Building U.S. Capacity to Review and Prevent Maternal Deaths

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Building U.S. Capacity to Review and Prevent Maternal Deaths
CDC Foundation | CDC Division of Reproductive Health
www.reviewtoaction.org | http://mmria.org

National Sources of Maternal Mortality Information

	CDC – National Center for Health Statistics (NCHS)
Data Source	Death certificates
Time Frame	During pregnancy – 42 days
Source of Classification	ICD-10 codes
Terms	Maternal death
Measure	Maternal Mortality Rate - # of Maternal Deaths per 100,000 live births
Purpose	Show national trends and provide a basis for international comparison

As shown in:
St. Pierre A; Zaharatos J; Goodman D; Callaghan WM. Jan 2018. Challenges and opportunities in identifying, reviewing, and preventing maternal deaths. Obstetrics and Gynecology. 131; 138-142.

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National Sources of Maternal Mortality Information

	CDC – National Center for Health Statistics (NCHS)	CDC – Pregnancy Mortality Surveillance System (PMSS)
Data Source	Death certificates	Death certificates linked to fetal death and birth certificates
Time Frame	During pregnancy – 42 days	During pregnancy – 365 days
Source of Classification	ICD-10 codes	Medical epidemiologists (PMSS-MM)
Terms	Maternal death	Pregnancy associated, (Associated and) Pregnancy related, (Associated but) Not pregnancy related
Measure	Maternal Mortality Rate - # of Maternal Deaths per 100,000 live births	Pregnancy Related Mortality Ratio - # of Pregnancy Related Deaths per 100,000 live births
Purpose	Show national trends and provide a basis for international comparison	Analyze clinical factors associated with deaths, publish information that may lead to prevention strategies

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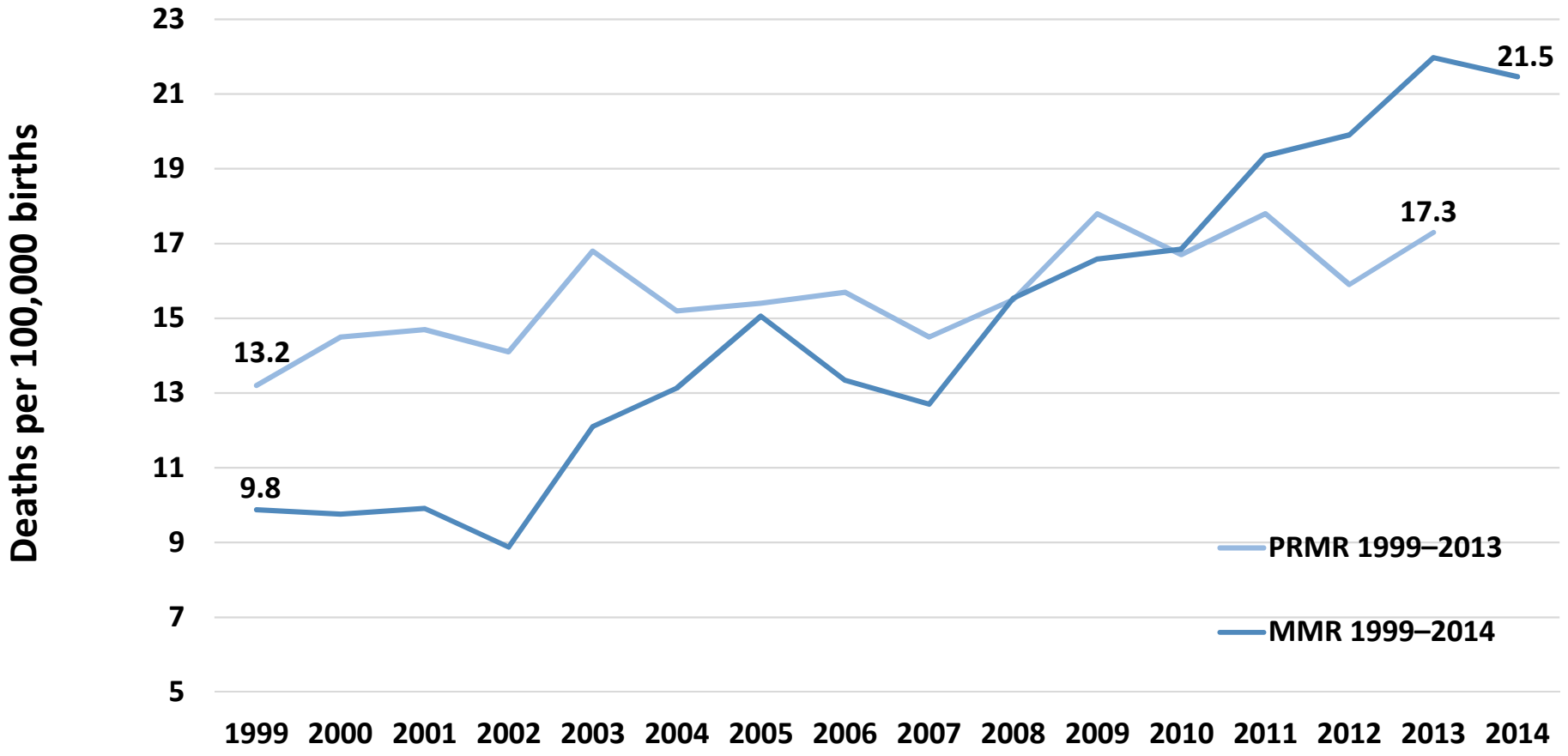
National Sources of Maternal Mortality Information



PRMR: Pregnancy-related mortality ratio
MMR: Maternal mortality rate

http://www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html

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Unique Role of MMRCs

	CDC – National Center for Health Statistics (NCHS)	CDC – Pregnancy Mor Surveillance System (PI	Maternal Mortality Review Committees
Data Source	Death certificates	Death certificates linked to f and birth certificate	Death certificates linked to fetal death and birth certificates, **medical records, social service records, autopsy, informant interviews…**
Time Frame	During pregnancy – 42 days	During pregnancy – 365	During pregnancy – 365 days
Source of Classification	ICD-10 codes	Medical epidemiologists (PM	**Multidisciplinary committees**
Terms	Maternal death	Pregnancy associate (Associated and) Pregnanc (Associated but) Not preg related	Pregnancy associated, (Associated and) Pregnancy related, (Associated but) Not pregnancy related
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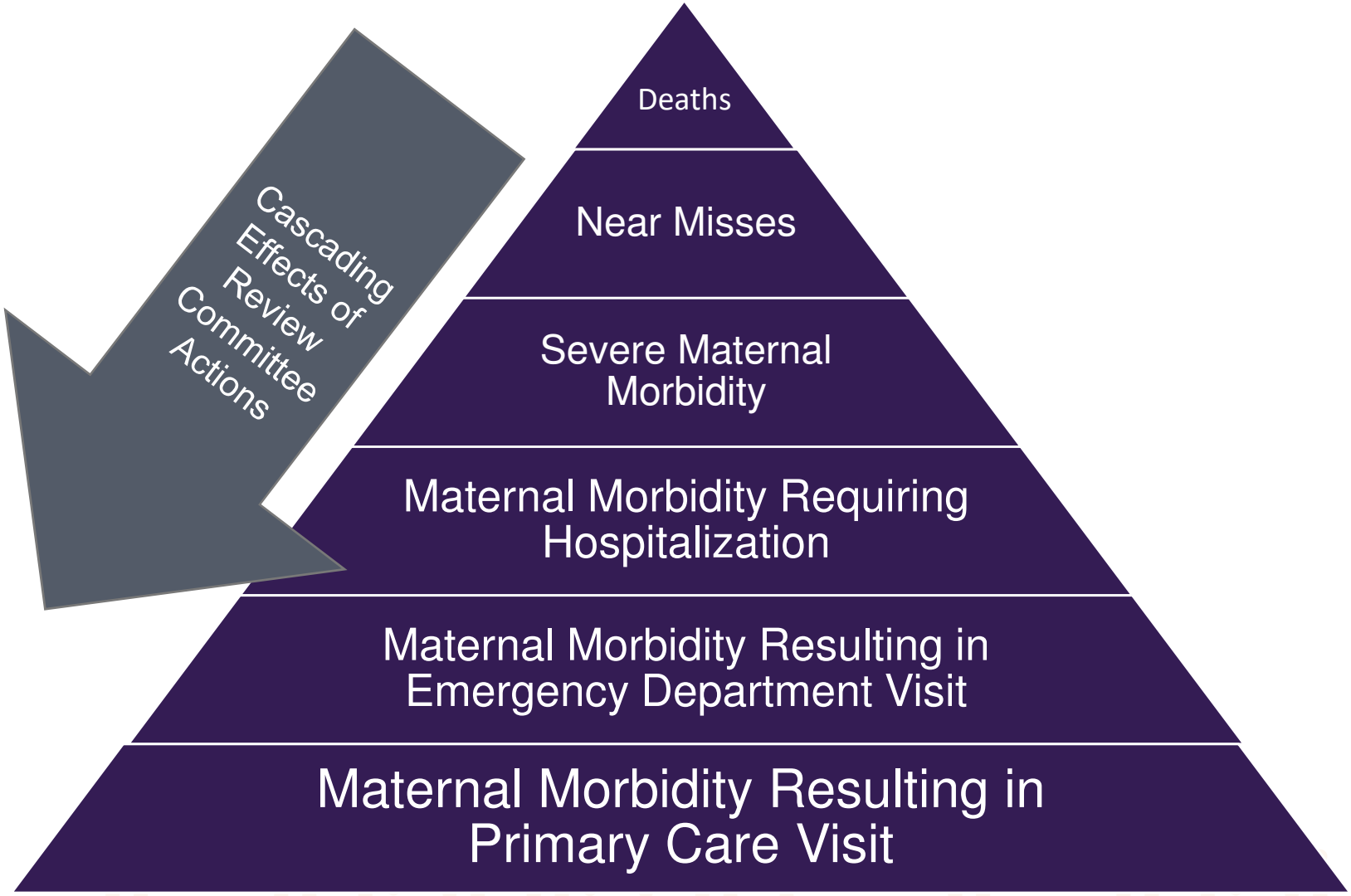
Purpose	Show national trends and provide a basis for international comparison	Analyze clinical factors ass with deaths, publish informa may lead to prevention str	**Understand medical and non-medical contributors to deaths, prioritize interventions that effectively reduce maternal deaths**

Nicely reviewed in:
- Callaghan, William M. 2012. Overview of maternal mortality in the United States. Seminars in perinatology. 36; 1: 2-6.
- Berg C, et al. (Editors). Strategies to reduce pregnancy-related deaths: from identification and review to action. Atlanta: C

Unique Role of MMRCs

Maternal Mortality Review Committees have access to multiple sources of information that provide a deeper *understanding of the circumstances* surrounding a woman's death. With these insights review committees *develop actionable recommendations to prevent future deaths*.

