, cultural issues, public awareness, public health, and stigma. The need for improved coordination between maternal health and other service providers was a dominant theme. A major subtheme in this area was the need for primary obstetric care to better coordinate with psychiatry, substance abuse treatment programs, social services and mental health providers regarding treatment when indicated. Example QIOs in this theme include, "For women on several medications and bipolar diagnosis, there should have been more thorough discharge planning by treating physician," and "Pregnancy management could have been better, she had fragmented care, and was in and out of a residential care facility that was not appropriate for her high-risk pregnancy status."

"A major theme among the quality improvement opportunities identified was the need for better screening for mental health conditions during pregnancy and postpartum, as well as screening for substance use, adverse childhood experiences, medical diagnoses, and intimate partner violence."

A second major subtheme involved the need for better screening for mental health conditions during pregnancy and postpartum, as well as screening for substance use, adverse childhood experiences, medical diagnoses and intimate partner violence. Maternal mental health issues affect partners and family members; there were a number of QIOs which focused on the need for partners and family members to have information and support regarding their loved one's mental illness. Example QIOs include: "Education is needed for partners, family members and the pregnant woman to understand that entering pregnancy with a history of mental health conditions is a risk factor, and women need to be screened and monitored closely throughout pregnancy and up to one year post delivery," and "Need culturally sensitive education for family members on signs/symptoms of maternal depression and what to do with suicidal ideation."

As shown in Chapter 2, more than half (54%) of the women who died experienced some type of reproductive loss in the year prior. A subtheme among the Pregnancy and Postpartum QIOs involved opportunities to screen, and provide support, for women who experience natural or social losses, e.g., "This woman could have benefitted from infant loss support groups, and wrap around, culturally appropriate support for her and her partner."

Table 3.3. Quality Improvement Opportunities (QIOs): Distribution and definitions[1], N=273

QIO Themes and Definitions	n	%
Coordination of care: Need for better coordination between providers and systems with regard to treatment and information	70	25.6
Obstetrics (OB) and psychiatry/mental health: Coordination between OB or primary prenatal/postpartum provider and specialized perinatal mental health providers	48	17.6
Mental health treatment: Coordination between primary OB provider and perinatal psychiatric/mental health services	40	14.7
Medications: Education and best practices around psychiatric medication treatment in perinatal population	24	8.8
Referrals: Referrals from primary OB provider to perinatal psychiatric/mental health services	9	3.3
Patient education: Education about treatment, changing/discontinuing medications, other key information for women from providers	8	2.9
Mental health hospitalization: Length of stay, insurance issues, follow up post-discharge	8	2.9
Child welfare: Child welfare system integration with maternal support services	9	3.3
Pediatrics/Neonatal Intensive Care Unit (NICU): Pediatric or neonatal care coordination with maternal mental health services	7	2.6
Criminal justice: Police, criminal justice, jail personnel/system integration with mental health systems	6	2.2
Information sharing: Information sharing across OB and psychiatry care teams	6	2.2
Substance use treatment: Substance use treatment/referral system coordination with maternal mental health services	2	0.7
Screening: Need for comprehensive screening for issues related to maternal mental health	68	24.9
Screen mental health (MH): Screening for mental health issues throughout pregnancy and postpartum	46	16.8
Screen substance use: Screening for substance use (not same as inpatient drug rehab with MH services and mother/baby care)	16	5.9
Screen ACES: Screen using Adverse Childhood Experiences survey (ACEs)	12	4.4
Screen medical diagnoses and pain: Screen and assess medical diagnoses; physical pain	4	1.5
Screen intimate partner violence: Screen for intimate partner violence	2	0.7

Table 3.3 (*continued*)

QIO Themes and Definitions	n	%
Pregnancy and postpartum support: Opportunities to provide needed services and support for women who are pregnant or within one year of pregnancy	54	19.8
Birth & Postpartum: Includes hospital labor and delivery and postpartum issues	35	12.8
Continuation of care: More/closer/better postpartum follow-up needed, when patient history is positive for mental health issues	23	8.4
Perinatal social worker/lactation: Opportunities for social work; lactation; other in hospital services to support women with MH diagnosis	12	4.4
Postpartum discharge planning: Opportunities for better discharge planning for women with MH diagnosis	7	2.6
Postpartum/Social support: General types of support/services that women needed during postpartum	28	10.3
Grief/Loss support: QIOs related to grief or loss and need for bereavement support	17	6.2
Pregnancy support: General types of support/services that women needed during pregnancy	13	4.8
Partner and family support: Opportunities for partners and families to receive education and support regarding maternal mental health	51	18.7
Family intervention: For families of women with MH diagnosis: signs and symptoms to know; opportunity for family to intervene at crisis points	34	12.5
Suicide ideation response: In particular, how to respond to suicidal ideation/plan	13	4.8
Partner support: Opportunities to better support partners of women with MH diagnoses	7	2.6
Reproductive life planning: Opportunities for family planning, contraception counseling; pregnancy spacing issues	7	2.6
Cultural issues: Opportunities to provide culturally relevant services and information, due to race, ethnicity, religion and age	31	11.4
Ethnic minority: Opportunities to provide culturally relevant and sensitive care, services, information to ethnic minorities, e.g., Hmong, Indian, Korean	10	3.7
Teens: Opportunities to better support pregnant teens	9	3.3
Public awareness: Need for public awareness about maternal mental health and suicide prevention	30	11
Firearm safety: Gun safety/access for people with MH diagnoses	15	5.5

Table 3.3 (*continued*)

QIO Themes and Definitions	n	%
Resources: Specific resources named	5	1.8
Public health (PH): Opportunities to refer to PH services, in addition to Home Visiting/Medi-Cal	23	8.4
Home Visiting: Opportunities to refer women to home visiting	16	5.9
Medi-Cal/Comprehensive Perinatal Services Program (CPSP): Opportunities to refer women to Medi-Cal or CPSP providers, programs that follow mandated psychosocial screening, assessments and referrals.	10	3.7
Stigma: Opportunities to reduce stigma associated with maternal mental health conditions; related to public awareness and cultural issues	6	2.2

1. QIO themes are not mutually exclusive (i.e., one QIO may have several themes assigned to it); overarching themes are bolded and sub-themes are listed beneath each overarching theme.

Quality Improvement Opportunities and the WHO framework for prevention and promotion in mental health

After the QIOs were coded by using theoretical and emergent themes, they were then coded according to the World Health Organization (WHO) framework for prevention and promotion in mental health to aid in the recommendations process [32]. The WHO framework identifies three levels of prevention: Primary, Secondary and Tertiary prevention, as shown in Table 3.4.

