Maternal Mortality Crisis: Progress Made and Next Steps

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June 28, 2019

HEALTH
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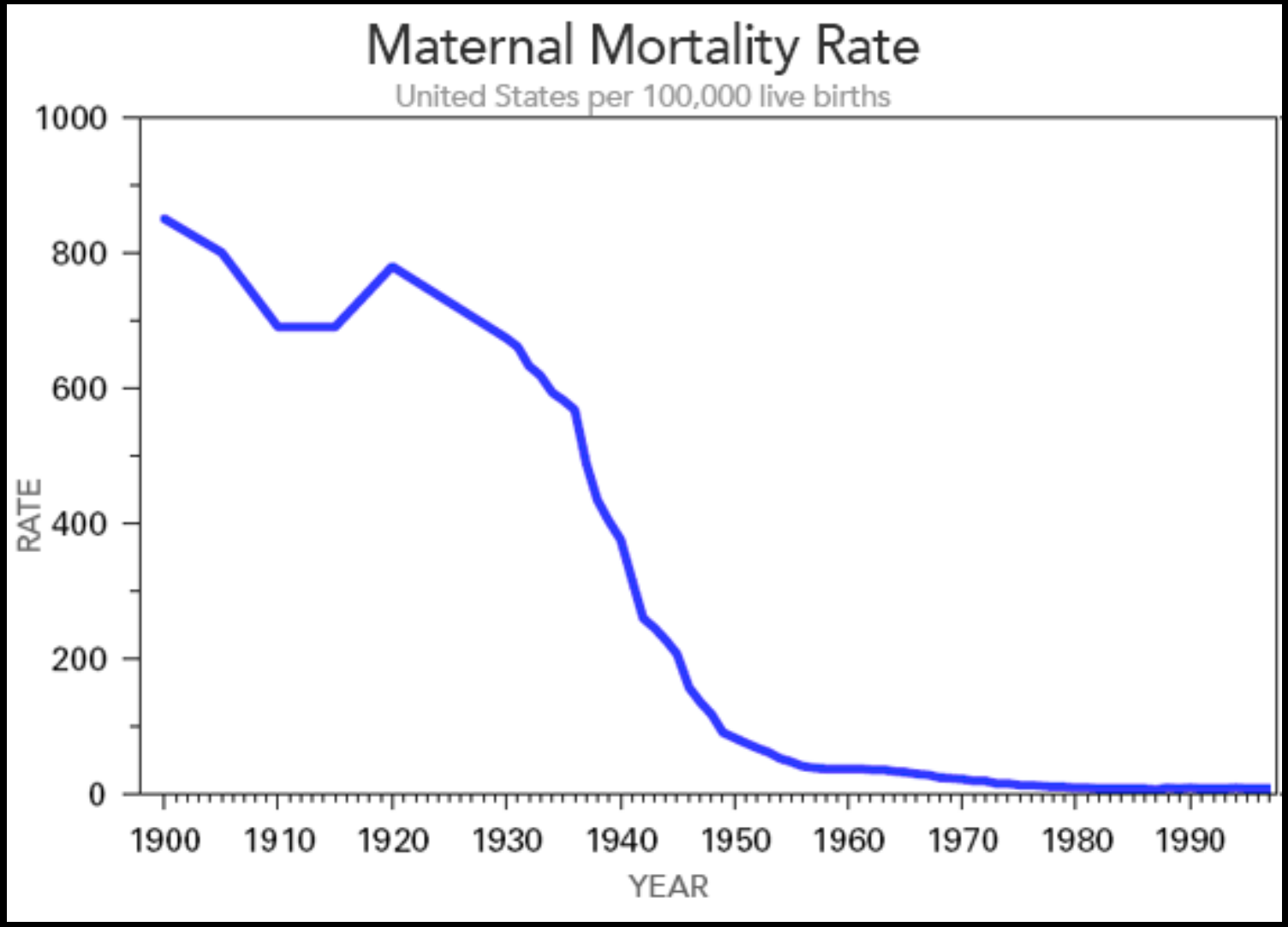
Disclosure Statements

- I have no relevant financial relationships to disclose or conflicts of interest to resolve.

