
This project was supported by Federal Title V Maternal Child Health Block Grant funds from the Health Resources and Services Administration (HRSA) to the California Department of Public Health; Center for Family Health; Maternal, Child and Adolescent Health Division.

Summer 2019
Objectives

- To describe the epidemiology of suicide in the perinatal population
- To show findings from in-depth case reviews of pregnancy-associated suicide in California
- To discuss quality improvement opportunities and recommendations for suicide prevention in the perinatal population
CA-PAMR Project Team

- **California Department of Public Health**
  Maternal, Child and Adolescent Health Division
  Project Home, Funder, Public Health Authority
  Vital records, epidemiology tools and resources

- **Public Health Institute (PHI)**
  Investigative reports procurement
  Medical records abstraction
  Data management and analysis

- **CA Maternal Quality Care Collaborative (CMQCC)**
  Committee management
  Maternity care providers engagement
  Quality Improvement Interventions

- **Volunteer Expert Review Committee**
CA-PAMR Volunteer *Suicide Review* Committee

Represented Disciplines:

- Psychiatry
- Psychology
- Emergency medicine
- Obstetrics
- Social work
- Public health nursing
- Forensic pathology
CA-PAMR aims and objectives

CA-PAMR aims to reduce mortality among pregnant and postpartum women, up to one year after the end of pregnancy

In-depth case reviews seek to:

• Improve cause-of-death classifications and timing
• Determine whether death was related to pregnancy and degree of preventability
• Examine social determinants of health to address health inequity
• Identify multidisciplinary quality improvement opportunities
• Produce recommendations for preventing deaths in the perinatal population
CA-PAMR methods

Construct Pregnancy-Associated Death Cohort

Pre-screen pregnancy-associated deaths:
Apply inclusion/exclusion criteria

Abstract data and prepare case summaries:
Investigative reports, Medical records, Other data

Committee reviews cases: Classify death as suicide vs. accident, identify contributing/critical factors, quality improvement opportunities, preventability, determine if pregnancy-related

Analyze quantitative and qualitative data:
Committee produces data-informed recommendations for preventing suicide
Key definitions

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

• **Pregnancy-related death**: Death of a woman while pregnant or within one year after end of 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.

Source: Centers for Disease Control and Prevention (CDC)
Background

Epidemiology of suicide in the perinatal period

CA-PAMR aims and methods
US and CA suicide rates among women of reproductive age (15-49 years), 1999-2016

Source: CDC Wonder Online Database accessed on 09/24/18.
Suicide cases were identified by ICD-10 codes U03, X60-X84, and Y87.0
Causes of pregnancy-associated mortality* in CA

*Deaths while pregnant or within one year after end of pregnancy in 2002-2012

- Suicide
- Drug overdose
- Homicide
- Accidental (except drug overdose)
- Undetermined
- Medical causes

Deaths by suicide call attention to unmet maternal mental health needs.
Moving average of suicide ratios for CA women of reproductive age (15-49 years), 2002-2012

Source: Pregnancy-associated deaths: CDPH birth and death files, 2002-2012; cases were identified using ICD 10 codes U03, X60-X84, and Y87.0 on linked administrative data. Population data: EpiCenter.
Cause-of-death classification for cases of potential suicide

Pregnancy-associated deaths in 2002-2012

- 86 Suicide
  - 85 Suicide
  - 1 UTD
- 31 Accidental/Other
  - 14 Suicide
  - 9 Accidental
  - 8 UTD

99 Deaths by Suicide

UTD = Unable to Determine

117 Cases Reviewed
Moving average of pregnancy-associated suicide ratios for CA women by data source

Source: CDPH birth and death files, 2003-2012. Cases were identified using ICD 10 codes U03, X60-X84, and Y87.0 on death certificate and linked administrative data. *Numerator <20 cases, unreliable ratio.
Suicide ratios among California women of reproductive age (15-49 years) by race/ethnicity, 2002-2012

Source: Pregnancy-associated deaths: CDPH birth and death files, 2002-2012; cases were identified using ICD 10 codes U03, X60-X84, and Y87.0 on linked administrative data. Population data: EpiCenter. *Suicide ratio may be unreliable, numerator <20 deaths.
CA Pregnancy-Associated Suicide Cohort