Table 3.4. WHO framework for prevention and promotion in mental health

WHO framework for prevention and promotion in mental health
Primary Prevention – two levels
1. Universal prevention – targeting general public
2. Selective prevention – targeting individuals or subgroups who have higher risk of developing a mental disorder than the general population pregnant/postpartum women
Secondary Prevention refers to interventions undertaken to reduce the prevalence and avoid delays in treatment (early intervention) among women with existing diagnosis or known risk factors; all specific treatment-related strategies
Tertiary Prevention includes interventions that reduce disability related to the illness, all forms of rehabilitation, prevention of relapses of the illness

Primary Prevention

The QIOs that related to primary prevention opportunities at the Universal level, or targeting the general public, included the need for more public awareness about maternal mental health risk factors, signs and symptoms, treatment and recovery as well as those related to gun safety to prevent suicide. Closely related to public awareness was the need for more resources to support women with mental health conditions during and after pregnancy. Primary prevention opportunities selectively targeting pregnant and postpartum women at increased risk of developing a mental disorder include the importance of routine screening for mental health conditions as well as support and education for family members of women with mental health conditions, which should be culturally sensitive to particular racial/ethnic or cultural groups.

Secondary Prevention

The majority of QIOs referred to secondary prevention, or those interventions undertaken to reduce the prevalence and avoid delays in treatment (early intervention) among women with existing diagnoses or known risk factors. QIO themes that fell under the secondary prevention umbrella included (1) better assessment of pregnant/postpartum women who have a history of mental health conditions or trauma/loss; (2) improved care coordination across Obstetrics, Pediatrics/Neonatal Intensive Care Unit (NICU), Mental Health, Social Services, and Public Health services; (3) a comprehensive system of referrals for women with known risk factors or mental health conditions; and (4) coordinated treatment and outpatient follow-up when indicated (e.g., mental health treatment, bereavement support, substance use treatment). The QIOs in this category also included the need for improved interagency systems coordination (e.g., foster care, child welfare, criminal justice) as well as referrals to public health services where applicable (e.g., Home Visiting, Black Infant Health, Women Infant Children). QIOs related to the need for education were also included in this secondary prevention level, such as education for family members and partners when there is known history or current mental health diagnosis and education for providers regarding mental health in the pregnant and postpartum population.

Tertiary Prevention

Tertiary prevention includes interventions that reduce disability related to the illness, all forms of rehabilitation, and prevention of relapses of the illness. The first set of QIOs in this group related to the need for education directed at primary obstetric *and* psychiatric providers regarding perinatal mental health diagnoses and treatment. Examples of QIOs referring to tertiary prevention include "Better education and management of medications during pregnancy (She stopped meds and started new ones but they were not appropriate)" and "Educate providers, including psych providers about the need to better treat psychosis in terms of medication (types, dosages, contraindicated) and length of hospitalization, and follow-up needs in seriously ill people." The second set of QIOs in this group related to the need for psychiatric providers to be better informed about best practices in medication and treatment for the perinatal population, for example, "Educate psychiatrists about optimal medication for bipolar psychosis in postpartum patients," and "Education for psych clinicians – postpartum psychosis can shift quickly; don't let personal knowledge of family (or her socioeconomic status or possible high functioning) supersede clinical judgment."

Looking at the QIOs through the lens of the prevention framework aided the committee in its task of developing recommendations.

Summary

The committee's review of each pregnancy-associated suicide identified opportunities for improvement and provided insights into the gaps in care and support for women during pregnancy and in the year following. The predominant themes among the improvement opportunities included coordination of care, screening, pregnancy and postpartum support, partner and family support, cultural issues, public awareness, public health, and stigma. The need for improved coordination between maternal health and other service providers was an especially dominant theme. A major subtheme in this area was the need for primary obstetric care to better coordinate with psychiatry and mental health regarding treatment when indicated. The complex, interconnected nature of mental health, substance use, and the sociocultural meanings of pregnancy, childbirth and motherhood requires comprehensive care for women who are diagnosed with mental health conditions. Addressing and implementing improvement opportunities identified in this report will help improve care for all pregnant and postpartum women and especially those affected by mental illness, substance use and other psychosocial circumstances, with the goal of preventing maternal suicide.