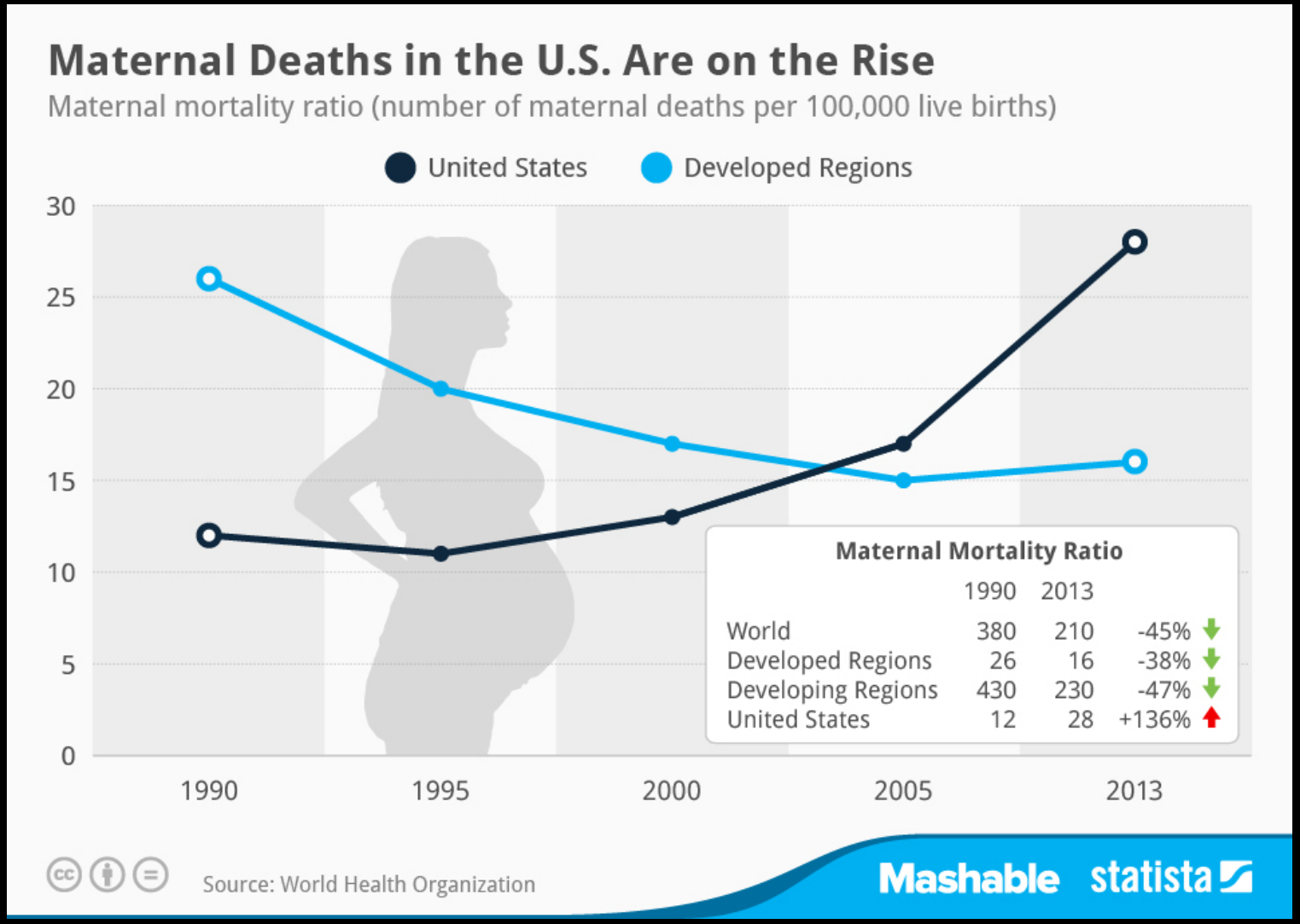
Learning Objectives

- Describe trends and terminology in maternal mortality reporting in United States
- Summarize leading causes of maternal mortality based on CDC Report from Nine Maternal Mortality Review Committees
- Understand value of state-level MMRCs and importance of multi-pronged approach (patient, provider, facility, systems, community)