Findings from in-depth reviews of 99 pregnancy-associated suicide cases in 2002-2012
Age, CA P-A Suicide Cohort, 2002-2012 (N=99)

CA Pregnancy-Associated (P-A) Suicide Cohort: Women who died by suicide while pregnant or within a year after end of pregnancy;
CA Non P-A Suicide Cohort: Women of reproductive age (15-49 years) who died by suicide and were not pregnant within a year prior to death;
CA Birth Cohort: Women with a live birth or fetal death
Race/Ethnicity, CA P-A Suicide Cohort, 2002-2012 (N=99)

CA Pregnancy-Associated (P-A) Suicide Cohort: Women who died by suicide while pregnant or within a year after end of pregnancy;
CA Non P-A Suicide Cohort: Women of reproductive age (15-49 years) who died by suicide and were not pregnant within a year prior to death;
CA Birth Cohort: Women with a live birth or fetal death
Education, CA P-A Suicide Cohort, 2002-2012 (N=99)

CA P-A Suicide Cohort (N=99)
- No high school diploma: 23%
- High school or equivalent: 26%
- Some college: 29%
- Bachelor degree or higher: 30%

CA Non P-A Suicide Cohort (N=4,675)
- No high school diploma: 15%
- High school or equivalent: 26%
- Some college: 32%
- Bachelor degree or higher: 24%

CA Birth Cohort (N=5,908,797)
- No high school diploma: 10%
- High school or equivalent: 21%
- Some college: 21%
- Bachelor degree or higher: 24%

CA Pregnancy-Associated (P-A) Suicide Cohort: Women who died by suicide while pregnant or within a year after end of pregnancy;
CA Non P-A Suicide Cohort: Women of reproductive age (15-49 years) who died by suicide and were not pregnant within a year prior to death;
CA Birth Cohort: Women with a live birth or fetal death
Other demographic characteristics,
CA P-A Suicide Cohort, 2002-2012 (N=99)

<table>
<thead>
<tr>
<th></th>
<th>CA P-A Suicide Cohort (N=99)</th>
<th>CA Birth Cohort (N=5,908,797)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. born</td>
<td>77%</td>
<td>56%</td>
</tr>
<tr>
<td>Delivery payer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medi-Cal/Other government</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>Private insurance</td>
<td>44%</td>
<td>48%</td>
</tr>
<tr>
<td>Self-pay/Uninsured</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Age &lt;20 years at first birth</td>
<td>29%</td>
<td>19%</td>
</tr>
<tr>
<td>Adequate prenatal care (pregnancies 20+ weeks only)</td>
<td>66%</td>
<td>80%</td>
</tr>
</tbody>
</table>

CA Pregnancy-Associated (P-A) Suicide Cohort: Women who died by suicide while pregnant or within a end of pregnancy;
CA Non P-A Suicide Cohort: Women of reproductive age (15-49 years) who died by suicide and were not pregnant within a year prior to death;
CA Birth Cohort: Women with a live birth or fetal death
Timing of death
CA P-A Suicide Cohort, 2002-2012 (N=99)

Most deaths occurred >42 days after pregnancy ended.
Mechanism of suicide
CA P-A Suicide Cohort, 2002-2012 (N=99)

- Hanging: 39%
- Drug Overdose: 22%
- Firearm: 15%
- Jump from height: 13%
- Oncoming traffic/train: 5%
- Other: 5%
  - stabbing/cutting
  - drowning
  - burning
  - carbon monoxide poisoning

13 of the 23 drug overdose suicide cases had positive toxicology screens for opioids (11 for prescription opioids and 2 for heroin)
Mental health history
CA P-A Suicide Cohort, 2002-2012 (N=89)*

<table>
<thead>
<tr>
<th>Mental health condition (per CA-PAMR committee)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe mental health condition(s) prior to pregnancy</td>
<td>41%</td>
</tr>
<tr>
<td>Mild to moderate depression or anxiety prior to pregnancy</td>
<td>21%</td>
</tr>
<tr>
<td>Prior suicide attempt(s) ONLY (no other mental health history noted)</td>
<td>4%</td>
</tr>
<tr>
<td>New onset mental health condition(s)</td>
<td>25%</td>
</tr>
<tr>
<td>No mental health history noted</td>
<td>9%</td>
</tr>
</tbody>
</table>