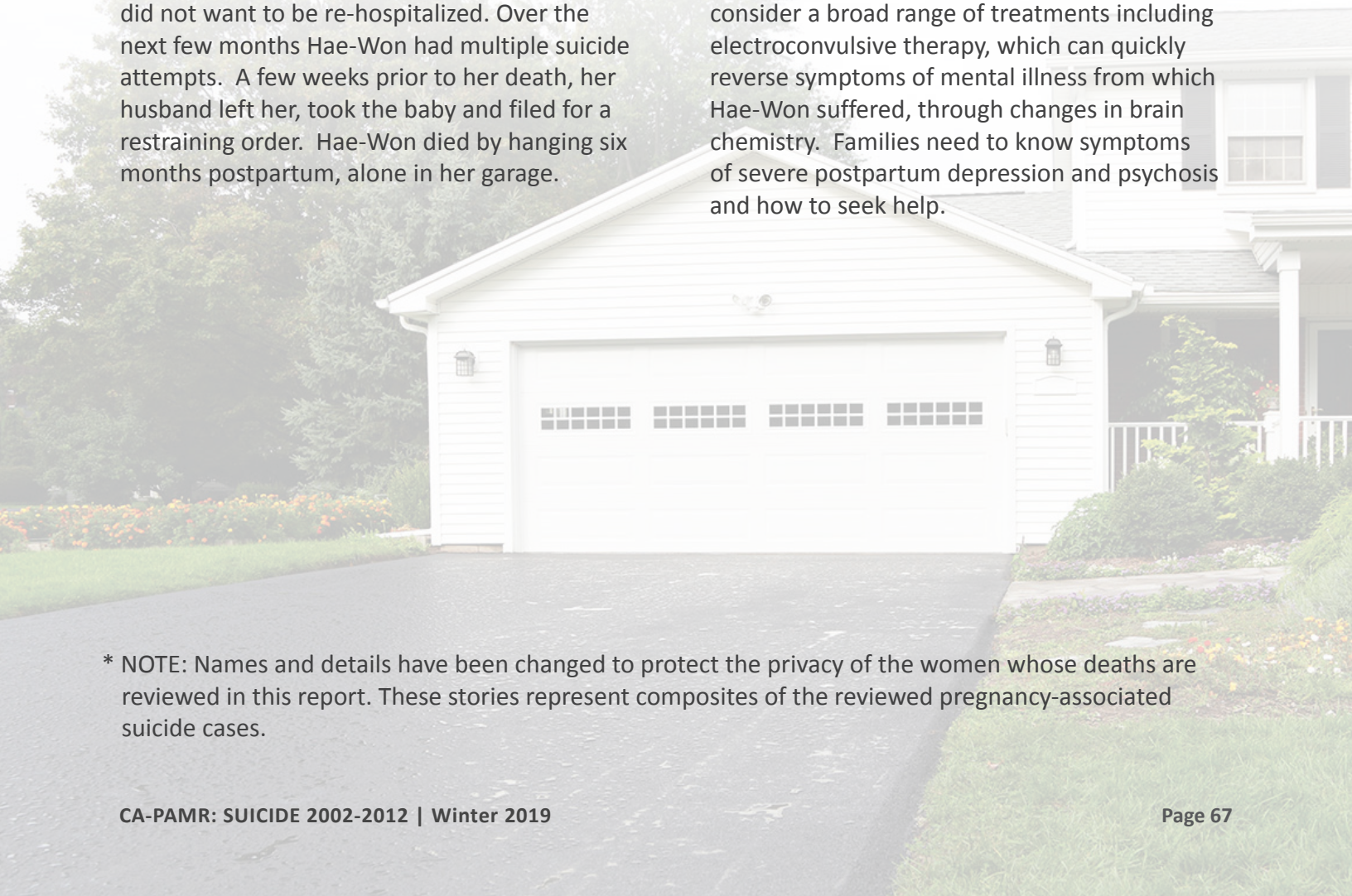
Case Study Vignette

Hae-Won's Story*

After years struggling to conceive, Korean-born Hae-Won became pregnant through in-vitro fertilization (IVF). She developed gestational hypertension and gave birth to a healthy infant via scheduled cesearean at 36 weeks gestation. Hae-Won had no mental health history prior to pregnancy and no history of substance use or exposure to violence. Two months after the baby was born, Hae-Won's husband found her walking outside threatening to kill herself. Over the next few days, she continued to make comments about murder-suicide, so her husband took her to the hospital for a psychiatric evaluation where she was admitted on a 5150 hold (involuntary psychiatric hold for individuals who are in danger of self-harm). She refused follow-up treatment because she did not want to be re-hospitalized. Over the next few months Hae-Won had multiple suicide attempts. A few weeks prior to her death, her husband left her, took the baby and filed for a restraining order. Hae-Won died by hanging six months postpartum, alone in her garage.

Insight

The review committee determined that Hae-Won's death had a strong chance of preventability. Given the seriousness of her threats, the committee considered her postpartum psychiatric hospitalization too short to thoroughly assess and treat her condition. Women with new onset maternal health conditions need appropriate short- and long-term follow-up. Additionally, women who conceive via IVF have a higher risk for depression and mental health issues. Mental health professionals need to be informed that ambivalence is part of the presentation of **severe postpartum depression or psychosis** and utilize culturally-sensitive screening and treatment methods. In cases such as this one, it is important to work with the family and consider a broad range of treatments including electroconvulsive therapy, which can quickly reverse symptoms of mental illness from which Hae-Won suffered, through changes in brain chemistry. Families need to know symptoms of severe postpartum depression and psychosis and how to seek help.



* NOTE: Names and details have been changed to protect the privacy of the women whose deaths are reviewed in this report. These stories represent composites of the reviewed pregnancy-associated suicide cases.

Case Study Vignette

Mariah's Story*

Mariah was in her early 30s, married with two school-age children. Toward the end of her third pregnancy, she became distressed about the safety of her neighborhood due to illegal drug activity. She was referred for mental health care, but it is unknown if she received treatment for her new onset mental health condition. After she gave birth to a healthy baby, her mother traveled from her home country of Guatemala to help care for the children. Mariah's family was concerned about her depression. The day before her death, Mariah began giving away her possessions to family members. She was found unconscious the next morning in bed with a positive toxicology screen for multiple drugs and alcohol, six months after giving birth.

Insight

The review committee determined that Mariah's death had a strong chance of preventability in part due to the presence of strong family support and a history of successful parenting. Perhaps if Mariah's family had access to **culturally and linguistically appropriate information about maternal mental health**, they may have been able to help Mariah access appropriate and timely care. Mariah should have been screened four times during her prenatal and postpartum care in a Medi-Cal clinic, using culturally sensitive tools that assess social isolation, risk factors for mental health conditions and suicide, and protective factors. For women with risk factors for, or diagnosis of severe depression, the review committee recommends that ongoing follow-up should extend to one year postpartum.

* NOTE: Names and details have been changed to protect the privacy of the women whose deaths are reviewed in this report. These stories represent composites of the reviewed pregnancy-associated suicide cases.

Chapter 4:
Recommendations to Prevent Pregnancy-Associated Suicide

Chapter 4: Recommendations to Prevent Pregnancy-Associated Suicide

Recommendations process and objectives

Data-driven recommendations were developed using a modified version of the Nominal Group Technique (NGT), a process to gain consensus from a diverse group of individuals [33]. NGT is designed to encourage individual participation, and is structured to ensure equal participation by all persons, with the result being a set of prioritized recommendations that transparently represent the group's consensus. The CA-PAMR team facilitated iterative data analyses with Review Committee members via written, individual conversations, and teleconference formats over a period of five months (Figure 4.1). The goals of the recommendation process—to develop a list of recommendations that can be assessed in terms of key criteria (evidence, impact, feasibility, and scalability) and identify implementation partners—were shared and communicated with the committee.

After the iterative data analysis conversations, the CA-PAMR team requested that each committee member generate a list of recommendations. The team then consolidated this list, eliminated duplicates, and asked the committee members to individually prioritize the recommendations. The team then investigated feasibility and impact criteria, fine-tuned the wording, and created another draft set of recommendations and sent these to the committee for feedback. An in-person meeting was held, and a subset of committee members met with the CA-PAMR team to finalize the list of recommendations, which was again distributed to committee members for final comments and approval. The final consensus recommendations are presented in Table 4.1.