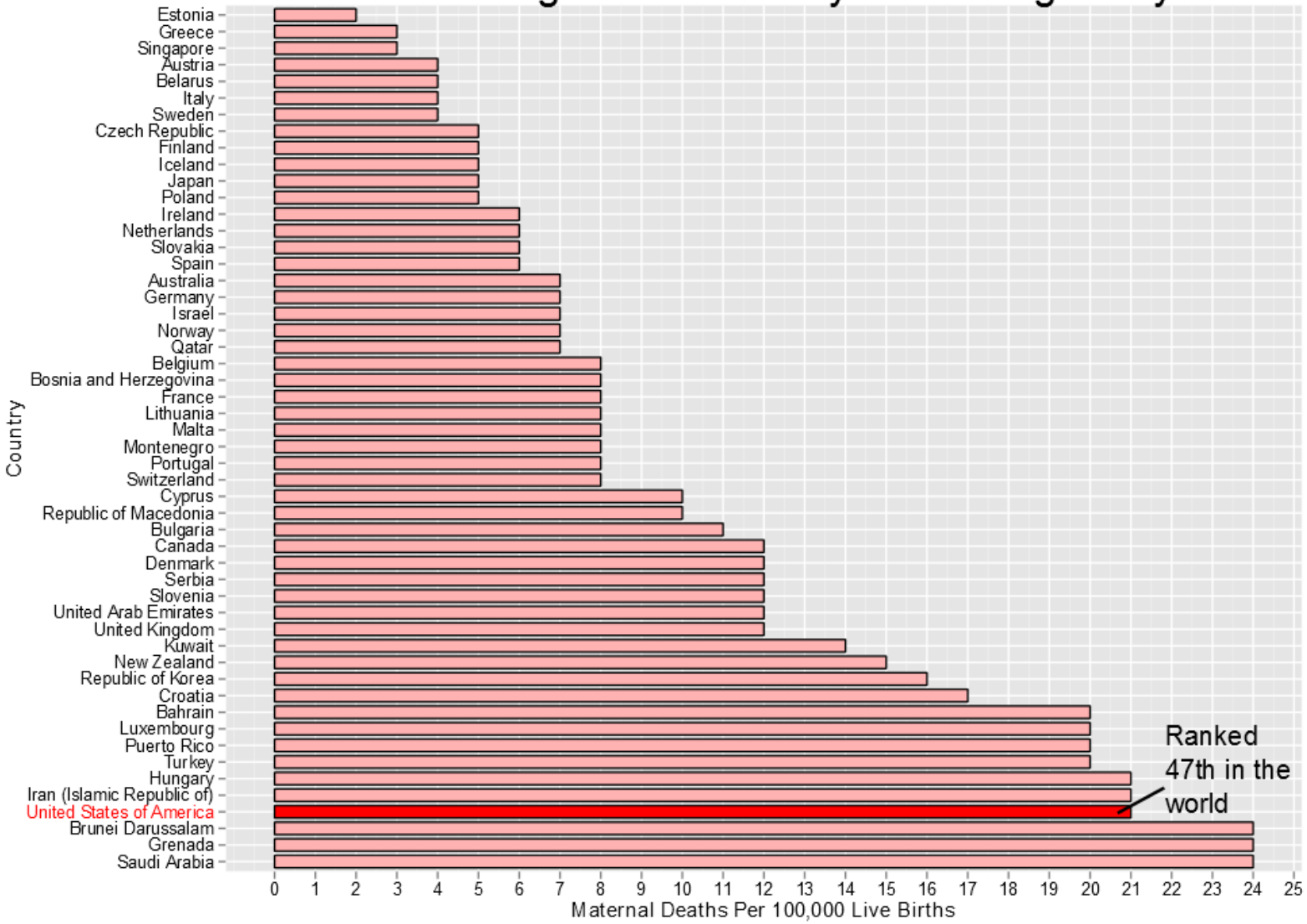
Mortality Rates in the U.S.



Mortality Rates in the U.S.



Countries Where the Fewest Women Die While Pregnant or Shortly After Pregnancy



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Data Source: Trends in Maternal Mortality: 1990-2010. WHO/UNICEF/UNFPA/WB

Maternal Mortality Crisis

https://www.usatoday.com

Maternal Death: WHO Definition

- Death of a woman while pregnant or within 42 days of termination of pregnancy irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes

Pregnancy-Related Death

- 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 Death

- Death of a woman while pregnant or within one year of termination of pregnancy, regardless of the cause
- Pregnancy-associated deaths make up the universe of maternal mortality

Ascertainment of Maternal Deaths

- Vital Statistics
  - National Center for Health Statistics
  - Pregnancy Mortality Surveillance System (PMSS)
- MMRCs
  - Increased ascertainment
  - Linking of birth and death certificates, death code related to pregnancy ('O codes'), pregnancy checkbox on death certificate, hospital reporting, coroner reporting, media reporting

Issues with Ascertainment

- Reliance on vital statistics can result in missed cases
- Can also over-capture with death codes and pregnancy check-box
  - California still does not use the pregnancy check-box on the death certificate
  - Other states phased in this recommendation over years

Maternal Mortality
Trends - USA

- Due to different reporting among states no true MMR in the U.S. since 2007!
- Most of increase due to ascertainment
- MMR: 7.55 in 1993 to 21.5 in 2014
- Mainly due to two ICD-10 codes
  - Renal disease and "other maternal diseases classifiable elsewhere"
- If these deaths excluded, no increase in MMR

Joseph et al Obstet Gynecol 2017;129:91

Maternal Mortality
Trends - USA

- Regression analysis to adjust for ascertainment
  - No increase in MMR (RR 1.09 (0.90-1.25))
- Checkbox states: MMR 22.4
- No checkbox states: MMR 9.9
- 90% of change in MMR due to ascertainment
- 28.8% due to misclassification

Joseph et al Obstet Gynecol 2017;129:91

Pregnancy Check Box

- Correction factors to adjust data for addition of the pregnancy check-box
- 26.6% increase in maternal mortality from 18.8 to 23.8 per 100,000 live births from 2000 to 2014
  - Excludes CA and TX

McDorman et al Obstet Gynecol 2016

National Maternal Mortality Ratios

It is an international embarrassment that the United States, since 2007, has not been able to provide a national maternal mortality rate to international data repositories such as those run by the Organization for Economic Cooperation and Development.[21] This inability reflects the chronic underfunding over the past two decades of state and national vital statistics systems. Indeed, it was primar-

McDorman MF, et al. Recent Increases in the U.S. Mortality Rate: Disentangling Trends from Measurement Issues. Obstet Gynecol 2016; 128(3):447.