Power of MMRCs



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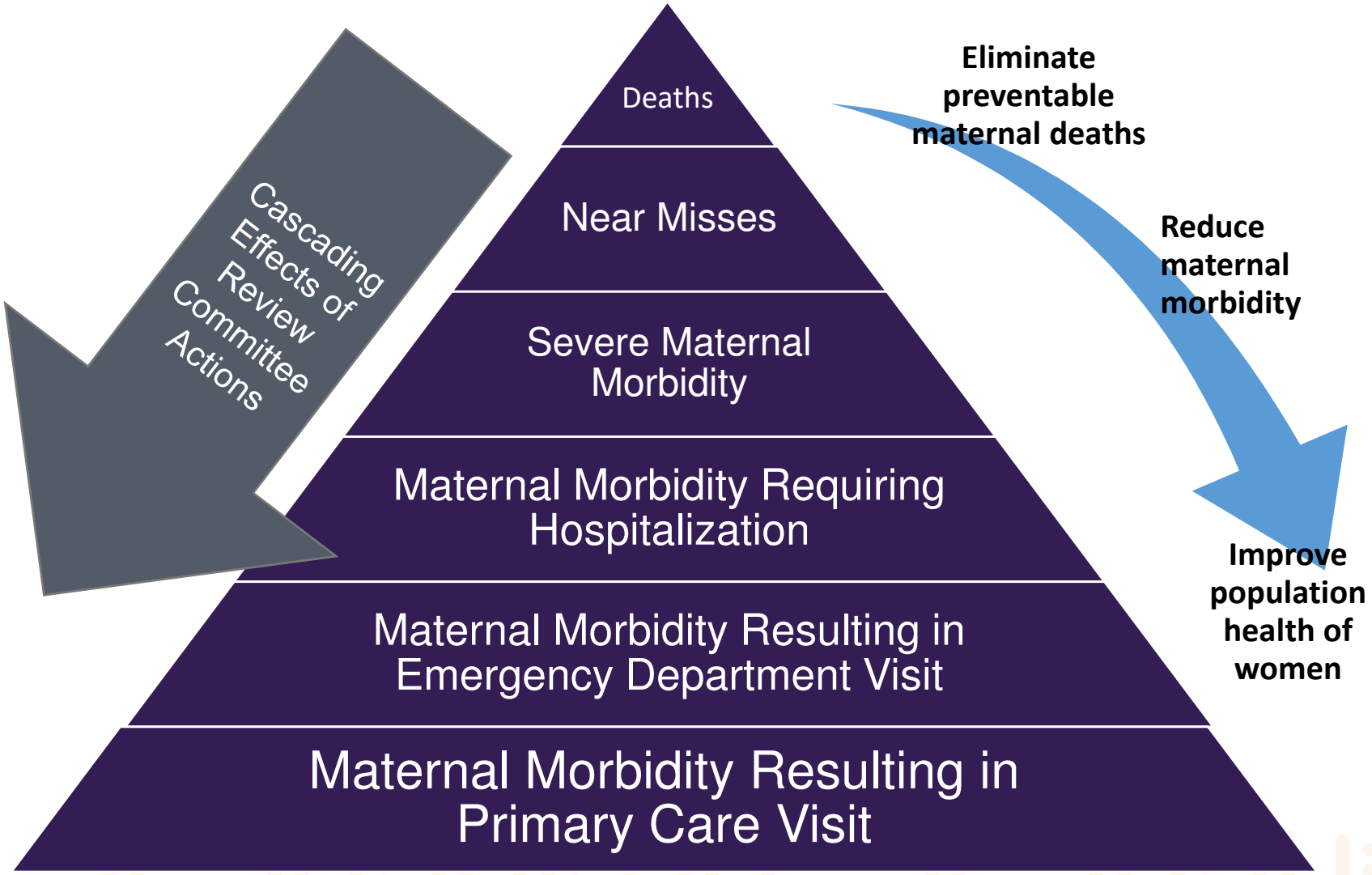
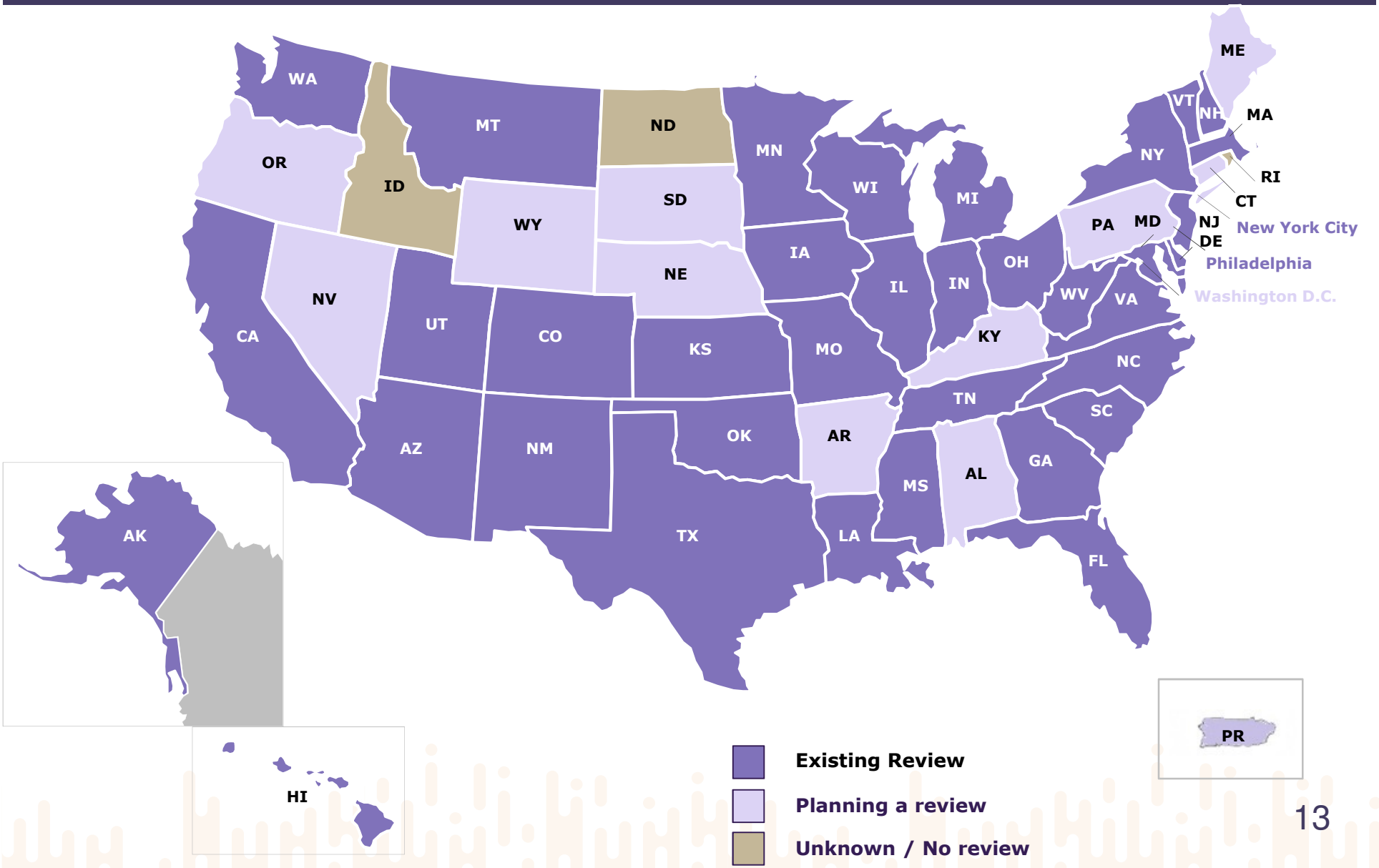


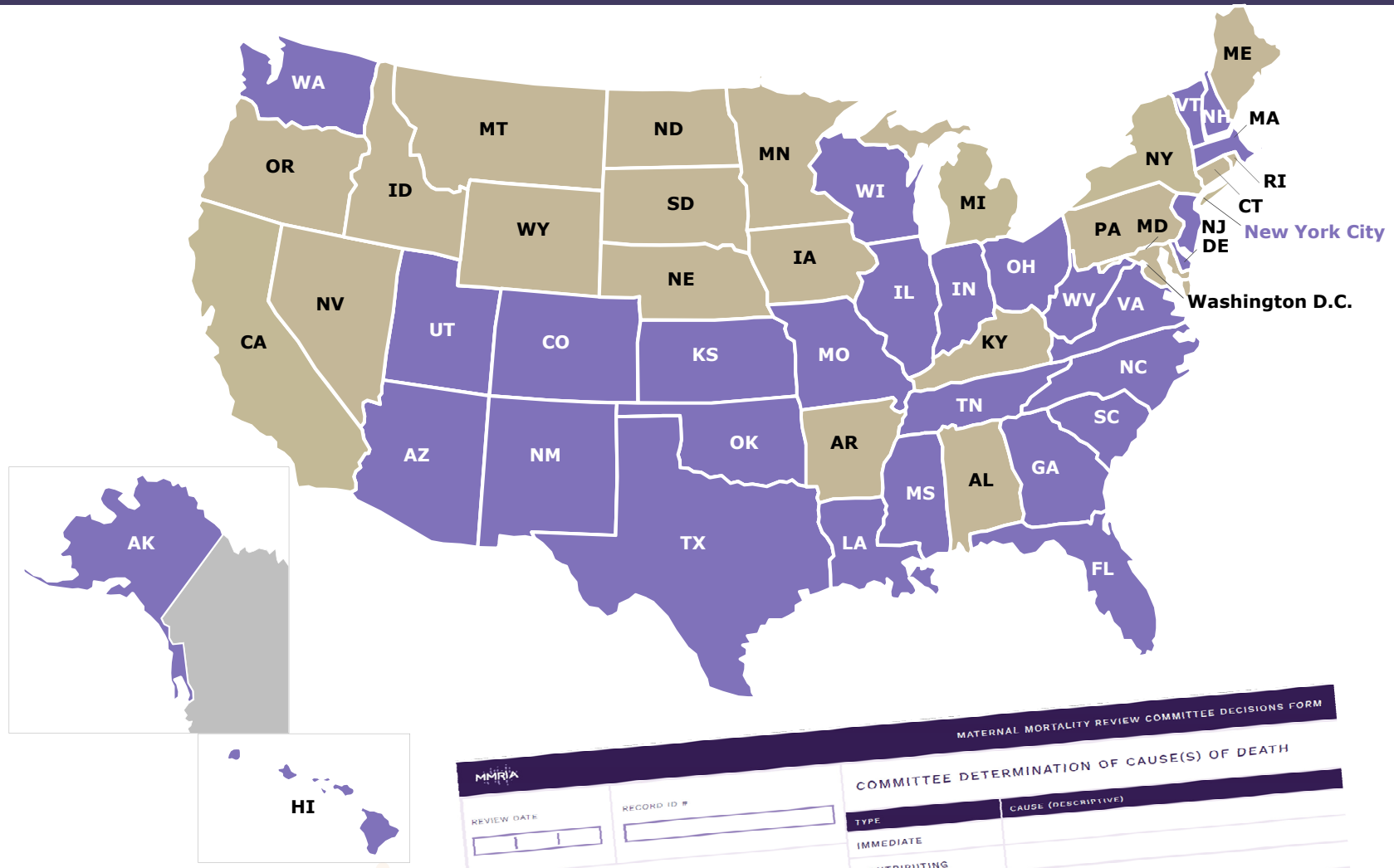
Maternal Mortality Review in the U.S. Today

1930	New York Academy of Medicine & Philadelphia County Medical Society
1968	44 States + D.C.
2012	18 States + Philadelphia
2018	Reviewing: 36 States + Philadelphia & NYC
	Planning: 6 States + Puerto Rico + D.C.