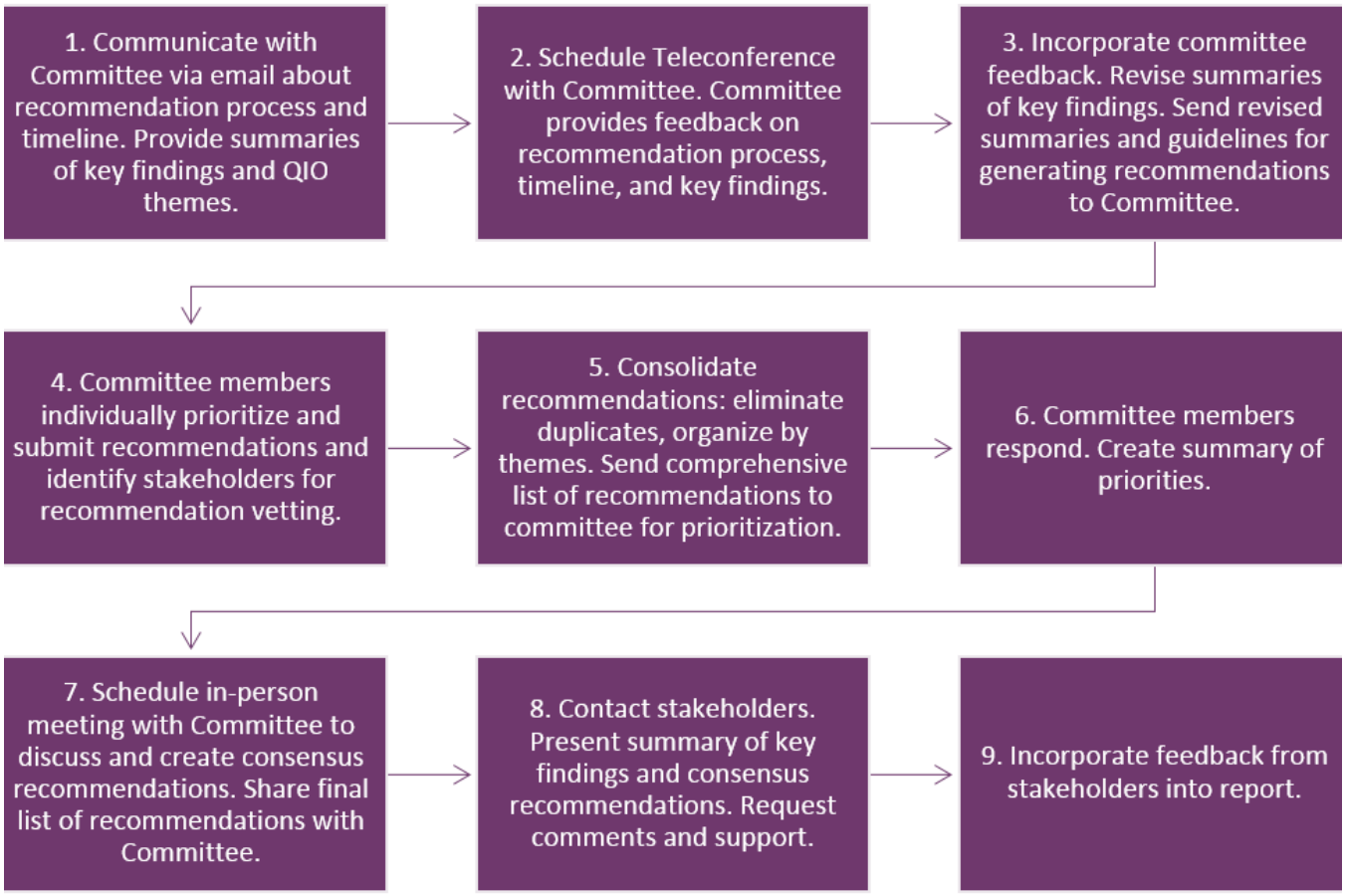


Figure 4.1. Flow chart of the recommendation development and vetting processes.

Evidence supporting recommendations to prevent pregnancy-associated suicide

CA-PAMR completed a review of 117 potential pregnancy-associated suicide cases from 2002-2012; 99 of these deaths were classified as suicide. In addition to administrative data (vital records, patient discharge data), coroner reports, autopsies, toxicology screens, and medical records were examined to investigate the deaths of all women who died by suicide and identify the critical factors relevant to their deaths. Analyses of the 99 pregnancy-associated suicide cases revealed the following key findings:

Case findings and critical factors: Most of the pregnancy-associated deaths by suicide occurred between six weeks and one year postpartum. Committee-determined critical factors connected to a woman's suicide included interpersonal conflict, significant loss of a loved one, and/or substance use. Over 60% of the women had a history of either severe or mild-to-moderate mental health conditions before pregnancy, and a quarter of the women had new onset mental health conditions noted during or after pregnancy. Depression, psychosis, and bipolar disorder were the top three diagnostic impressions at the time of a woman's suicide. Substance use was a common co-occurring condition with all mental health disorders. Nearly one-third of

women used illicit drugs (methamphetamine, cocaine, heroin) and/or abused prescription opioids; heavy alcohol use was noted in nearly 20% of the cases. Only a small proportion of the women who died by suicide received appropriate and adequate psychiatric medication.

Pregnancy-relatedness and preventability: The CA-PAMR data showed a strong positive relationship between pregnancy-relatedness and preventability; yet the the CA-PAMR committee also identified a number of critical factors beyond better assessment and treatment that impacted the type and nature of quality improvement opportunities identified. The CA-PAMR data revealed similar patterns of psychosocial and critical factors among all pregnancy-associated suicide cases irrespective of pregnancy-relatedness, suggesting that prevention strategies would benefit all women at risk of suicide during or after pregnancy.

Quality Improvement Opportunities: A key outcome of case reviews was the identification of quality improvement opportunities to inform recommendations for prevention of pregnancy-associated suicide. Based on the case data available to the committee, the most common emergent themes of quality improvement opportunities were (1) coordination of care issues between obstetric, mental health, and substance use care; (2) missed screening opportunities; (3) partner and family support in response to emotional distress; (4) cultural issues; and (5) systemic public health services. The majority of these recommendations fall into the secondary level of prevention, addressing the needs of an at-risk population: women who enter pregnancy with a mental health condition and those identified through prenatal or postpartum screening.

Recommendations

Major recommendations arising from this in-depth examination of pregnancy-associated suicide cases are presented in Table 4.1. They are organized according to the public health framework for prevention (see Chapter 3 for details). These recommendations reflect the key findings and quality improvement opportunities described in this report as well as the expertise of the CA-PAMR committee members. They are intended as a starting point for improving maternal mental health care and prevention of suicide. Many of these recommendations will require interdisciplinary collaboration across multiple sectors to be successfully implemented.

Table 4.1. CA-PAMR recommendations for the prevention of pregnancy-associated suicide

Primary Prevention
Universal prevention – public messaging
• Increase culturally and linguistically relevant public awareness about maternal mental health risk factors, signs, symptoms, treatment, and recovery. • Improve data collection on maternal mental health and suicide at the time of death in order to inform better policy through (a) in-depth interview of family and friends; (b) review of medical and mental health records regarding diagnoses and medications used and dosing; and (c) comprehensive toxicological analysis in all cases of suspected suicide or drug overdose.
Selective prevention – targets individuals or subgroups who have a higher risk
• Reduce social isolation during and after pregnancy by increased availability to evidence-based, culturally and linguistically relevant group prenatal care, peer-led support, or home visiting programs. • Support incentives to routine screening of pregnant and postpartum women for mental health conditions by both obstetric providers and pediatricians during well-child visits. • Explore gun safety and access issues for people with history of mental health risk factors.
Secondary Prevention
• Improve initial and on-going professional education for healthcare providers regarding assessment and referral to appropriate care of women who have a history of mental health conditions, trauma, or loss. • For women with mental health conditions, incorporate routine suicide risk assessment using a validated tool. • For women with high risk of suicide, care providers should develop a safety plan for the patient and her family that includes information on California's Gun Violence Restraining Order, which allows for temporary removal of firearms from the home.