Progress Made!

- Development of infrastructure to fund and organize maternal death reporting
- Support for maternal mortality review committees in every state
- Standardization of reporting for aggregation at the national level
- Assessment of preventability with recommendations for action

Infrastructure

- Building U.S. Capacity to Review and Prevent Maternal Deaths
  - Centers for Disease Control and Prevention
  - CDC Foundation
  - Association of Maternal-Child Health Programs (funded by Merck for Mothers)

Infrastructure

- Merck for Mothers funded established and new maternal mortality committees to improve infrastructure at state level
- Ongoing interaction between CDC partners and state committees
  - 42 states, 1 city, and 1 U.S. territory (92%)
- Creation of MMRIA which is a standardized reporting tool for maternal death review

MMRIA

- MMRIA tool walks committee members through available documents for each case
- Make determination regarding:
  - Pregnancy related vs pregnancy associated
  - Preventability
- Recommendations moving forward

Report from Nine Committees

- Shared data from 9 states: Colorado, Delaware, Georgia, Hawaii, Illinois, North Carolina, Ohio, South Carolina, Utah
- Aggregated causes of deaths and assessment of preventability using a standardized data collection form

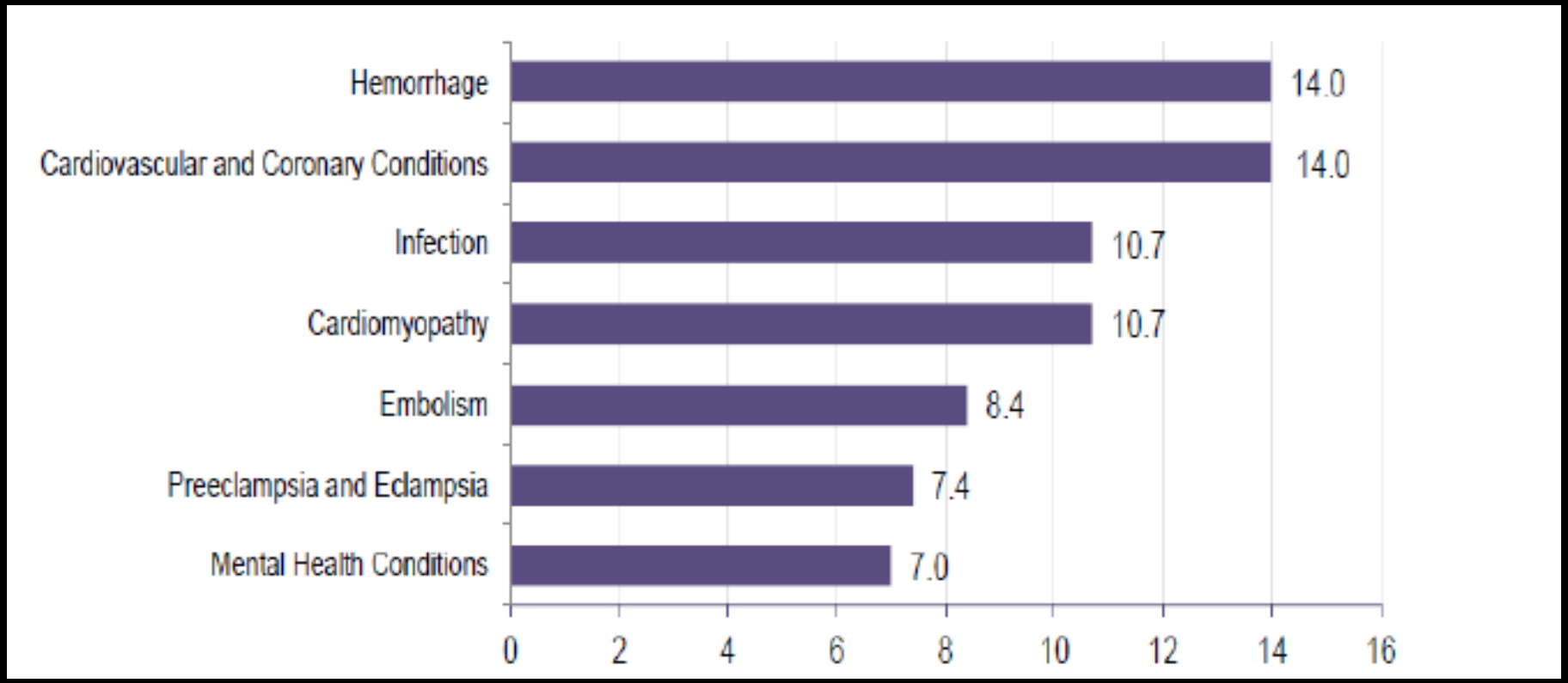
Report from Nine Committees

- N=680 pregnancy-associated deaths
  - 34.9% of deaths were pregnancy related
- 60% of cases thought to be preventable
  - Deaths from hemorrhage and cardiovascular disease were most likely to be classified as preventable
- Includes opportunities to alter outcome at both the clinical and non-clinical, and public health systems levels