*10 cases excluded due to incomplete or missing mental health history data

40% of women had prior suicide attempts, 67% of which occurred within 6 months of death.
### Mental health diagnostic impressions*

### CA P-A Suicide Cohort, 2002-2012 (N=99)

<table>
<thead>
<tr>
<th>Mental health diagnostic impression (not mutually exclusive)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>56%</td>
</tr>
<tr>
<td>Substance use disorder</td>
<td>32%</td>
</tr>
<tr>
<td>Psychosis</td>
<td>24%</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>17%</td>
</tr>
<tr>
<td>Anxiety</td>
<td>8%</td>
</tr>
<tr>
<td>Personality disorder</td>
<td>6%</td>
</tr>
<tr>
<td>Post-Traumatic Stress Disorder (PTSD)</td>
<td>4%</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>4%</td>
</tr>
</tbody>
</table>

*Diagnostic impressions refer to the likely clinical diagnosis based on consensus committee determinations*
Mental health diagnostic impressions (mutually exclusive)
CA P-A Suicide Cohort, 2002-2012 (N=99)

<table>
<thead>
<tr>
<th>Mutually exclusive combinations of diagnostic impressions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYCHOSIS</td>
<td>26%</td>
</tr>
<tr>
<td><em>Psychosis with other mental health conditions including substance use disorder</em></td>
<td>16%</td>
</tr>
<tr>
<td><em>Psychosis only</em></td>
<td>10%</td>
</tr>
<tr>
<td>MOOD DISORDERS (depression, bipolar disorder, no psychosis)</td>
<td>58%</td>
</tr>
<tr>
<td><em>Mood disorders with other mental health conditions including substance use disorder</em></td>
<td>38%</td>
</tr>
<tr>
<td><em>Depression only</em></td>
<td>20%</td>
</tr>
<tr>
<td>Substance use disorder only</td>
<td>4%</td>
</tr>
<tr>
<td>No diagnostic impressions identified</td>
<td>12%</td>
</tr>
</tbody>
</table>

*Less than half of women with serious mental health conditions received psychiatric treatment near the time of death.*
Suicidal communications (not mutually exclusive)

<table>
<thead>
<tr>
<th>Suicidal communications</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbalized emotional distress</td>
<td>62%</td>
</tr>
<tr>
<td><em>Examples: indicated depression due to financial problems, giving up baby for adoption, children in foster care, ending relationship with partner</em></td>
<td></td>
</tr>
<tr>
<td>Suicidal ideation (thoughts of self-harm)</td>
<td>41%</td>
</tr>
<tr>
<td>Verbalized a suicide plan</td>
<td>19%</td>
</tr>
<tr>
<td>None mentioned</td>
<td>13%</td>
</tr>
</tbody>
</table>

*14 cases excluded due to incomplete or missing data

Over half of the women expressed at least one type of suicidal communication.
Reproductive loss
CA P-A Suicide Cohort, 2002-2012 (N=99)

<table>
<thead>
<tr>
<th>Reproductive loss definitions (mutually exclusive)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pregnancy/Infant loss</strong> associated with most recent pregnancy – includes miscarriage, stillbirth/fetal demise, abortion, infant death</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Social loss</strong> associated with most recent pregnancy – includes adoption, child living with another family member, foster care, Child Protective Services involvement</td>
<td>14%</td>
</tr>
<tr>
<td><strong>Prior pregnancy loss</strong> – stillbirth/fetal demise from prior pregnancy</td>
<td>29%</td>
</tr>
<tr>
<td><strong>No reproductive loss</strong> (ever)</td>
<td>47%</td>
</tr>
</tbody>
</table>

Nearly a quarter of women had a reproductive loss in their most recent pregnancy.
Substance use (mutually exclusive) 
CA P-A Suicide Cohort, 2002-2012 (N=84)*

<table>
<thead>
<tr>
<th>Mutually exclusive combinations of substance use patterns</th>
<th>During or after pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illicit drugs or abused prescription opioids, with or without alcohol (heavy use), tobacco or marijuana use</td>
<td>32%</td>
</tr>
<tr>
<td>Heavy alcohol use, with or without tobacco or marijuana use</td>
<td>7%</td>
</tr>
<tr>
<td>Tobacco or marijuana use only</td>
<td>10%</td>
</tr>
<tr>
<td>None noted</td>
<td>51%</td>
</tr>
</tbody>
</table>

*84 of 99 cases: Excluded 15 women with incomplete or missing data on substance use

Women who used illicit drugs or abused prescription opioids were more likely to have experienced physical or sexual violence as children or adults (54% vs. 7%).