- Improve systems of referral and ensure access to care, including substance use treatment, for women with known risk factors or mental health conditions.
- Improve coordination of care across obstetrics, pediatrics/Neonatal Intensive Care Units (NICUs), mental health services, substance use treatment programs, bereavement support, social services, and public health services.
- Improve interagency coordination specific to foster care, child welfare, criminal justice and referral to public health programs.
- Improve education and training on risk of separation of mothers and babies for all agencies and programs involved in maternal and child health and welfare.
- Mental health professionals should provide support and education for family members of women with mental health conditions.

Tertiary Prevention

- Improve education for obstetric and psychiatric providers regarding perinatal mental health diagnoses and treatment, particularly around management of medications in pregnancy and medical management of psychosis in postpartum patients.
- Educate psychiatric providers on the value of keeping mother and baby together during day treatments or hospitalizations.

Conclusion

Maternal mental health, a marker of maternal well-being and a determinant of an infant's life-long health, is a public health priority. Pregnancy-associated suicide is a tragic event that has a profound impact on the child and family who are left behind. Between 2002-2012, suicide accounted for 4.3% of all deaths among California women who were pregnant within the prior year (based on linked administrative data). While still rare in this population, suicide risk is significantly increased among women who enter pregnancy with existing mental health conditions and those women who develop new onset conditions during or after pregnancy, such as postpartum depression or psychosis [1, 2]. The CA-PAMR in-depth reviews revealed that preventability of pregnancy-associated suicide is high. Further, the committee review provided insights into the gaps in maternity and mental health care and support, and alternative strategies for bridging those shortfalls. These insights are reflected in the recommendations, which are intended to be the first step in addressing this important issue. Translating these recommendations into action will require multidisciplinary collaboration across multidisciplinary sectors. Innovative solutions will be critical to success in saving mothers' lives.

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Appendix

Technical Notes: Methods

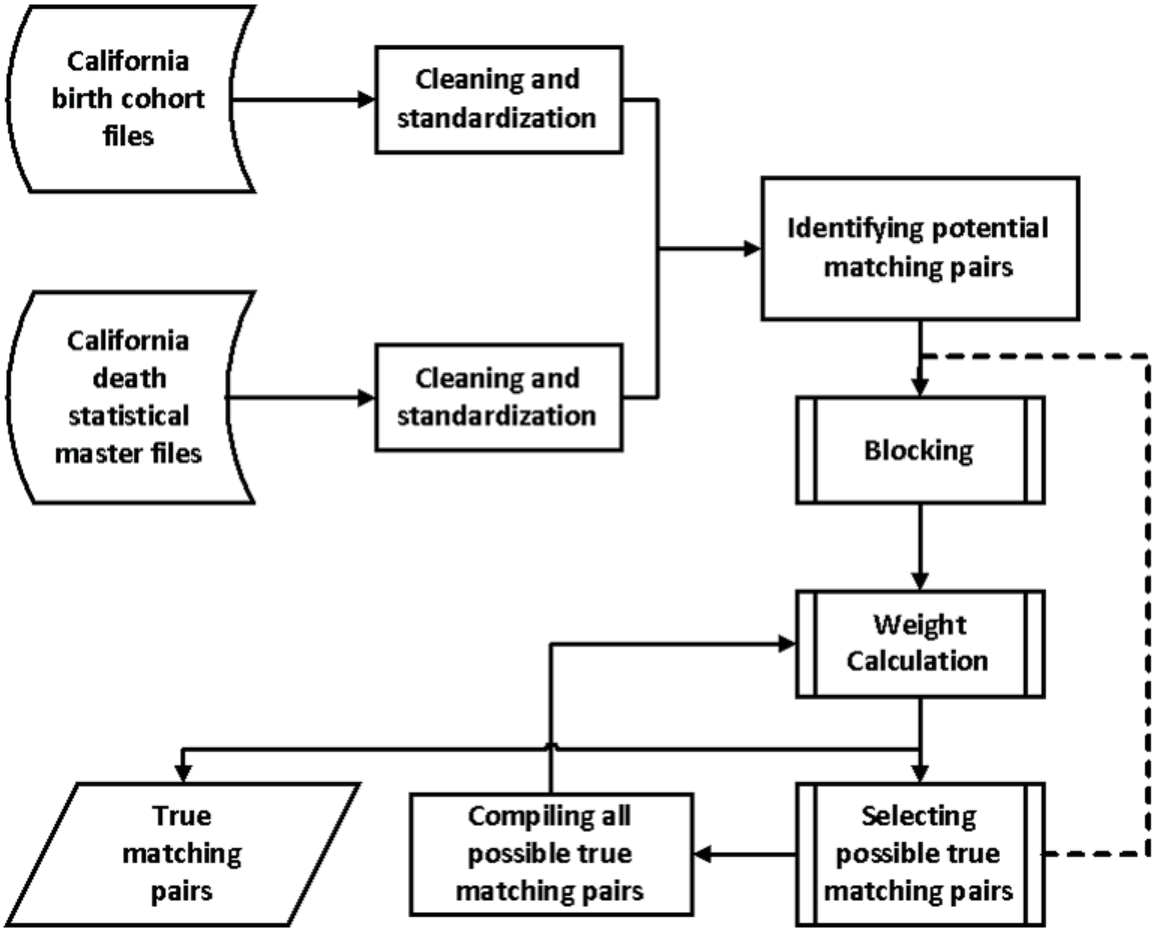
Data Sources

Data Source	Purpose
Administrative data files: • CDPH Statistical Master Birth file • CDPH Statistical Master Death file • CDPH Statistical Master Fetal Death file • CDPH Birth Cohort file: Contains data for all live births and the infants who died in the first year of life (linked to the birth). • California Office of Statewide Health Planning and Development (OSHPD), Patient Discharge Dataset (PDD)	To identify the pregnancy-associated cohort, time to death, birth and psychiatric/ substance-abuse-related hospitalizations if applicable. To construct the CA Birth Cohort and CA Non Pregnancy-Associated Suicide Cohort. To obtain demographic and reproductive history information on cases and comparative populations.
Death investigation reports: • Coroner / Medical Examiner investigations • Autopsy reports • Toxicology screens	To confirm evidence of pregnancy and manner of death. To provide details of the decedent's mental health and psychosocial circumstances leading up to the death for inclusion in case summary.
Medical records: • Prenatal • Delivery • Psychiatric admissions • Postpartum encounters	To incorporate clinical events and interactions with the medical community into the case summary.
Online sources: • Obituaries • News articles • Blogs • Personal websites	To add additional personal context to the case narrative, as available.

Data Linkage Methods

The pregnancy-associated death cohort was constructed following two processes: 1) probabilistic record linkage of birth cohort file and death master statistical file, to capture women who died within one year of delivery; and 2) deterministic record linkage of death master statistical file and patient discharge data, to identify women who had a recent pregnancy, irrespective of delivery.