Report from Nine Committees

- Contributing Factors
  - Patient, family, healthcare provider, facility, systems or community level
- Most cases multifactorial
  - On average at least 4 factors identified
  - "Swiss cheese model"
- Need involvement from multi-disciplinary stakeholders moving forward

Aggregated Causes of Death



From Report from Nine Maternal Mortality Review Committees

Disparities

- Causes of death varied by race and ethnicity
  - Top 5 causes non-Hispanic white women were cardiovascular, hemorrhage, infection, mental health conditions, cardiomyopathy
  - Top 5 causes non-Hispanic black women were cardiomyopathy, cardiovascular, preeclampsia and eclampsia, hemorrhage, embolism

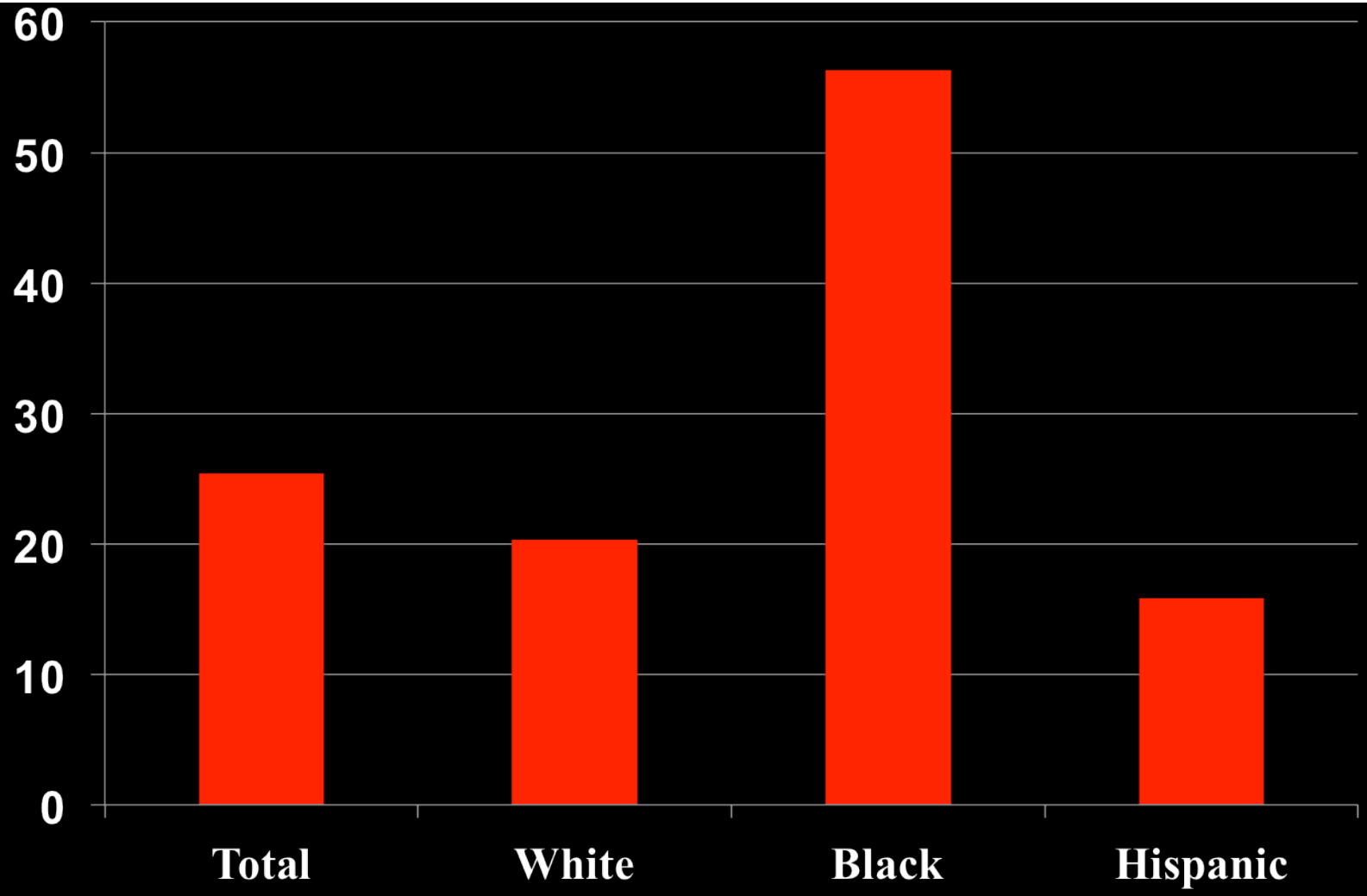
Maternal Mortality
Racial Disparity

- Persistent
- Reasons not clear
- U.S. data sets 2013 – 2014 (27 states)
  - Over 2.5 fold increase in MMR for Non-Hispanic black women
- Similar data in U.K.
  - Black women RR 4.19 (2.69-6.35)