MMRCs: Where we are today



A Common Language



MMRIA — MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM

REVIEW DATE

RECORD ID #

PREGNANCY-RELATEDNESS: SELECT ONE

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

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

COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH

TYPE	CAUSE (DESCRIPTIVE)
IMMEDIATE	
CONTRIBUTING	
UNDERLYING	
OTHER SIGNIFICANT	

IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING CAUSE OF DEATH
Refer to attached page for PMSS-MM cause of death list. If more than one is selected, list in orde
importance beginning with the most compelling (1-2; no more than 2 may be selected in the syst

Using MMRIA Committee Decisions Form

MMRC Support Strategies

- **Systematic data collection and use**

  Maternal Mortality Review Information Application (MMRIA)

- **Technical assistance and training**

  In-person and distance-based, conferences

- **Access to resources and learning**

  www.ReviewtoAction.org

- **Innovate**

  Socio-spatial dashboard

  Informant Interview

Report from Nine Maternal Mortality Review Committees

Terminology

Pregnancy-Associated Deaths

Pregnancy-Related Death

Both temporally and causally related to pregnancy

Pregnancy-Associated but NOT Related Death

Only temporally related to pregnancy

Unable to Determine

As shown in:
St. Pierre A; Zaharatos J; Goodman D; Callaghan WM. Jan 2018. Challenges and opportunities in identifying, reviewing, and preventing maternal deaths. Obstetrics and Gynecology. 131; 138-142.

The Data

- 9 Committees
  - 855 potentially pregnancy-related deaths
    - 680 valid pregnancy-associated deaths for which pregnancy-relatedness could be determined
      - 237 pregnancy-related deaths

The Data

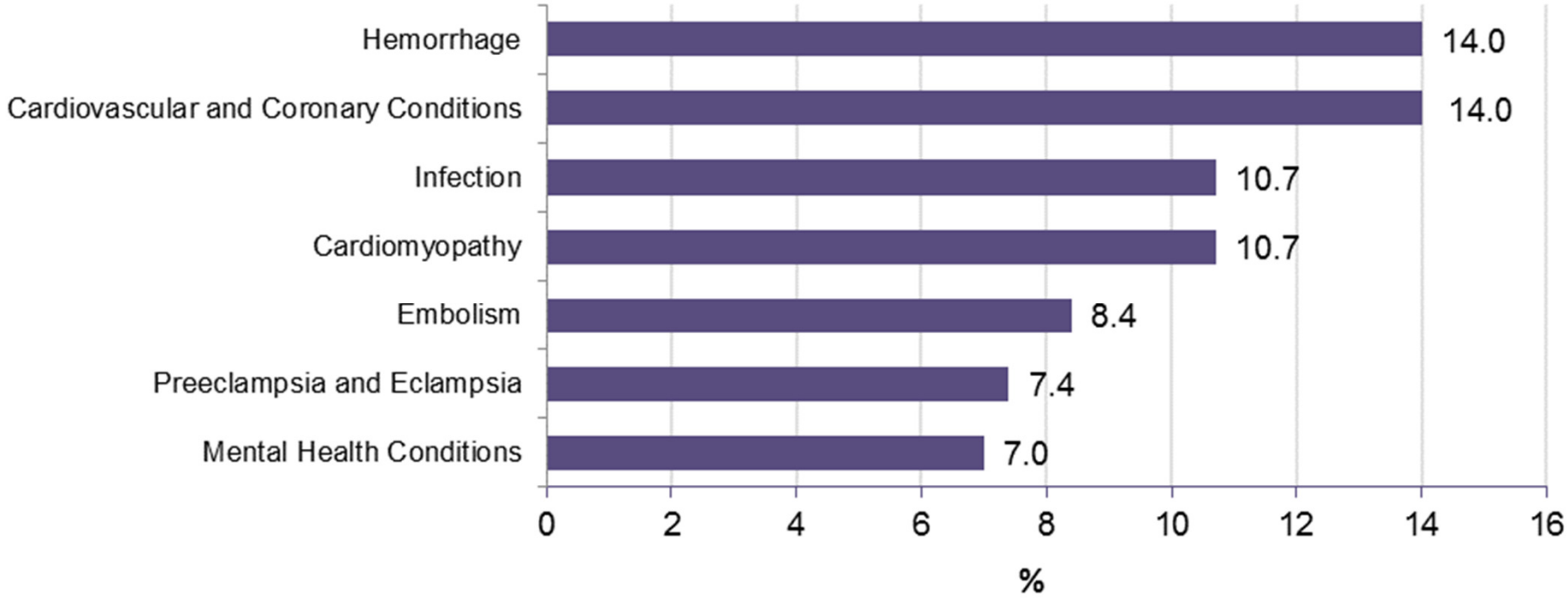
- Two questions overlap with PMSS
- Four questions unique to committee data

Was the Death Pregnancy-Related?

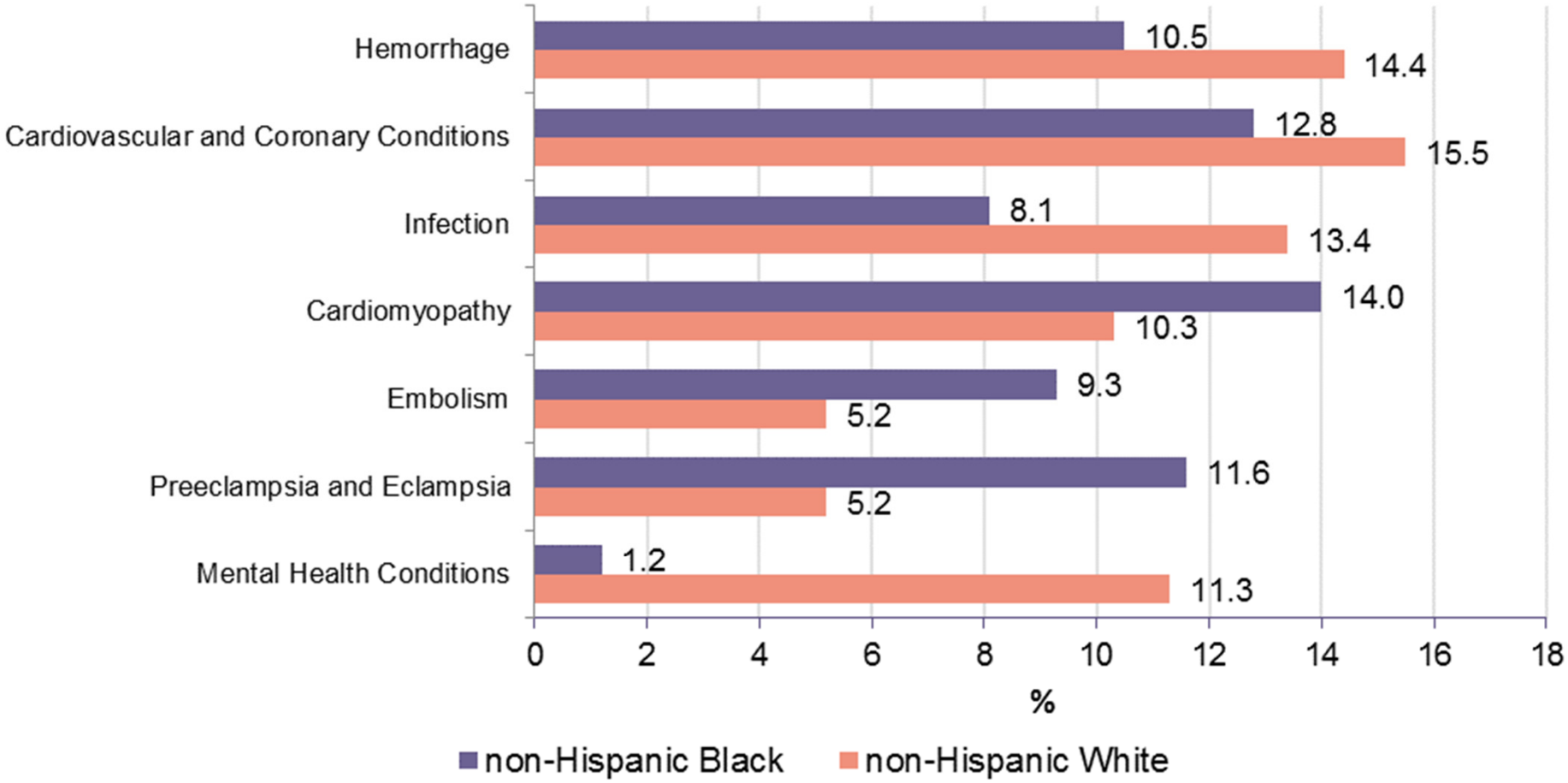
Distribution of Pregnancy-Related Deaths by Timing of Death in Relation to Pregnancy

What was the Cause of Death?

Leading Underlying Causes of Pregnancy-Related Deaths



Leading Underlying Causes of Pregnancy-Related Deaths, by Race-Ethnicity



Was the Death Preventable?

Preventable

there was at least some chance of the death being averted by one or more **reasonable** changes to patient, family, provider, facility, system, and/or community factors.