Process I: Probabilistic Record Linkage of Birth Cohort File and Death Master Statistical File



Step 1: Prepared data files by cleaning and standardizing data fields.

Step 2: Refined the comparison space of potential birth-death pairs

- A CDC method[1] for matching potential records by various combinations of identifiers was adopted and modified to generate potential matching.
- Jaro-Winkler method[2] was used to calculate consistency, hence to determine agree/non-agree status of two text strings.

Step 3: Assigned matching weights and selected possible true matching pairs

- Blocked potential matching pairs dataset by unique identifier or combination of identifiers.
- Estimated error probabilities[3] using each block as a proxy of true matching pairs dataset.
- Measured the agreement / non-agreement weight for each pair by summing value-specific probability ratios (frequency-based m-probability to u-probability)[3] of all dispositioned match/ non-match identifiers within the pair.
- Selected possible true matching pairs with weight above pre-defined threshold.[4]
- Compiled a true matching dataset by merging potential true matching pairs within all blocks.

Step 4: Selected true matching pairs

- Estimated error probabilities using the compiled true matching dataset.
- Calculated weight for each record in the potential matching pairs dataset.
- Set determining weight threshold via ROC curve analysis (threshold sensitivity 97%, specificity 99%) on a validated reference dataset.
- Pairs with weights above the threshold were included in the cohort; Pairs with weights within marginal range of the threshold were included after clerical review confirmation; Pairs with weights below the threshold, but sharing unique identifiers such as name and date of birth were retained and flagged in the final cohort.

Process II: Deterministic Record Linkage of Death Master Statistical File and Patient Discharge File

Excluding all linked records from process I, all death records of female California residents within reproductive age range were linked to patient discharge records. SSN and DOB were used as the unique identifiers for the deterministic linkage. Pregnancy status was identified by:

- Diagnosis-related group (DRG) codes: 765-770, 774,775,777-779.
- ICD 9 CM diagnosis codes: 630-679, V22,V23,V24,V27, V28, V89, V91, and V72.42, exclude followings:
    1. 677: Late effect of complication of pregnancy, childbirth, and the puerperium.
    2. 67454: Peripartum cardiomyopathy, postpartum condition or complication.
- ICD 9 CM procedure codes: 69.01, 69.51, 74.91, 75.0.

All linked records from process I and II were further reviewed with additional data sources to confirm pregnancy.

References:

1. National Center for Health Statistics. Office of Analysis and Epidemiology, NCHS 2011 Linked Mortality Files Matching Methodology, September, 2013. Hyattsville, Maryland. https://www.cdc.gov/nchs/data/datalinkage/2011_linked_mortality_file_matching_methodology.pdf.

2. Jaro, M. A., *Advances in Record-Linkage Methodology as Applied to Matching the 1985 Census of Tampa, Florida.* Journal of the American Statistical Association, 1989. 89, 414-420.

3. Winkler, W. E., *Frequency-based Matching in the Fellegi-Sunter Model of Record Linkage.* Proceedings of the Section on Survey Research Methods, American Statistical Association, 1989, 778-783.

4. Cook, L.J., et al., *Probabilistic record linkage: relationships between file sizes, identifiers, and match weights.* Methods Inf Med, 2001. 40:196-203.

Confidentiality and Institutional Review Board Approval

All CA-PAMR Committee members and persons involved in data procurement and analysis signed confidentiality agreements and a recusal policy before reviewing any material related to pregnancy-associated deaths. The Committee for the Protection of Human Subjects of the State of California Health and Human Services Agency approved all CA-PAMR protocols, data abstraction forms and contact letters. The Institutional Review Boards of the Public Health Institute and Stanford University deemed the study exempt. All protocols comply with the Health Insurance Portability and Accountability Act (HIPAA) privacy rules. All data regarding patients, providers, and hospitals were de-identified within the documents available to reviewers.

Forms

CA-PAMR Suicide Abstraction Form

CA-PAMR Suicide Case Information Sheet

CA-PAMR Suicide Case Summary (template)

CA-PAMR Pregnancy-Associated Suicide Review Form

PAMR ID_____

CA-PAMR Suicide Abstraction Form

TERMINAL EVENT

1. Pregnant at time of death ☐ Yes ☐ No

2. Weight at time of death _____ (lbs) **Height_____ (inches)**

3. BMI at time of death _____ ☐ Unknown

4. Autopsy done ☐ Yes ☐ External exam only ☐ No

5. Method of suicide

☐ Carbon monoxide poisoning ☐ Gun ☐ Hanging
☐ Jumping ☐ Knife/Stabbing/Cutting instrument ☐ Drug overdose
☐ Other, specify_____

6. Location of death ☐ Own home ☐ Other's home ☐ Other, Specify_____
☐ Unknown

7. Death witnessed ☐ Yes ☐ No ☐ Not documented

8. Decedent left note ☐ Yes ☐ No ☐ Not documented

9. Toxicology screen (autopsy) ☐ No autopsy ☐ Negative

☐ Positive, for

- ☐ Methamphetamine
- ☐ Pseudoephedrine
- ☐ Ethanol
- ☐ Barbiturates
- ☐ Carbon monoxide
- ☐ Cocaine and metabolites
- ☐ Opiates – oxycodone / hydrocodone
- ☐ Opiates – heroin /morphine/methadone
- ☐ Acetaminophen
- ☐ Other, specify_____

MEDICAL HISTORY

10. Medical History (excluding mental health)

☐ No source data
☐ None mentioned
☐ Chronic condition (specify)_____
☐ Acute condition (specify)_____

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PAMR ID_____

11. Family Medical History – Mother, Father, Siblings (ever)

☐ No source data
☐ None mentioned
☐ Chronic condition (specify)_____
☐ Acute condition (specify)_____

MENTAL HEALTH HISTORY

12. Family Mental Health History (Grandparent, parent, siblings)

☐ No source data
☐ None mentioned
☐ Alcohol/drug abuse/addiction
☐ Bipolar
☐ Depression
☐ Post-Partum Depression
☐ Suicidality
☐ Any psychiatric hospitalization
☐ Other, specify_____

13. Decedent Mental Health History

☐ No source data
☐ None mentioned
☐ Yes

14. Prior Suicide attempts (#)_____ ☐ No source data

15. Timing of most recent attempt ☐ NA ☐ <6 mos ☐ 6-12 mos ☐ 1-2 years ☐ 3+ yrs

16. Suicidal behavior during pregnancy up to time of death (any mention)

☐ No source data
☐ None
☐ Suicidal ideation
☐ Verbalized emotional distress
☐ Verbalized plan (with means to carry out) for suicide

17. Changes in behavior during pregnancy and up to death (any mention)

☐ No source data
☐ None
☐ Eating ☐ Weight loss
☐ Sleeping ☐ Other (specify)_____
☐ Personal hygiene

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18. Experienced significant life stressors during pregnancy and up to death (any mention)