Over 50% of the women did NOT use any substances.
Psychosocial stressors* near time of death
CA P-A Suicide Cohort, 2002-2012 (N=99)

The review committee determined that stressful life events precipitated the deaths of 65% of women.

*Categories are not mutually exclusive.
Summary of key findings

_Suicide is a complex interplay and outcome of biological, psychosocial, and environmental factors._

CA-PAMR in-depth reviews revealed many factors that may have contributed to suicide during or after pregnancy, including:

- **Pre-existing and new onset mental health conditions** – 62% pre-existing, 25% new onset
- **Psychosocial stressors** – 85% had stressful life event(s) near time of death
- **Substance use** – potential coping mechanism, 39% used illicit drugs, abused Rx opioids or alcohol
- **Reproductive loss** – 24% of women had a pregnancy loss or had a child removed from them
- **Lack of support after pregnancy** – 83% died 43-365 days after the end of pregnancy

Lastly, CA-PAMR methods led to a more complete and accurate identification of suicide cases.
CA-PAMR methods: Strengths and limitations

• Improved data linkage method for case ascertainment
  ✓ Cast a wide, inclusive net to capture suicide cases
  ✓ Able to report on degree of case misclassification by data source
  ✓ Able to calculate pregnancy-associated suicide ratios by data source

• Augmented linked administrative data with medical records and coroner reports
  ✓ Obtained information on medical conditions, complications, treatments, life circumstances and factors leading up to death
  ✗ BUT data varied in scope, quality and completeness

• Compared P-A suicide cases to other populations
  ✓ Compared to women who gave birth and reproductive age women who died by suicide
  ✗ BUT no comparison data on mental health, psychosocial stressors to assess suicide risk
Relationship of Suicide to Pregnancy and Preventability:

_Pregnancy-relatedness criteria, preventability, quality improvement opportunities and recommendations_
Criteria for pregnancy-relatedness in pregnancy-associated suicide

1. Underlying mental health issues aggravated by pregnancy or its management (including withdrawal from, changes to, or suboptimal dosing of psychiatric medications; complications of pregnancy triggering further mental health distress)

2. Severe postpartum depression, postpartum psychosis, or other conditions unique to pregnancy

3. Related to pregnancy loss or neonatal loss (including removal of the infant/child from the mother)

4. Unwanted pregnancy (ended pregnancy medically or by maternal death)

5. Within 42 days postpartum/fetal demise (and no other criteria apply)

Challenging to assess whether deaths from suicide are pregnancy-related
Mental health history by pregnancy-relatedness
CA P-A Suicide Cohort, 2002-2012 (N=72)*

* 27 of 99 cases: Excluded women for whom pregnancy-related could not be determined (n=22) and those with no mental health history data available (n=5).
Assessing preventability of pregnancy-associated suicide

Committee members were asked to assess preventability of death by suicide by considering the following:

1. **Was the death preventable** if a different set of feasible actions had been implemented?

2. **What was the degree of preventability** if alternative actions had been implemented?  
   
   *Chance to alter the outcome was rated as Strong, Good, Some, or None*

3. **What are these alternative actions** to improve patient care and outcomes?  
   
   *Also referred to as Quality Improvement Opportunities (QIOs)*
Preventability of death by suicide
CA P-A Suicide Cohort, 2002-2012 (N=99)

51% of the cases fall into the categories of 'Strong' and 'Good'.