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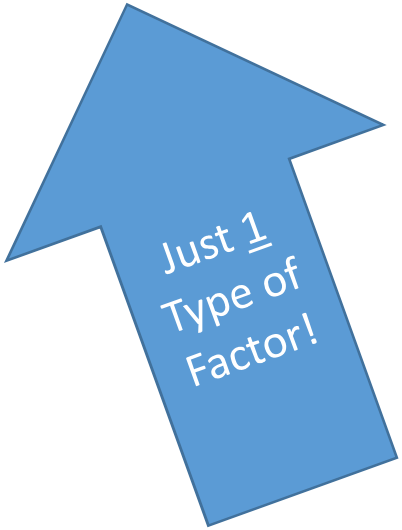
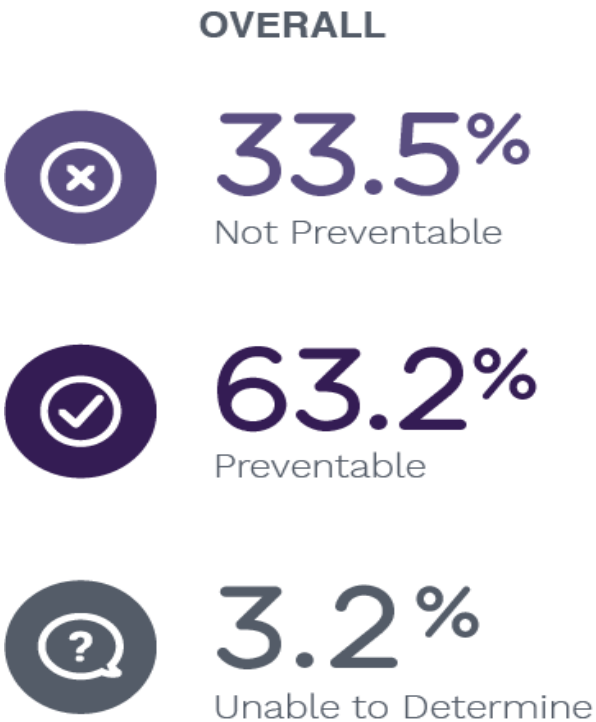
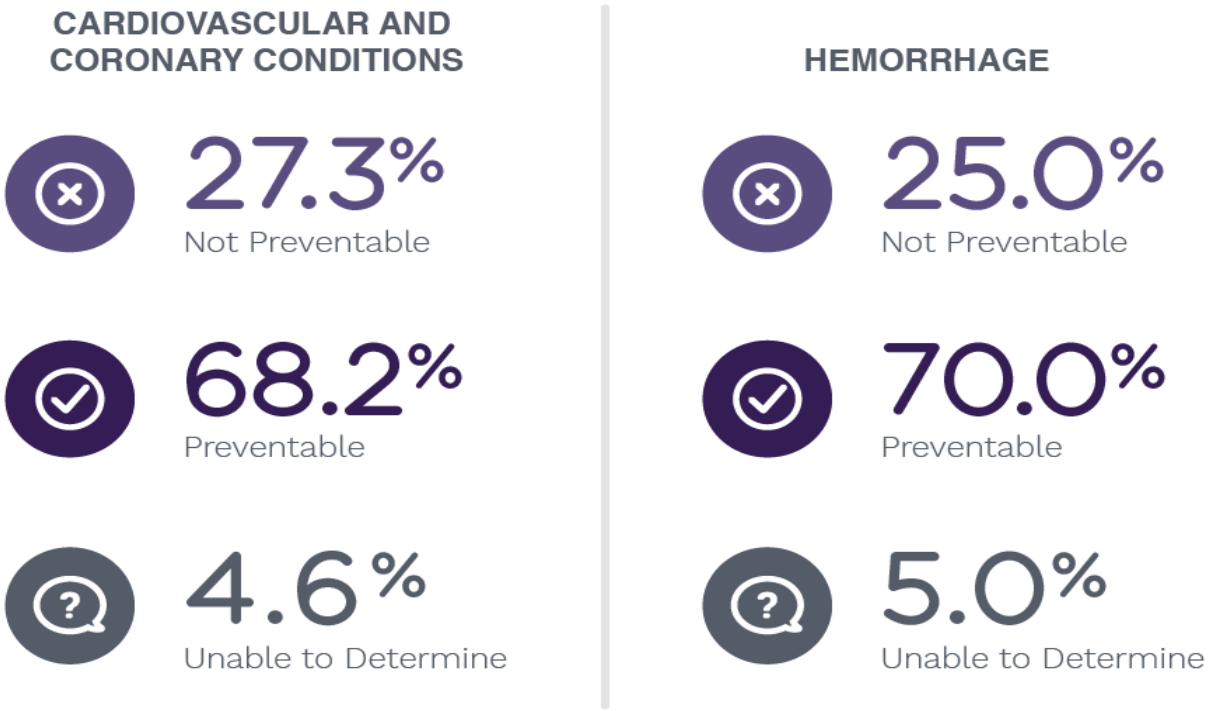


Distribution of Preventability Among Pregnancy-Related Deaths

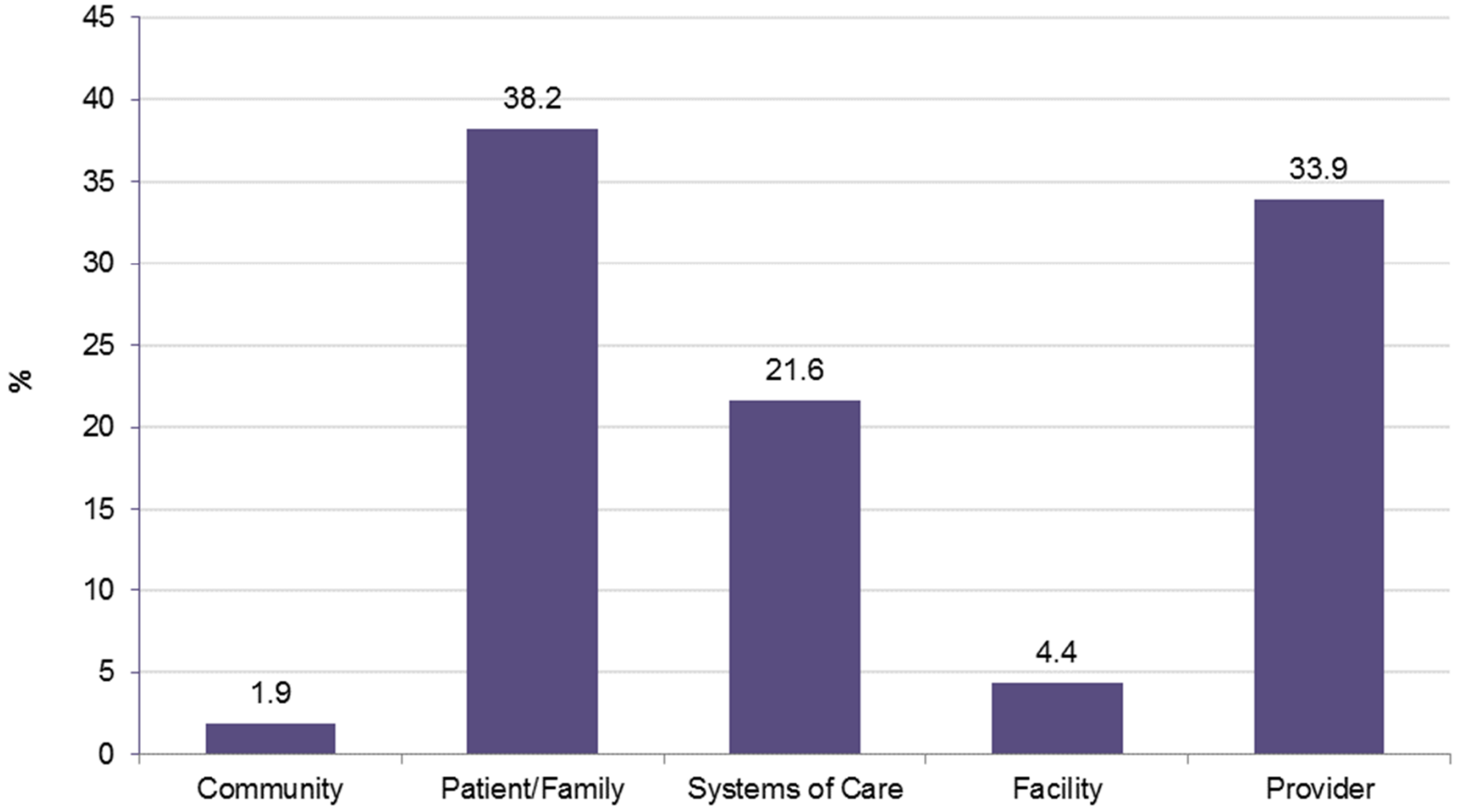


Distribution of Preventability Among Pregnancy-Related Deaths, by Cause of Death



What were the Factors that Contributed to this Death?

Distribution of Contributing Factors among Pregnancy-Related Deaths



Contributing factors by leading causes of pregnancy-related death

Hemorrhage

Factor Level (% of total factors)	Most Common Factor Class(es) (% of level-specific classes)	Common Themes
Provider (31.0%)	Assessment (33.3%)	Delayed or missed diagnosis or treatment Ineffective treatments
	Knowledge (13.3%)	Failure to seek consultation
Systems of Care (36.0%)	Personnel (27.8%)	Inadequate training Inadequate or unavailable personnel
	Policies/Procedures (19.4%)	Lack of applicable policies and procedures
	Continuity of Care/Care Coordination (16.7%)	Lack of coordination and communication between providers that supports patient management

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

Recommendation themes:

Improve training

Enforce policies and procedures

Adopt maternal levels of care/ensure appropriate level of care determination

Improve access to care

Improve patient/provider communication

Improve patient management for mental health conditions

Improve procedures related to communication and coordination between providers

Improve standards regarding assessment, diagnosis and treatment decisions

Improve policies related to patient management, communication and coordination between providers, and language translation

Improve policies regarding prevention initiatives, including screening procedures and substance use prevention or treatment programs

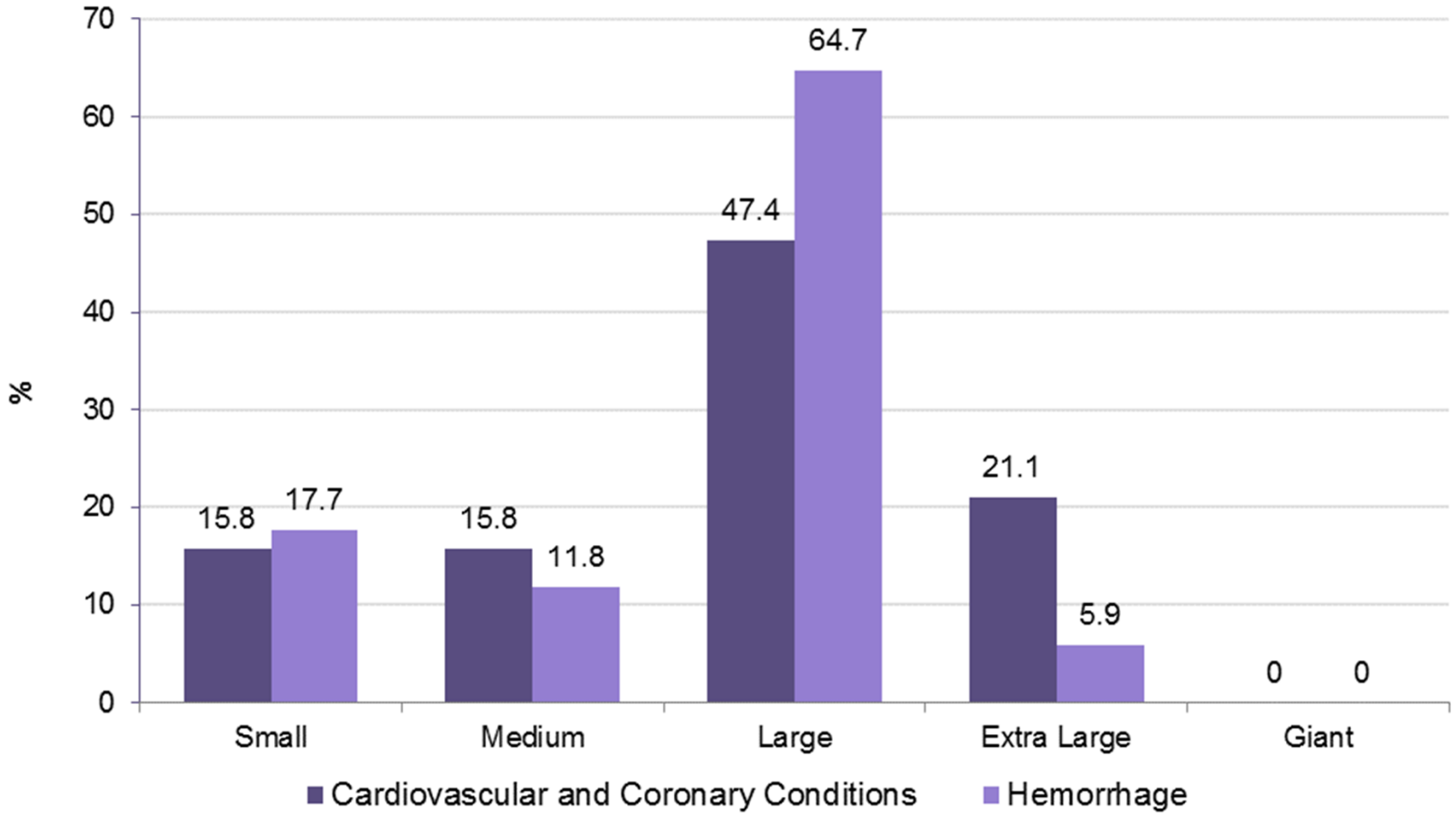
Recommendation Themes for Action, with Select Examples

Improve Training
Training on safe methods and medication during labor induction, including appropriate use of vacuum and forceps during delivery
Provider education on how to perform cardiac exams
Training on caring for patients with drug addiction
Death certificate training for clinicians
Training for emergency room staff on the care of pregnant women
Training on how to administer mental health and suicide assessments and steps following positive results
Improve Procedures Related To Communication and Coordination Between Providers
Determine who will care for specific high-risk obstetric patients and expertise required for procedures
Identify quality improvement procedures and implement periodic drills, including obstetric emergency drills for birthing hospitals
Improve hand-off communication
Improve communication with emergency room staff

What is the Anticipated Impact of Those Actions if Implemented?