- ☐ No source data
- ☐ None
- ☐ Loss of parent/significant loved one
- ☐ Suicide of close relation
- ☐ Work-related stressor
- ☐ Intimate partner violence
- ☐ Relationship trouble / breakup
- ☐ Tension among extended family/in-laws
- ☐ Financial issues
- ☐ CPS involvement
- ☐ Unwanted pregnancy
- ☐ Any trauma during pregnancy
- ☐ Other, specify_____

19. Mental Health Issues (any mention)	**Pre-pregnancy**	**During pregnancy**	**Post-partum-death**
☐ No source data			
☐ None / Screened negative			
☐ Anxiety	☐	☐	☐
☐ Bipolar	☐	☐	☐
☐ Depression	☐	☐	☐
☐ Eating disorder	☐	☐	☐
☐ Psychosis	☐	☐	☐
☐ Schizophrenia	☐	☐	☐
☐ Other, specify_____	☐	☐	☐

20. Mental health treatment			
☐ No source data ☐ None			
☐ Took Rx for mental health Specify med(s)	☐ _____ _____	☐ _____ _____	☐ _____ _____
☐ Changed dosage		☐	☐
☐		☐	☐
☐ Changed medication	☐	☐	☐
☐ Stopped taking medication			
☐ Rec'd counseling or therapy (include individual or group)			

PAMR ID_____

20a. Describe medication changes/issues (include timing of changes, i.e. during pregnancy, during breastfeeding, etc.)

20b. Positive social support (code all that apply)

- ☐ No source data / None documented
- ☐ None
- ☐ Immediate family
- ☐ Friends
- ☐ Partner/FOB
- ☐ Other (specify)_____

SUBSTANCE ABUSE	Pre-pregnancy	During pregnancy	L&D/Post-partum
21. Substance abuse			
☐ No source data			
☐ None			
☐ Tobacco / Smoker	☐	☐	☐
☐ Alcohol	☐	☐	☐
☐ Methamphetamine	☐	☐	☐
☐ Cocaine	☐	☐	☐
☐ Marijuana	☐	☐	☐
☐ Heroin	☐	☐	☐
☐ Other Opiates	☐	☐	☐
☐ Other, specify_____	☐	☐	☐
22. Rehab mentioned			
☐ No	☐	☐	☐
☐ No source data			
☐ Yes, but timing not noted			

23. Partner alcohol/drug abuse mentioned?

- ☐ No
- ☐ No source data

PAMR ID_____

PSYCHOSOCIAL HISTORY

24. Communication barriers

- ☐ No source data
- ☐ None documented
- ☐ Non-English-speaking
- ☐ Low literacy skills
- ☐ Low intelligence
- ☐ Learning disability
- ☐ Other, specify_____

25. Housing inadequacy

- ☐ No source data
- ☐ None documented
- ☐ Unstable/Transient housing/homeless
- ☐ Substandard housing
- ☐ Isolated living situation / geographic location
- ☐ Recent move > 1 hour from prior residence

26. Poverty indicators (excluding housing)

- ☐ No source data
- ☐ None documented
- ☐ Single mother
- ☐ No financial support from FOB
- ☐ Receives WIC
- ☐ Physical isolation/remote from care facility
- ☐ Unemployed (unintentionally)
- ☐ No reliable transportation
- ☐ No phone/message phone
- ☐ Other, specify_____

27. Incarceration / Criminal justice system involvement

- ☐ No source data
- ☐ None documented
- ☐ Decedent Specify_____
- ☐ FOB / Partner Specify_____
- ☐ Family (parent or sibling) Specify_____

EXPOSURE TO VIOLENCE

28. Experienced physical violence as adult

- ☐ No source data
- ☐ None documented
- ☐ Yes
  - ☐ Perpetrator not specified
  - ☐ FOB
  - ☐ Intimate partner, not FOB
  - ☐ Non-family, non-intimate partner
  - ☐ Family member, non-intimate partner

29. Experienced sexual violence as adult

- ☐ No source data
- ☐ None documented
- ☐ Yes
  - ☐ Perpetrator not specified
  - ☐ FOB
  - ☐ Intimate partner, not FOB
  - ☐ Non-family, non-intimate partner

PAMR ID_____

30. History of violence (as child) (<18 years)

☐ No source data ☐ None documented

☐ Experienced childhood physical violence (Specify perpetrator – check all that apply)

- ☐ By family member, or parent's intimate partner
- ☐ By other known assailant
- ☐ By unknown assailant

☐ **Experienced childhood sexual violence** (Specify perpetrator – check all that apply)

☐ No source data ☐ None documented

- ☐ By family member, or parent's intimate partner
- ☐ By other known assailant
- ☐ By unknown assailant

31. Witnessed violence (Specify perpetrator – check all that apply)

☐ No source data ☐ None documented

- ☐ By family member, or parent's intimate partner
- ☐ By other known assailant
- ☐ By unknown assailant

PREGNANCY/LABOR AND DELIVERY/POST-PARTUM

32. Gravida_____ Para_____ SABs _____ IABS_____

32a. Ages of children at time of death _____ _____ _____ _____ _____

☐ NA ☐No source data

33. Prenatal Care ☐Yes ☐ No ☐Unknown **1st Visit (GA)____ # of Visits_____**

34. Infertility tx ☐Yes ☐ No ☐Unknown

35. Birth Outcome ☐ Unknown/No source data

☐ Live Birth ☐ Fetal Demise ☐ SAB ☐ IAB ☐ Undelivered

36. Mode of delivery ☐ Unknown/No source data ☐ NA - Died prior to delivery

☐ Vaginal **(skip to 38)**

☐ C/S --> ☐Planned ☐ Unplanned during labor ☐Crash/Emergent

37. Indication for C/S ☐ Fetal condition ☐Maternal condition ☐Repeat ☐ NA

38. Gestational Age _____ weeks ____ days ☐ No source data

39. Birthweight ___lbs____ oz **Apgars** 1 min ___ 5 mins ____ ☐ Unknown ☐ NA

40. Infant admitted to NICU? ☐ Yes ☐ No ☐ Unknown ☐ NA

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PAMR ID_____

41. Disposition of infant ☐ Home ☐ CPS/Foster Care ☐ Adoption ☐ Other ☐ NA (fetal death/died prior to delivery)

42. Pre-Pregnancy/Prenatal Complications

☐ No source data ☐ None documented
☐ Prior post-partum depression
☐ Hypertensive disorder (chronic, gestational, preeclampsia, eclampsia)
☐ Diabetes
☐ Placental issues
☐ Cardiovascular condition
☐ Genetic condition
☐ Autoimmune condition
☐ Other, specify_____

43. Major L&D Complications

☐ No source data ☐ None documented
☐ Hypertensive disorder (any)
☐ Hemorrhage
☐ Cardiovascular condition
☐ Other, specify_____