MacDorman et al; Obstet Gynecol 2017;129:811-8

Knight et al; Confidential Enquiries 2016

MMR: USA
Race / Ethnicity 2013-14



MacDorman et al; Obstet Gynecol 2017;129:811-8

Maternal Mortality
Racial Disparity

- Reasons complex
- Not only due to poverty and reduced access to medical care
- Status syndrome – chronic stress
- Co-morbidities, obesity, poor care, miscommunication with health care providers, life-style issues, etc.
- Higher case fatality rate, unconscious bias
- Cardiomyopathy, VTE, preeclampsia

Causes of Death

- Only two states had the same three leading causes of maternal deaths
- Demonstrates importance of maternal mortality data at the state level

Utah Data

- Three most common causes
  - Drug-induced 26%
  - VTE 13%
  - MVC 12%
- Most commonly opioids

Smid et al Obstet Gynecol 2019

Fictitious Case

- 22 yo G1P1 at 2 months postpartum, found unresponsive by police after her mother called 911 when she did not answer phone
- Administration of multiple doses of naloxone was ineffective, she never regained pulse or respirations
- Time of death unknown, probably > 4 hours
- Cause of death: Unintentional/Acute Fentanyl Intoxication

Fictitious Case (the details)

- Began prenatal care at 20 weeks
- Unaware she was pregnant until boyfriend told her she looked "knocked up"
- Patient disclosed injection drug use
  - Referred to methadone maintenance program
- History of childhood trauma
- Suspicion of intimate partner violence from the father of the baby

Fictitious Case (the details)

- Scored 18 on PHQ-9 consistent with severe depression
  - Antidepressant prescribed
  - Continued antidepressant throughout her pregnancy
- Missed several prenatal appointments, which she stated was due to transportation issues

Fictitious Case (the details)

- Admitted for observation at 34 weeks gestation with vaginal bleeding
  - Concern for intimate partner violence
- Delivered viable female infant at 36 weeks gestation
  - Infant had mild NAS symptoms but did well without pharmacotherapy
- Antidepressant Rx refilled on discharge

Fictitious Case (the details)

- Missed scheduled postpartum visits at 2 and 6 weeks
- Per practice policy, a "no show" letter was sent to her last known address
- No further attempts to follow up
- At 6 weeks she lost Medicaid coverage
- Dropped out of methadone treatment due to cost

Case Review

MMRCs have a unique ability to make recommendations to prevent deaths due to mental health conditions and substance use disorder

- Assess your MMRC membership to assure that you have the relevant expertise needed to review substance use cases
  - Perinatal psychiatrist
  - Prenatal care provider specializing in serving women with substance use disorder
  - Opioid grantees
  - Community providers of support services or MAT

Case Review

- Details are important in maternal health case review
- Was substance use and other mental health disorders disclosed?
- Was a treatment plan initiated?
- Was the treatment plan followed?
- Were there barriers to accessing resources?

Committee Review Questions

Did any of the ER visit, PNC or hospitalization records show that she was she screened for substance use?

Was she referred to a mental health provider?

What stressors were present before, during and after pregnancy?

Was there any record of drug charges filed against her?