Impacts of Actions

Recommendation Themes for Action and Estimated Potential for Impact if Implemented, by Cause of Death



Emerging Issues

- Maternal Mental Health Conditions – an Update
- Severe Maternal Morbidity Review
- Incorporating Equity – an Update

What we are really excited about:

- Significant progress towards providing comprehensive data
- Able to analyze all 6 key questions
- Recommendations for prevention
- Socio-spatial dashboard

Acknowledgements:

Dabo Brantley

William Callaghan

David Goodman

Sarah Haight

Kendra Hatfield-Timajchy

Jean Ko

Michael Kramer

Elena Kuklina

Amy St. Pierre

Julie Zaharatos

What's next

- Manuscripts using data from 14 MMRCs
- Deeper dive into specific causes of death
- To be released over next year

Review to Action

Recommendations → Action

REVIEW to ACTION

Hemorrhage **is the leading cause of Pregnancy-Related maternal death in Florida. (1)**

Placental disorders **(including placenta previa, accreta/increta/percreta) accounted for 21% of hemorrhage related deaths > 20 weeks gestation. (1)**

With the rising cesarean rate, **the incidence of placenta accreta has increased. (2)**

Urgent Maternal Mortality Message to Providers

Diagnosis is essential before delivery

- If placental disorder suspected, get a Maternal-Fetal Medicine consultation.
- Ultrasonography with supplemental MRI when necessary.
- No imaging modality is perfect. If you suspect an issue—transfer to tertiary facility.

Risk factors

- Discuss pregnancy and delivery risks with patient and family.
- The risk of accreta increases with repeat cesarean sections, myomectomy, presence of placenta previa, multiparity, repetitive dilation and curettages and with advanced maternal age.
- A low lying anterior placenta may be ominous with multiple prior cesarean sections.

Readiness

- Develop and discuss with the patient, family and hospital staff an individual delivery plan.
- Consider early transfer to a tertiary center for access to sufficient blood bank supply and subspecialties.
- Let patients know there is a high risk for bleeding due to placental disorders that can occur after having multiple cesarean sections.
- Contingency plan should be made for emergency delivery.
- Implementation of hemorrhage protocols in all Florida delivery hospitals is essential, and should include a massive transfusion protocol, simulation drills and hemorrhage carts. For details on implementing a hemorrhage initiative see Florida Perinatal Quality Collaborative's Toolkit. (3)

Essential elements of delivery plan

- Preoperative counseling regarding risks.
- Timing of admission and delivery: see ACOG guidelines, may vary if patient unstable.
- Consult with neonatologist regarding corticosteroid administration, if applicable.
- Place blood bank on alert for potential massive transfusion protocol.
- When delivery is scheduled, discuss timing with a multispecialty team to optimize expert surgical and anesthesia assistance.
- Do not try to remove the placenta. Hysterectomy is usually the best option.
- If you have called for help and cannot control the bleeding surgically, compress the aorta or uterine vessels while waiting for help to arrive.

For more information, contact:
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Program Administrator
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(850) 245-4469

Florida HEALTH

During Pregnancy or Postpartum:
Women should go to the hospital if they cannot breathe or have severe shortness of breath because they could have Peripartum Cardiomyopathy (PPCM).

Urgent Maternal Mortality Message to Providers

Consider echocardiogram in pregnant or postpartum patients with persistent moderate or severe respiratory symptoms. Initial presentation of PPCM can be mistaken for upper respiratory illnesses. Pregnancy Associated Mortality Review (PAMR) findings.

Florida PAMR Findings:

1999–2012: 11.1% of pregnancy-related deaths in Florida were due to cardiomyopathy.[2]

1999–2011: 78% of pregnancy-related **deaths occurred** during the **postpartum** period.[2]

From 2009–2013:
- The percent of pregnancy-related deaths due to cardiomyopathy for non-Hispanic black women was 55% versus 25% for non-Hispanic white women.
- 80% of women who died from pregnancy-related cardiomyopathy were either overweight or obese (BMI > 25).[3]

Providers:

Peripartum cardiomyopathy is the development of heart failure in the last month of pregnancy or within 5 months postpartum in the absence of prior heart failure with no identifiable cause and echocardiogram indicative of left ventricular (LV) dysfunction.[4]

SIGNS/SYMPTOMS—ONSET CAN BE EASILY MISSED[5]

- Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes **fatigue, palpitation or dyspnea**[5]
- Unable to carry on any physical activity without discomfort, symptoms of heart failure at rest; if any physical activity is undertaken, discomfort increases[6]
- Arrhythmia/Cardiac Arrest
- Women with PPCM most commonly have dyspnea, dizziness, chest pain, cough, neck vein distention, fatigue and peripheral edema[5]

PPCM CRITERIA

- Idiopathic (no other cause) heart failure characterized by left ventricular (LV) systolic dysfunction
- At the end of pregnancy or during the postpartum period (spectrum of timing)
- Diagnosis of exclusion
- Ejection fraction (EF) generally below 45%
- Left ventricular (LV) dilation not required

RISK FACTORS[7,1]

Social: Advanced maternal age, smoking, malnutrition, African American race

Medical: Hypertension, Diabetes, family history, sleep apnea, obesity

Obstetric: Gravidity and parity, number of children, labor inducing medications, multiple gestation, family history

continued

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Florida HEALTH

Recommendations → Action

Original Research

Maternal Deaths From Suicide and Overdose in Colorado, 2004–2012

Torri D. Metz, MD, MS, Polina Rovner, MD, M. Camille Hoffman, MD, MSc, Amanda A. Allshouse, MS, Krista M. Beckwith, MSPH, and Ingrid A. Binswanger, MD, MPH, MS

MMR Data-Driven
Campaign to Prevent Deaths from Pregnancy-related Depression and Anxiety
Postpartum.net/Colorado

YOU ARE NOT ALONE

Get the Facts

Pregnancy-related depression and anxiety occurs during pregnancy or after giving birth, including after a pregnancy loss. It is the most common complication of pregnancy.

Know the Symptoms

Symptoms differ for everyone and might include feelings of anger or irritability, lack of interest in the baby, crying, sadness and more.

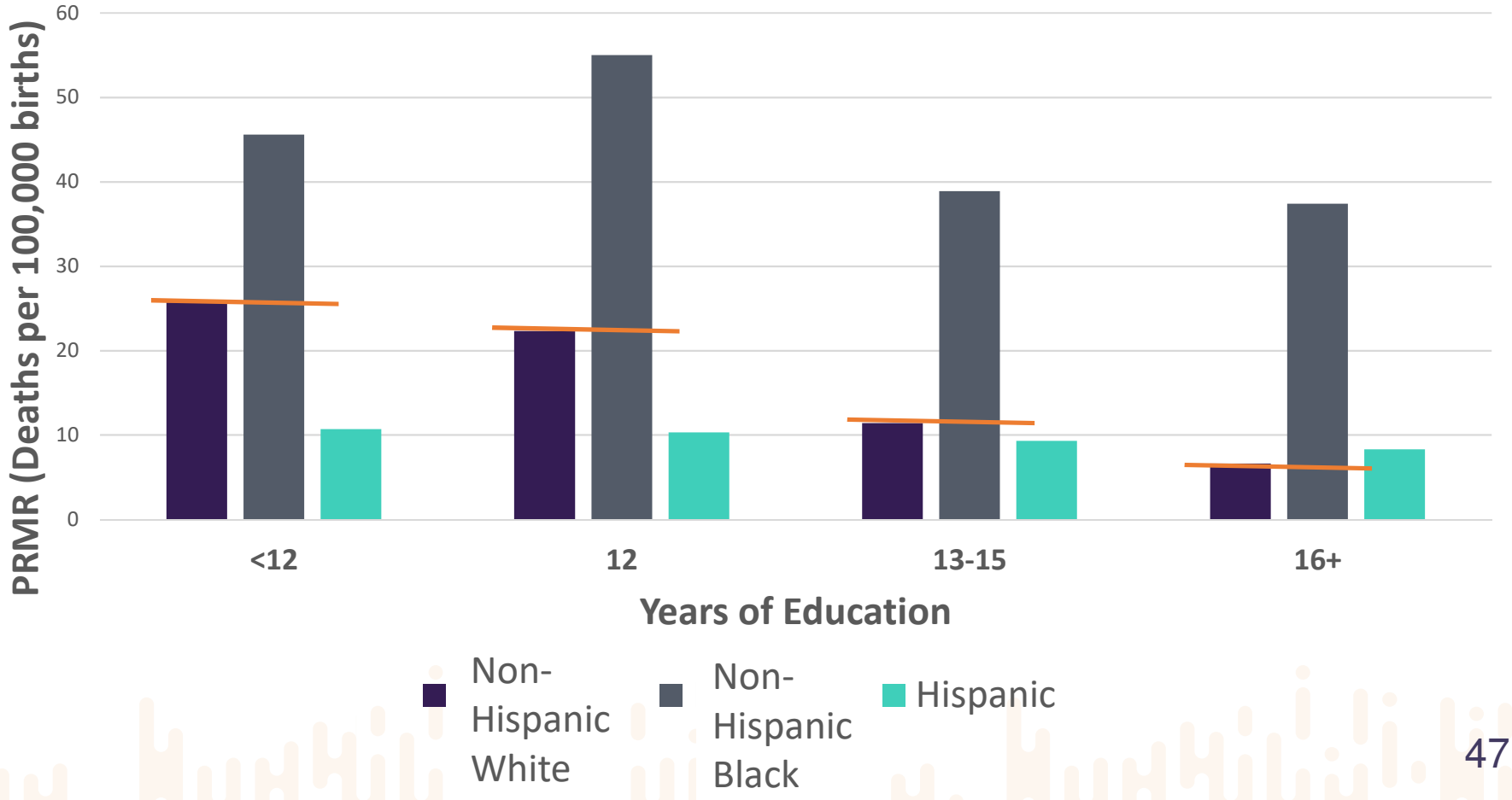
Find the Right Help

Treatment plans are different for each woman but might include increased self-care, support groups, counseling and treatment of symptoms with medication when necessary.