44. ICU admission

☐ No source data ☐ None documented
☐ Yes, Length of Stay in ICU _____ Days

45. Visit from hospital Social Worker?

☐ No source data
☐ None documented
☐ Yes

46. Breastfeeding?

☐ No source data
☐ No
☐ Yes

47. Bonding with baby?

☐ No source data
☐ No - Bonding deficit noted
☐ Yes - noted affirmatively or no deficit noted

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PAMR ID_____

48. Maternal transport to higher level of care

☐ No source data
☐ None documented
☐ Yes

49. Length of Stay at L&D admission ___ ___ Days ☐ Unknown

50. Discharged with prescription for narcotic painkiller

☐ No source data
☐ No
☐ Yes, specify med _____
☐ Unknown

51. Additional information from external data sources (media/obituary/personal website) that contributes to the understanding of this death

Data Sources:

☐ Prenatal record
☐ Postpartum record
☐ L&D admission
☐ ER visits, specify #Prenatal____ #Post-partum___
☐ Other admissions, specify #___
☐ Coroner investigative report
☐ Autopsy
☐ Toxicology report
☐ Obituary
☐ Media/News articles
☐ Personal Website
☐ CDPH Injury Control (Epic)

Suicide Case Information Sheet PAMR ID: _____

Suicide Case Information Sheet

Mother's Place of Birth:	*[text]*		
Age at Death:	*[numeric]*		
Race/Ethnicity:	*[text]*		
Marital Status:	*[text]*	**Payer Source:**	*[text]*
Education (Highest Grade):	*[text]*	**Occupation:**	*[text]*

Number of Hospitalizations:	*[numeric]*
Number of ER Visits:	*[numeric]*

Hospital	Admit Date	Discharge Date	Psychiatric / Substance-Related Diagnosis	Category
Hospital A	*[MM/DD/YY]*	*[MM/DD/YY]*	*[text]*	*[text]*
Hospital B				

Infant Date of Birth:	*[MM/DD/YY]*
Date of Death:	*[MM/DD/YY]*
Days from Birth to Death:	*[numeric]*
Timing of Death (Preg/Early/Late):	*[text]*
Reported to Coroner (Y/N):	*[text]*
Autopsy Performed (Y/N):	*[text]*
Immediate Cause of Death:	*[text]*
Underlying Causes of Death:	*[text]*
Other Significant Conditions:	*[text]*
Operations Performed (Y/N):	*[text]*
ICD 10 Code and Group Name:	*[text]*
Pregnancy Box Checked (Y/N):	*[text]*
Fetal Death (Y/N):	*[text]*

CA-PAMR Suicide Case Summary **PAMR ID**

Demographics: This was a year-old, woman, born in married/single, with education, occupation.

Timing of death:

Method:

Obstetric History: She was a G P , had X prenatal visits starting at X weeks and prenatal issues included: i

She had a delivery type at X weeks. Obstetric complications included:

Breastfeeding:

Bonding:

Ages of Other Children:

BMI at death:

Medical/Surgical history:

Family History (Medical/Mental health):

Mental Health history:

Substance use/abuse:

Exposure to Violence:

Life Circumstances:

Timeline of events leading to death:

Toxicology:

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CA-PAMR 2.0 MATERNAL SUICIDE REVIEW FORM

PAMR ID _ _ _ _ - _ _ _

Reviewer #1 _____ Reviewer #2 _____ Date: _____

1. Classification of death	☐ Suicide ☐ Drug overdose, accidental ☐ Unable to determine
2. Mental Health History *Committee consensus for "best estimate" of categorization*	☐ History of severe mental health issues prior to pregnancy ☐ History of mild/moderate depression/anxiety prior to pregnancy ☐ New onset maternal mental health issue ☐ No mental health history noted (record available) ☐ Prior suicide attempt ONLY (no other MH hx noted) ☐ Unable to determine (no records available)
3. Mental Health Diagnosis *Committee consensus for "best estimate" of diagnosis*	☐ Anxiety ☐ Bipolar disorder ☐ Depression ☐ Psychosis ☐ Schizophrenia ☐ Other, specify _____ ☐ Substance use disorder ☐ Unable to determine
4. Mental Health Treatment *At time of death*	Under psychiatric treatment? ☐ Yes ☐ No ☐ Unknown Appropriate psychiatric medications? ☐ Yes ☐ No ☐ Unknown
5. Overall Chance to Alter Outcome / Preventability *The case is considered to have had an overall chance to alter the outcome when specific and feasible actions, if implemented, might have changed the course of the woman's trajectory and led to a non-fatal outcome. The degree to which specific actions, if they had been implemented, may have altered the fatal chain of events are weighted along a continuum: "**Strong**", "**Good**", "**Some**", or "**None**".*	☐ **Strong** ☐ **Good** ☐ **Some** ☐ **None**
6. Pregnancy-Related Death? *if YES, select PRIMARY reason below:* ☐ Severe postpartum depression/ postpartum psychosis/ other conditions unique to pregnancy ☐ Unwanted pregnancy ☐ Underlying mental health issues aggravated by pregnancy or its management (including withdrawal, changes to, or suboptimal dosing of psychiatric medications, complication of pregnancy triggering further mental health distress) ☐ Related to pregnancy or neonatal loss, including removal of the infant/child from the mother ☐ Within 42 days post-partum/fetal demise ☐ Other: _____	☐ **Yes** ☐ **No** ☐ **Unable to Determine**

CA-PAMR 2.0 MATERNAL SUICIDE REVIEW FORM

PAMR ID __ __ __ __ - __ __ __

Identify Quality Improvement Opportunities (QIO) in this case, i.e., *alternative clinical approaches to recognition, diagnosis, treatment or follow-up, at the system, provider, and/or patient levels that may have led to better patient care and/or a better outcome. QIOs may also include public health prevention efforts, and social or health policy recommendations.*

Target

OB provider
Psychiatric
Family
Patient
Policy
Public Health
Other

Risk Factors (Red Flags)	Quality Improvement Opportunities	Target
Precipitating		
☐ Stressful life event	_____	_____
☐ Interpersonal conflict	_____	_____
☐ Significant loss / disruption	_____	_____
☐ Other_____	_____	_____
☐ Substance use	_____	_____
☐ Social isolation	_____	_____
☐ Other_____	_____	_____
☐ Other_____	_____	_____
Mediating		
☐ Pregnancy or postpartum	_____	_____
☐ Underlying medical condition(s)	_____	_____
_____	_____	_____
☐ Other_____	_____	_____
☐ Other_____	_____	_____
	_____	_____
☐ Severe mental health issue	_____	_____
	_____	_____
Other	_____	_____
	_____	_____

Visit the California Department of Public Health

http://www.cdph.ca.gov

Visit Maternal, Child and Adolescent Health

http://www.cdph.ca.gov/Programs/CFH/DMCAH

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