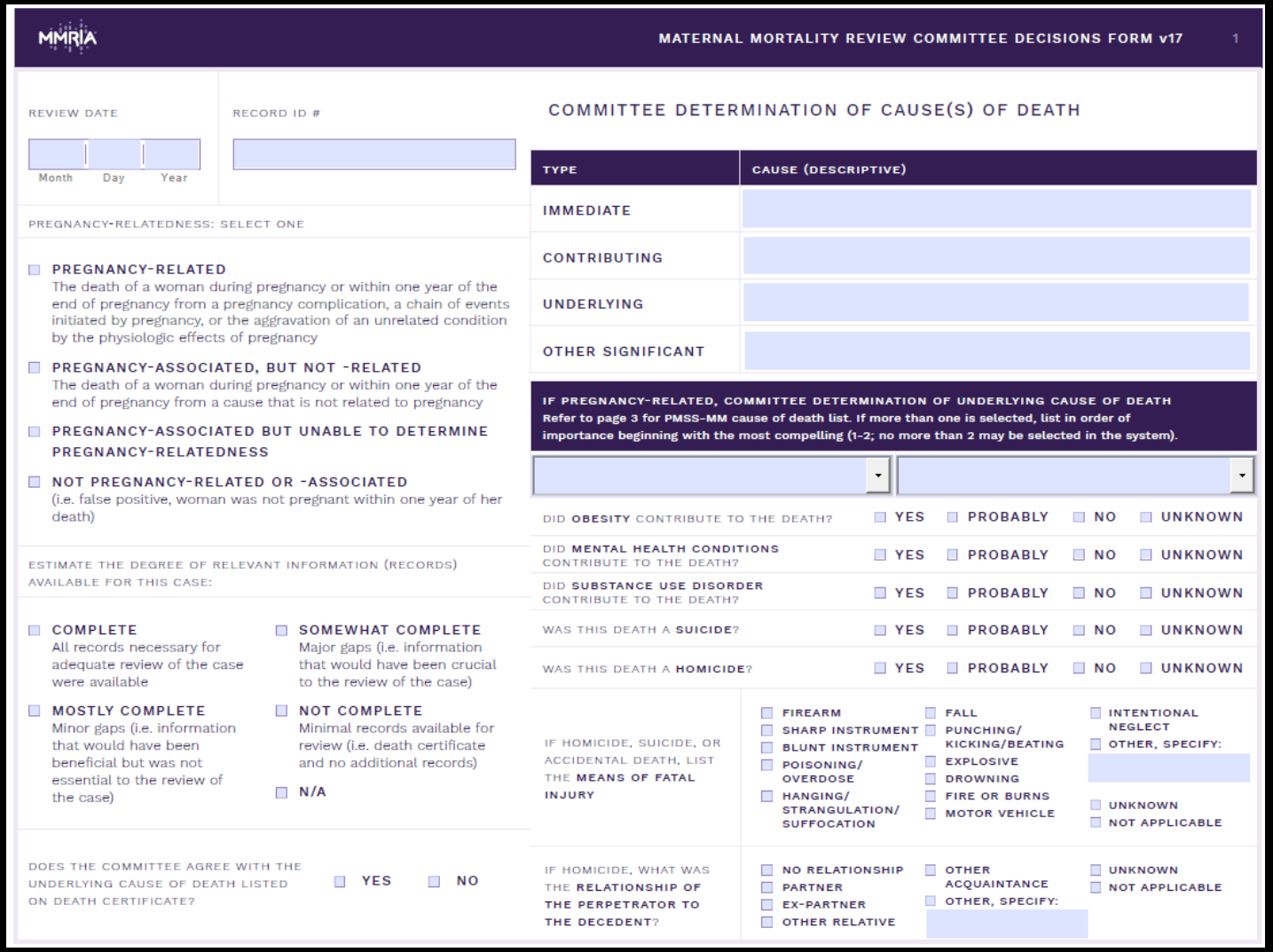
What were the results of her autopsy? Any special ME notes? What can we find in PDMP, VDRS, first responder notes?

Did she have stable housing? Was there a DV screen?

Data Sources

- Prenatal records, hospital records, autopsy
- PDMP
- Child welfare data
- Police, sheriff, and court records
- Other mortality review systems
  - Violent death reporting system (VDRS)
  - Local overdose fatality reviews
  - Fetal and infant mortality reviews (FIMR) and child death reviews (CDR)

Was the death pregnancy-related?



MMRIA

MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v17 1

REVIEW DATE

Month Day Year

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
- ☐ **PREGNANCY-ASSOCIATED BUT UNABLE TO DETERMINE PREGNANCY-RELATEDNESS**
- ☐ **NOT PREGNANCY-RELATED OR -ASSOCIATED**
  (i.e. false positive, woman was not pregnant within one year of her death)

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

- ☐ **COMPLETE**
  All records necessary for adequate review of the case were available
- ☐ **SOMEWHAT COMPLETE**
  Major gaps (i.e. information that would have been crucial to the review of the case)
- ☐ **MOSTLY COMPLETE**
  Minor gaps (i.e. information that would have been beneficial but was not essential to the review of the case)
- ☐ **NOT COMPLETE**
  Minimal records available for review (i.e. death certificate and no additional records)
- ☐ **N/A**

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

COMMITTEE DETERMINATION OF CAUSE(S) OF DEATH

TYPE	CAUSE (DESCRIPTIVE)
IMMEDIATE	
CONTRIBUTING	
UNDERLYING	
OTHER SIGNIFICANT	

IF PREGNANCY-RELATED, COMMITTEE DETERMINATION OF UNDERLYING CAUSE OF DEATH
Refer to page 3 for PMSS-MM cause of death list. If more than one is selected, list in order of importance beginning with the most compelling (1-2; no more than 2 may be selected in the system).