Community-Level Considerations for Maternal Mortality Review Committees

Challenge: Equity

Pregnancy-Related Mortality Ratio, 2011-2013
by Race-Ethnicity and Education



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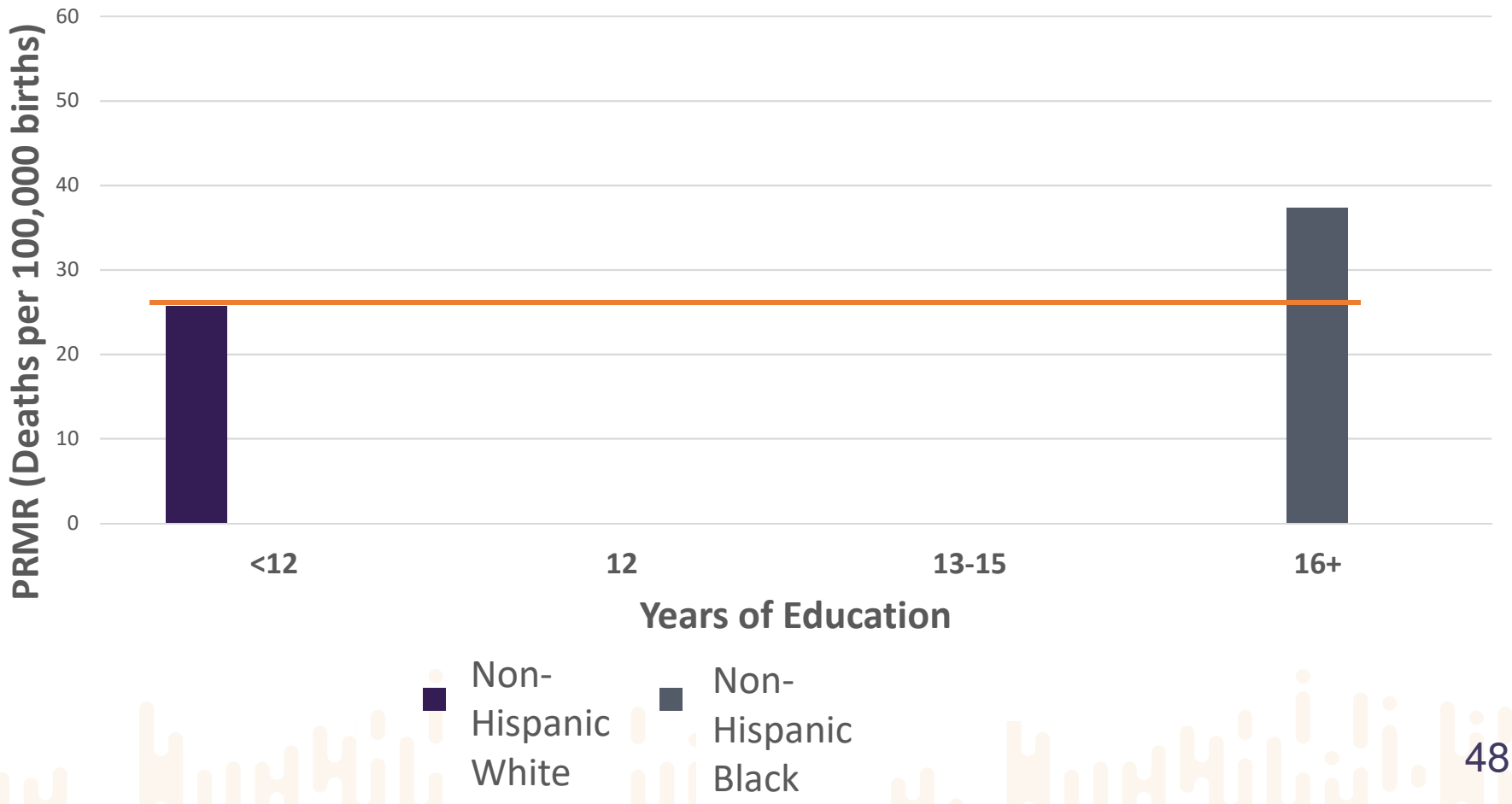

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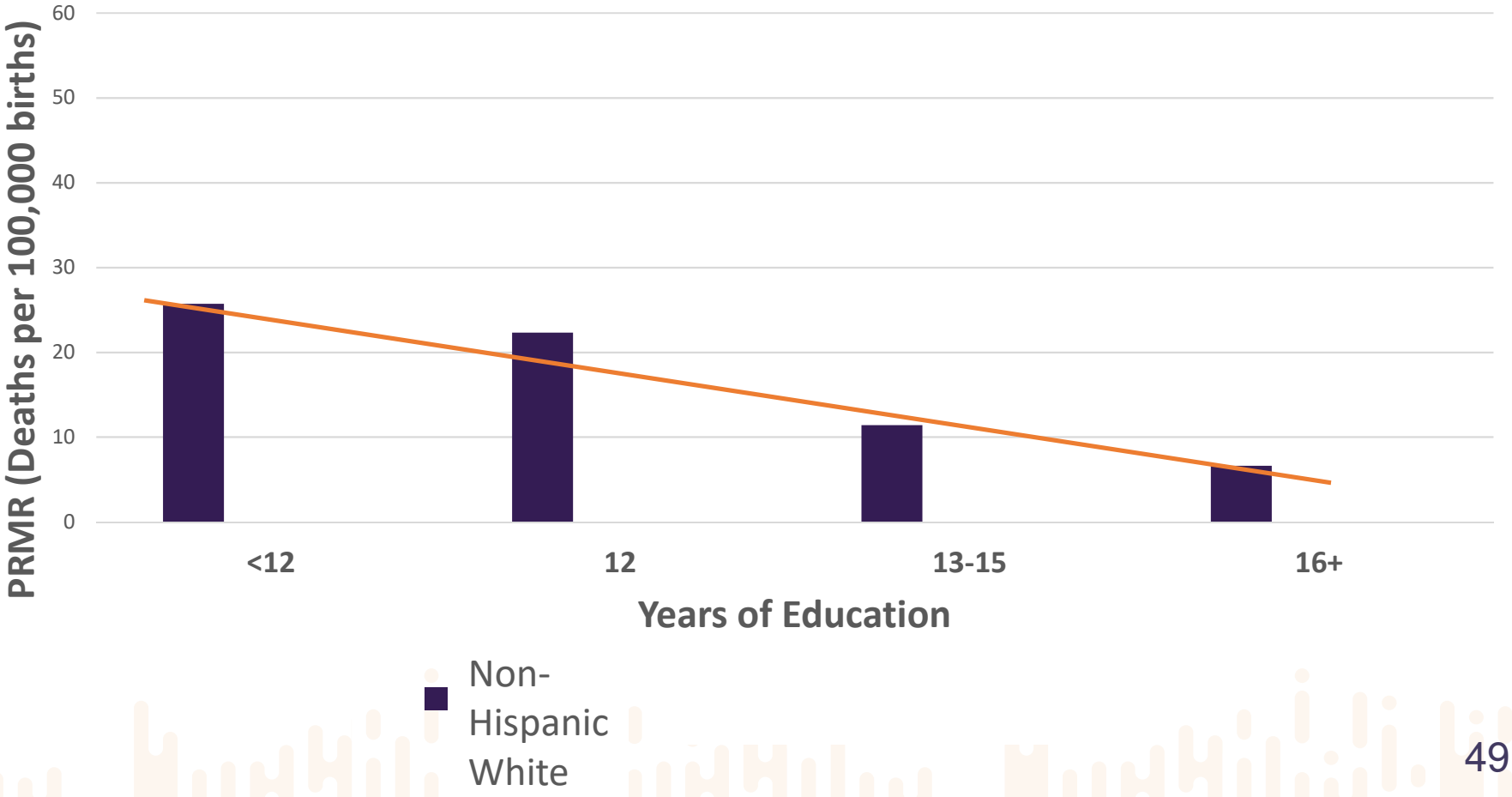
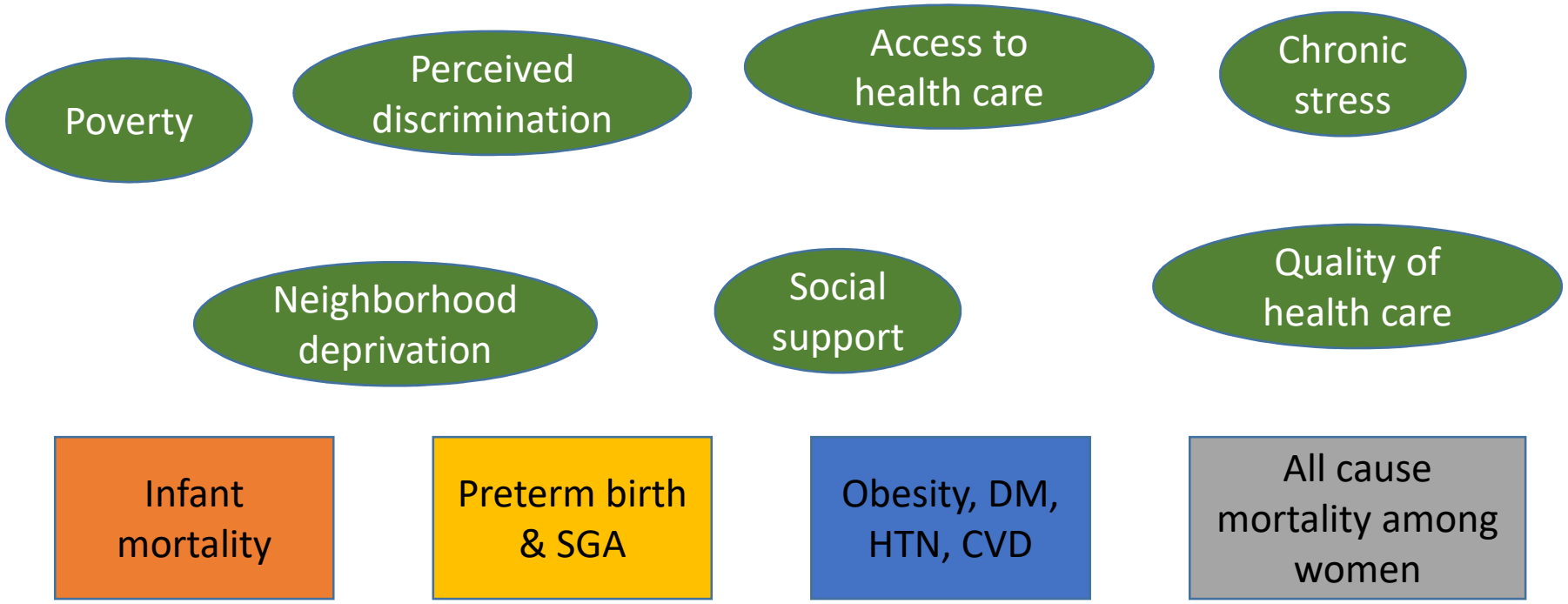