- Strong: 24 cases
- Good: 27 cases
- Some: 46 cases
- None: 1 case
- Unable to determine: 1 case
Preventability by mental health history
CA P-A Suicide Cohort, 2002-2012, N=89*

*10 of 99 cases: Excluded 9 women without mental health history and 1 woman for whom preventability could not be determined.
Quality Improvement Opportunities (QIOs) for pregnancy-associated suicide cases

- Committee identified QIOs for nearly all cases reviewed (96 out of 99)
- **Major QIO themes** highlighted the following needs:
  - **Improved obstetric care** to better coordinate with psychiatry and mental health regarding treatment when indicated
  - **Better screening and referrals for mental health conditions** during and after pregnancy, as well as for substance use, medical diagnoses, adverse childhood experiences, and intimate partner violence
  - **Pregnancy and postpartum care and support** related to pregnancy loss or removal of child from the mother
  - **Linguistically and culturally appropriate information/support for partners/family** regarding their loved one’s mental illness
QIOs within a public health framework for prevention

<table>
<thead>
<tr>
<th>Levels of prevention</th>
<th>Related QIO themes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Prevention</strong> – two levels</td>
<td>• Public awareness about maternal mental health</td>
</tr>
<tr>
<td>1. <strong>Universal prevention</strong> – targeting general public</td>
<td>• Routine screening for mental health conditions during and after pregnancy</td>
</tr>
<tr>
<td>2. <strong>Selective prevention</strong> – targeting individuals or subgroups who have higher risk of developing a mental health disorder than does the general pregnant/postpartum population</td>
<td>• Resources to support pregnant/postpartum women with mental health conditions</td>
</tr>
<tr>
<td></td>
<td>• Support and education for partners/family of women with mental health conditions</td>
</tr>
</tbody>
</table>
QIOs within a public health framework for prevention (cont.)

<table>
<thead>
<tr>
<th>Levels of prevention</th>
<th>Related QIO themes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secondary Prevention</strong> refers to interventions undertaken to reduce the prevalence of, and to avoid delays in treatment (i.e., early intervention) for, mental health conditions, among women with existing diagnoses or known risk factors; all specific treatment-related strategies</td>
<td>• Better assessment of women with histories of mental health conditions or trauma/loss</td>
</tr>
<tr>
<td></td>
<td>• Improved coordination across systems of care</td>
</tr>
<tr>
<td></td>
<td>• Comprehensive system of referrals</td>
</tr>
<tr>
<td></td>
<td>• Coordinated treatment and outpatient follow-up</td>
</tr>
</tbody>
</table>
QIOs within a public health framework for prevention (cont.)

<table>
<thead>
<tr>
<th>Levels of prevention</th>
<th>Related QIO themes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tertiary Prevention</strong> includes interventions that reduce disability related to</td>
<td>• Education for obstetric and psychiatric providers regarding perinatal mental</td>
</tr>
<tr>
<td>the illness, all forms of rehabilitation, prevention of relapses of the illness</td>
<td>health diagnoses and treatment</td>
</tr>
<tr>
<td></td>
<td>• Psychiatric providers to be informed about best practices in medication and</td>
</tr>
<tr>
<td></td>
<td>treatment for the perinatal population</td>
</tr>
</tbody>
</table>
Conclusion

• Pregnancy-associated suicide is **highly preventable** – 51% had good-to-strong preventability

• Major themes for preventing pregnancy-associated suicide:
  • **Improved coordination** between maternity care and mental health providers/services
  • **Better screening and referrals** for mental health, substance use, partner violence, traumatic events
  • **Pregnancy and postpartum support** for pregnancy loss / removal of the child from mother
  • **Linguistically and culturally appropriate information about mental illness** for partners/family

• Preventing pregnancy-associated suicide will require **interdisciplinary collaboration** across multiple sectors

*Maternal mental health*

– **a marker of maternal well-being and a determinant of a child’s lifelong health** –

*is a public health priority.*
Expert Review Committee

Listed below each name are the affiliations at the time of CA-PAMR Committee service, with specialty areas:

Elliott Main, MD, Chair
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Alinne Z. Barrera, PhD
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Lisa Marie Dryan, LCSW
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This project was supported by Federal Title V Maternal Child Health Block Grant funds from the Health Resources and Services Administration (HRSA) to the California Department of Public Health; Center for Family Health; Maternal, Child and Adolescent Health Division.
CA-PAMR Resources

**CDPH CA-PAMR Website:**
https://www.cdph.ca.gov/PAMR

Or search:
“California Pregnancy-Associated Mortality Review (CA-PAMR)"

Website contains:
- Project description, background and methods
- Key findings from latest review of pregnancy-associated suicide
- Links to **Reports** and **Toolkits**

**CMQCC CA-PAMR Website:**
https://www.cmqcc.org/research/ca-pamr-maternal-mortality-review