Challenge: Inequity

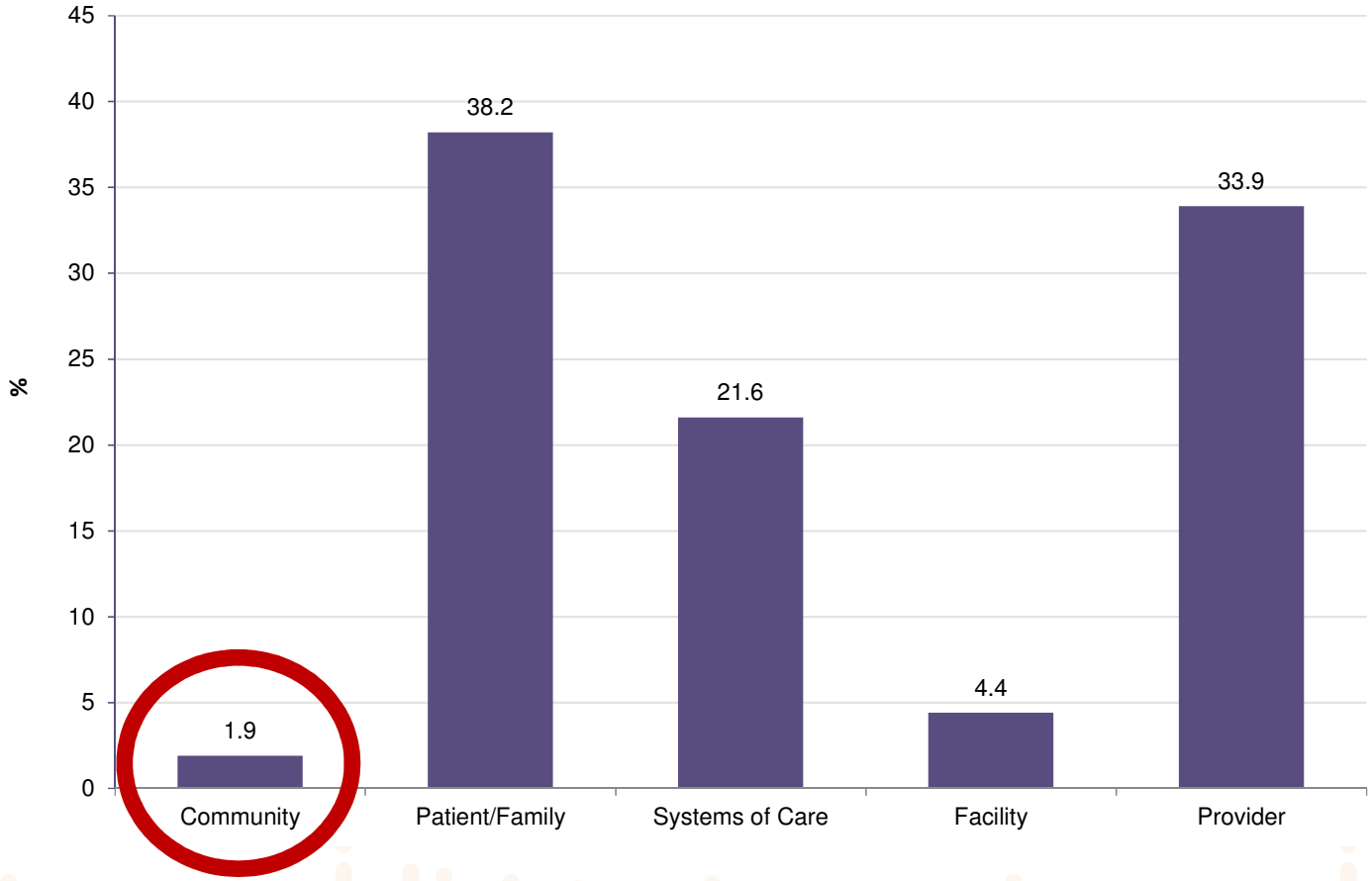
Social determinants of women's morbidity & mortality?



From Michael Kramer (Emory)

Challenge: Inequity

Distribution of contributing factors among pregnancy-related deaths



Report from Nine Maternal Mortality Review Committees. http://www.reviewtoaction.org/rsc-ra/term/70

Challenge: Inequity

Why is attribution of Community-level contributing factors so low among the Nine Committees that contributed data?

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Why is attribution of Community-level contributing factors so low among the Nine Committees that contributed data?

1. MMRCs do not have information

Challenge: Inequity

Why is attribution of Community-level contributing factors so low among the Nine Committees that contributed data?

1. MMRCs do not have information
2. Perceived as beyond their capacity

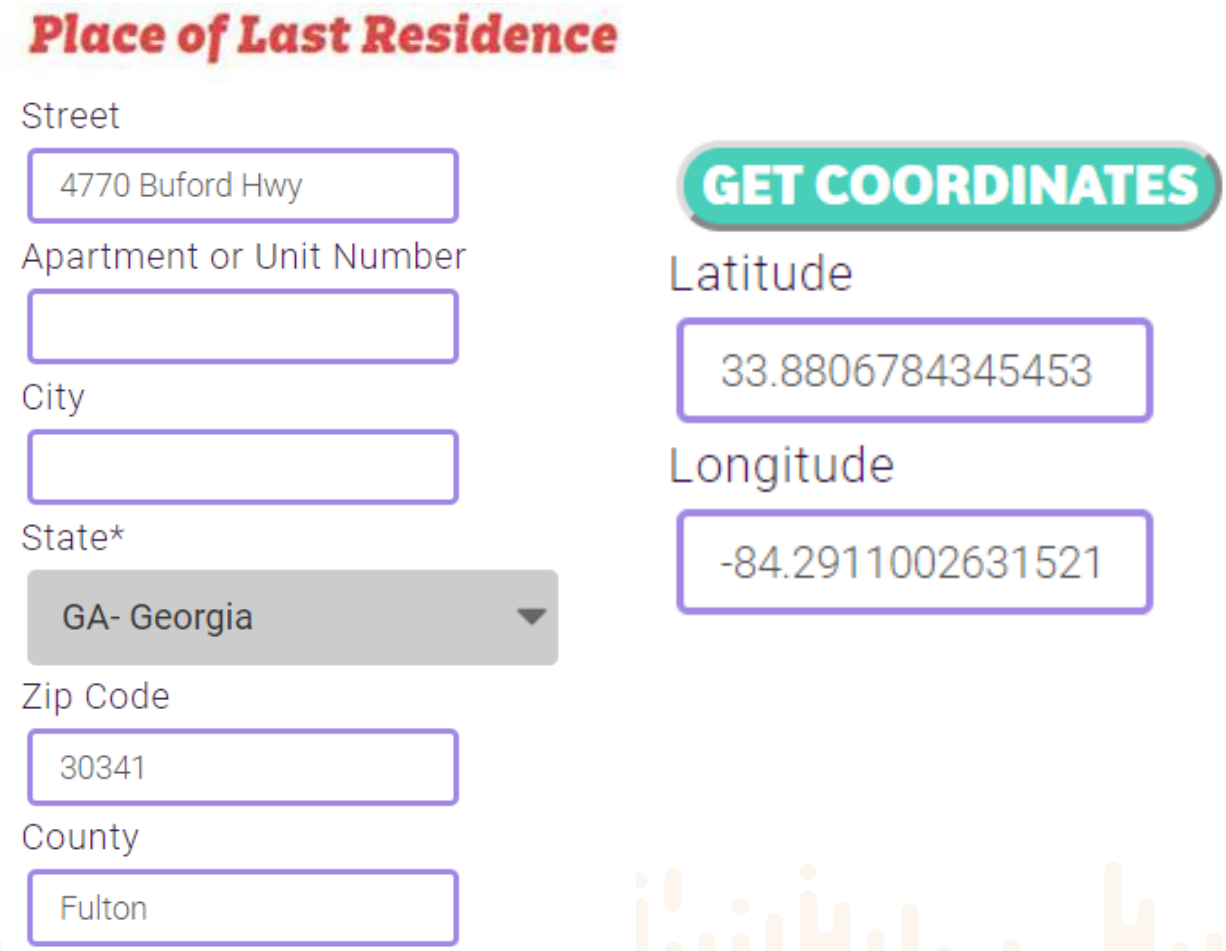
Challenge: Inequity

Bringing in data and building capacity:

1. Geocoding
2. Indicators
3. Dashboard
4. Potential interventions

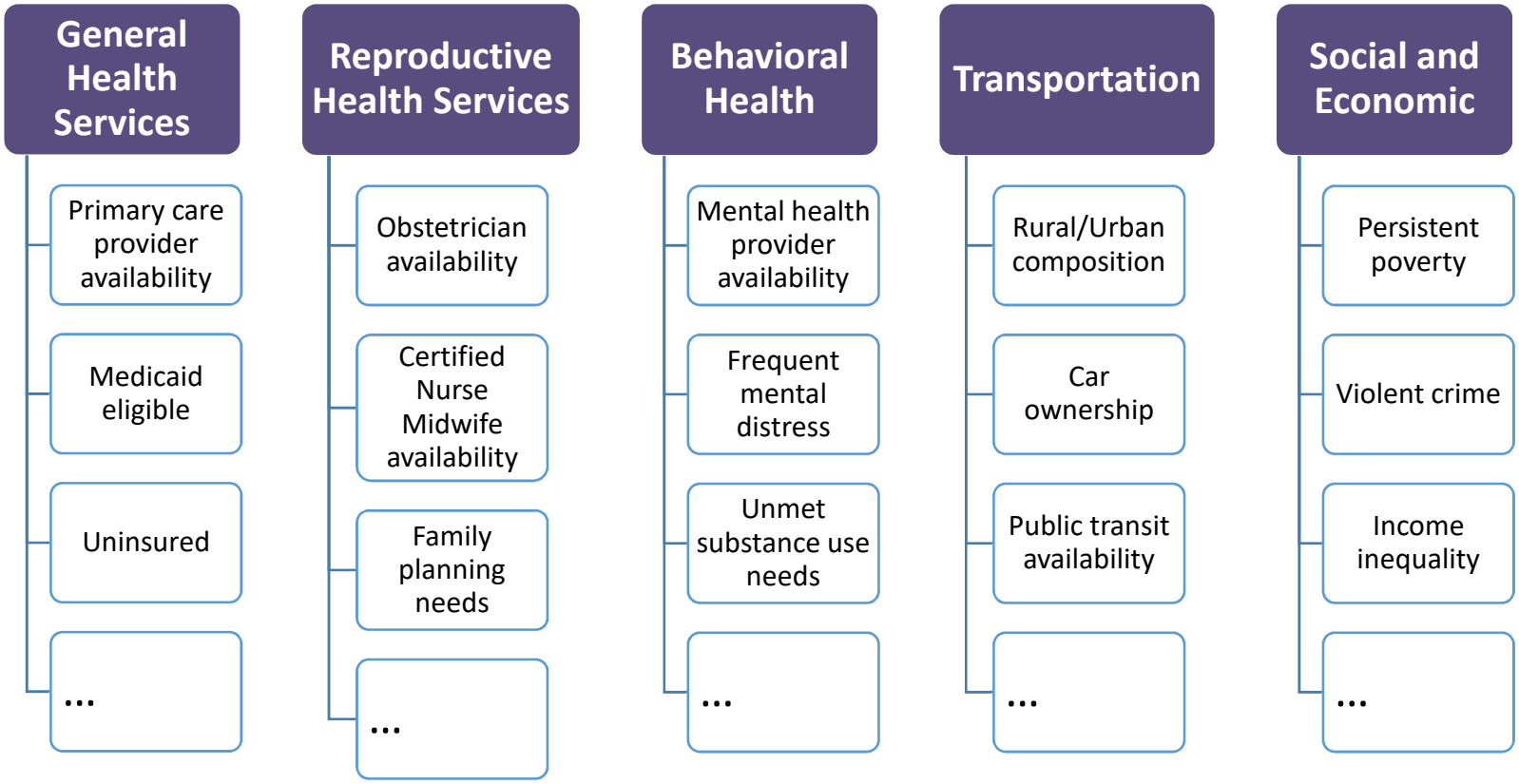
Geocoding: How it works in MMRIA

Place-based data: abstractor view



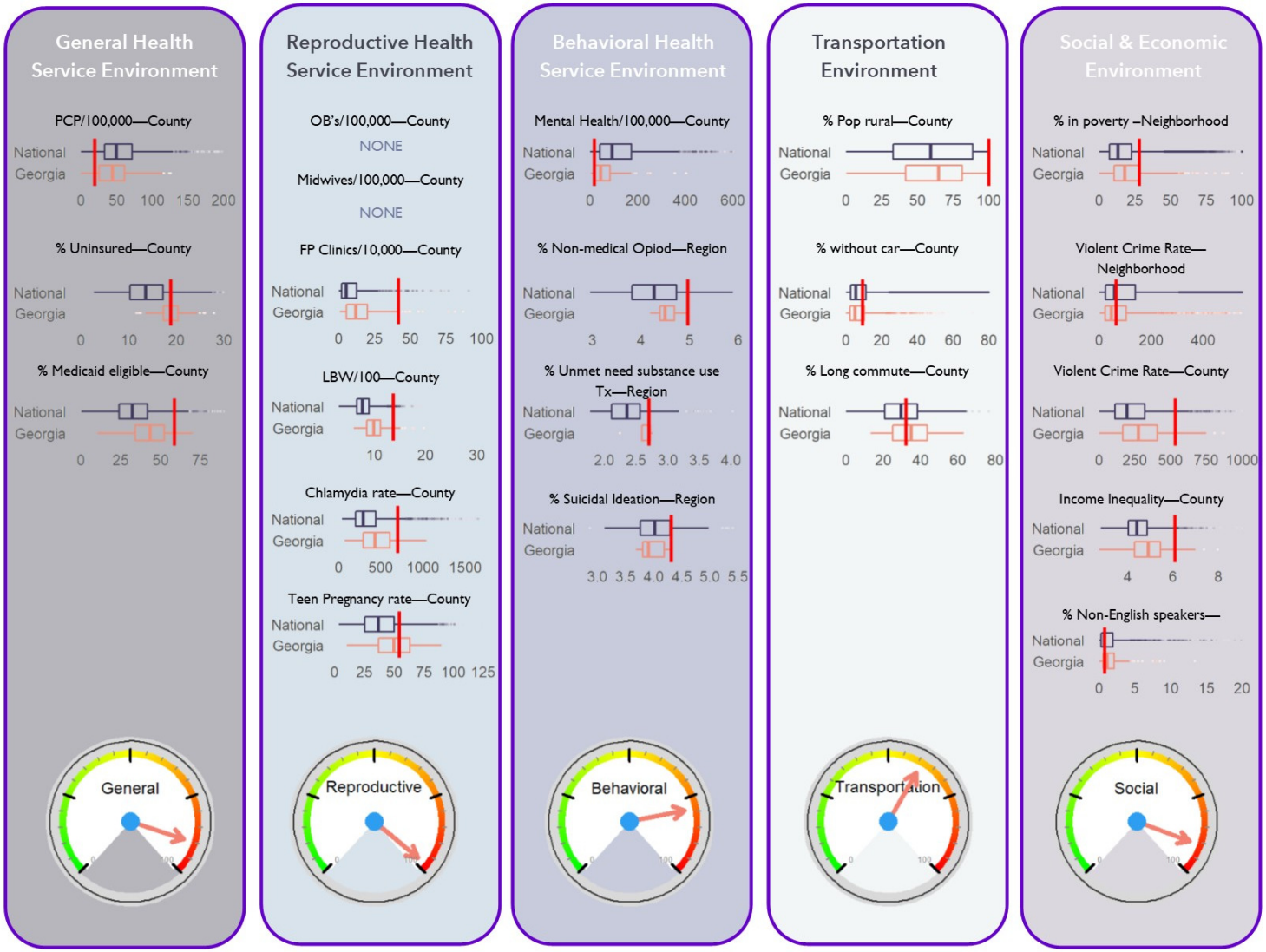
Socio-Spatial Framework: Domains and Indicators

5 domains with examples of indicators



Adapted from: Report from Nine Maternal Mortality Review Committees. http://www.reviewtoaction.org/rsc-ra/term/70

Socio-Spatial Dashboard: Committee Member View



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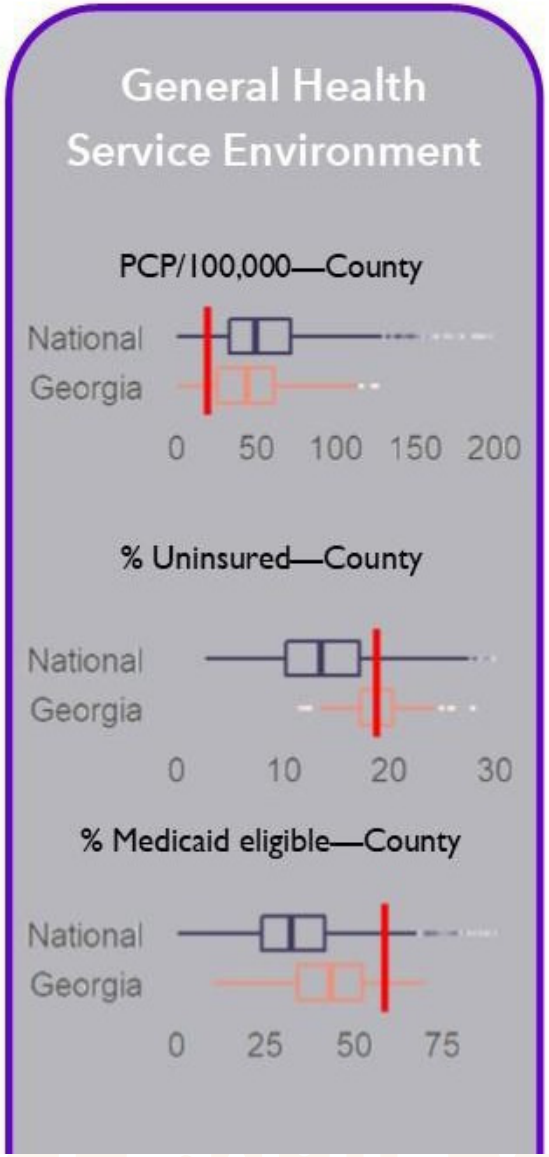


Each indicator plotted:

- The red line is the absolute value for the woman's local area/neighborhood
- Two boxplots represent the observed variation in the indicator:
  - National variation (purple)
  - State variation (pink)

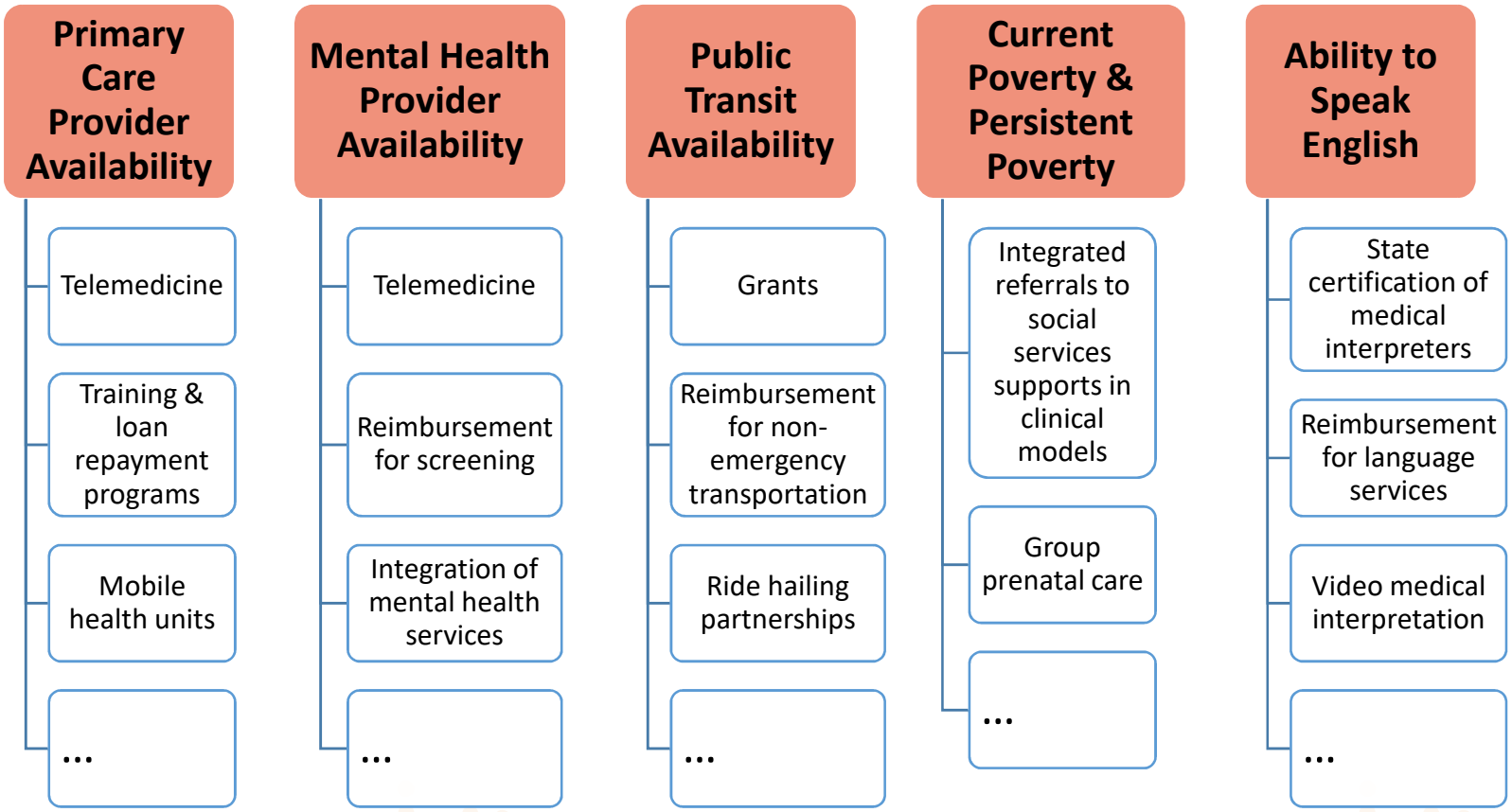
What context do we gain from the geospatial indicators?

The county where this mother lived had:

- A shortage of family planning and OB services
- Higher poverty and income inequality relative to the rest of the state
- Higher violent crime
- Greater housing shortages
- Low car ownership
- High unmet need for substance use treatment

Conversation Starters

Examples of possible interventions



Adapted from: Report from Nine Maternal Mortality Review Committees. http://www.reviewtoaction.org/rsc-ra/term/70

Proposed Pilot

Process:

1. Generate list of MMRIA case IDs and their geocodes for all pregnancy-related deaths for most recent year
2. Dashboard created for each death
3. Subcommittee re-discusses contributing factors and recommendations for each death, taking into account socio-spatial information
4. Contributing factors and recommendations entered into MMRIA
5. Findings reported back to full MMRC

Proposed Pilot

Benefits:

- Better understanding of community-level context of women
- Prioritize interventions that have the potential to address inequity
- Help inform policy priorities to improve the health of all women of reproductive age

Questions?

MMRIA

MATERNAL MORTALITY REVIEW
INFORMATION APP

REVIEW to ACTION

WORKING TOGETHER TO PREVENT
MATERNAL MORTALITY

Contact Us!

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