DID **OBESITY** CONTRIBUTE TO THE DEATH?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN
DID **MENTAL HEALTH CONDITIONS** CONTRIBUTE TO THE DEATH?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN
DID **SUBSTANCE USE DISORDER** CONTRIBUTE TO THE DEATH?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN
WAS THIS DEATH A **SUICIDE**?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN
WAS THIS DEATH A **HOMICIDE**?	☐ YES	☐ PROBABLY	☐ NO	☐ UNKNOWN

IF HOMICIDE, SUICIDE, OR ACCIDENTAL DEATH, LIST THE **MEANS OF FATAL INJURY**

- ☐ FIREARM
- ☐ SHARP INSTRUMENT
- ☐ BLUNT INSTRUMENT
- ☐ POISONING/ OVERDOSE
- ☐ HANGING/ STRANGULATION/ SUFFOCATION
- ☐ FALL
- ☐ PUNCHING/ KICKING/BEATING
- ☐ EXPLOSIVE
- ☐ DROWNING
- ☐ FIRE OR BURNS
- ☐ MOTOR VEHICLE
- ☐ INTENTIONAL NEGLECT
- ☐ OTHER, SPECIFY:
- ☐ UNKNOWN
- ☐ NOT APPLICABLE

IF HOMICIDE, WHAT WAS THE **RELATIONSHIP OF THE PERPETRATOR TO THE DECEDENT**?

- ☐ NO RELATIONSHIP
- ☐ PARTNER
- ☐ EX-PARTNER
- ☐ OTHER RELATIVE
- ☐ OTHER ACQUAINTANCE
- ☐ OTHER, SPECIFY:
- ☐ UNKNOWN
- ☐ NOT APPLICABLE

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-Related

- If she had not been pregnant, would she have died?
- Mental health, intimate partner violence, stress, drug metabolism closely linked with pregnancy

Was the death preventable?

MMRIA

MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM v17 2

COMMITTEE DETERMINATION OF PREVENTABILITY

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

WAS THIS DEATH **PREVENTABLE**? ☐ YES ☐ NO

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

CONTRIBUTING FACTORS WORKSHEET

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

CONTRIBUTING FACTOR LEVEL	CONTRIBUTING FACTOR (SEE BELOW) AND DESCRIPTION OF ISSUE
PATIENT/FAMILY	
PROVIDER	
FACILITY	
SYSTEM	
COMMUNITY	

RECOMMENDATIONS OF THE COMMITTEE

If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events? [Who?] should [do what?] [when?]

RECOMMENDATIONS OF THE COMMITTEE	LEVEL OF PREVENTION (SEE BELOW)	LEVEL OF IMPACT (SEE BELOW)

Was the death preventable?

- Depression and intimate partner violence strongly associated with opioid use disorders in women
- Prenatal depression highly predictive of postpartum depression

Was the death preventable?

- Postpartum women increased risk for OD:
  - Physiologic changes of pregnancy resolve, decreasing volume of distribution and rate of drug metabolism
  - Abstinence from illicit use of opioids during pregnancy decreases tolerance
  - Untreated mental illness is a known trigger for relapse
- Loss of insurance → cessation of treatment

What are the recommendations?

RECOMMENDATIONS OF THE COMMITTEE

If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events?
[Who?] should [do what?] [when?]

RECOMMENDATIONS OF THE COMMITTEE	LEVEL OF PREVENTION (SEE BELOW)	LEVEL OF IMPACT (SEE BELOW)

What are the recommendations?

Public Health should promote peer recovery support model.

Stakeholders should advocate for increased access to tx programs for women with SUD in pregnancy and postpartum.

Facilities should educate providers on screening for SUD, depression, and IPV.

PQC should promote obstetric and MAT provider coordination and patient contact when appointments are missed.

Community advocates should target naloxone distribution to patients with OUD and their families.

Payers should reimburse for outpatient case mgmt. prenatally and postpartum.

Stakeholders should advocate for postpartum coverage that extends to a minimum of 1 year.

MMRCs involve multiple disciplines and use the various viewpoints to make recommendations for action to prevent future deaths

Next Steps!

- Expansion of data collection using MMRIA to aggregate as national data
- Translation of state level recommendations into action
- Eliminate preventable maternal deaths

Maternal Mortality

National Partnership Maternal Safety

- Priority bundles:
  - Hemorrhage
  - Hypertension
  - VTE
- Unit improvement bundles:
  - Recognition of early warning signs
  - Internal case reviews
  - Support tools for families / staff

D'Alton et al; Obstet Gynecol 2014;123:973-7

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Perinatal Depression a
Anxiety Patient Safety

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can be used to access this and other patien

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- AIM Participants
- AIM Timelines
- AIM Enrollment Form
- AIM Program Description
- AIM Program Fact Sheet
- AIM Data
- AIM In Situ OB Drill Resources
- Contact AIM

The National Improvement Challenge

The National Improvement Challenge is an innovative program that seeks to improve maternal care

>>

Participate i
Action Serie

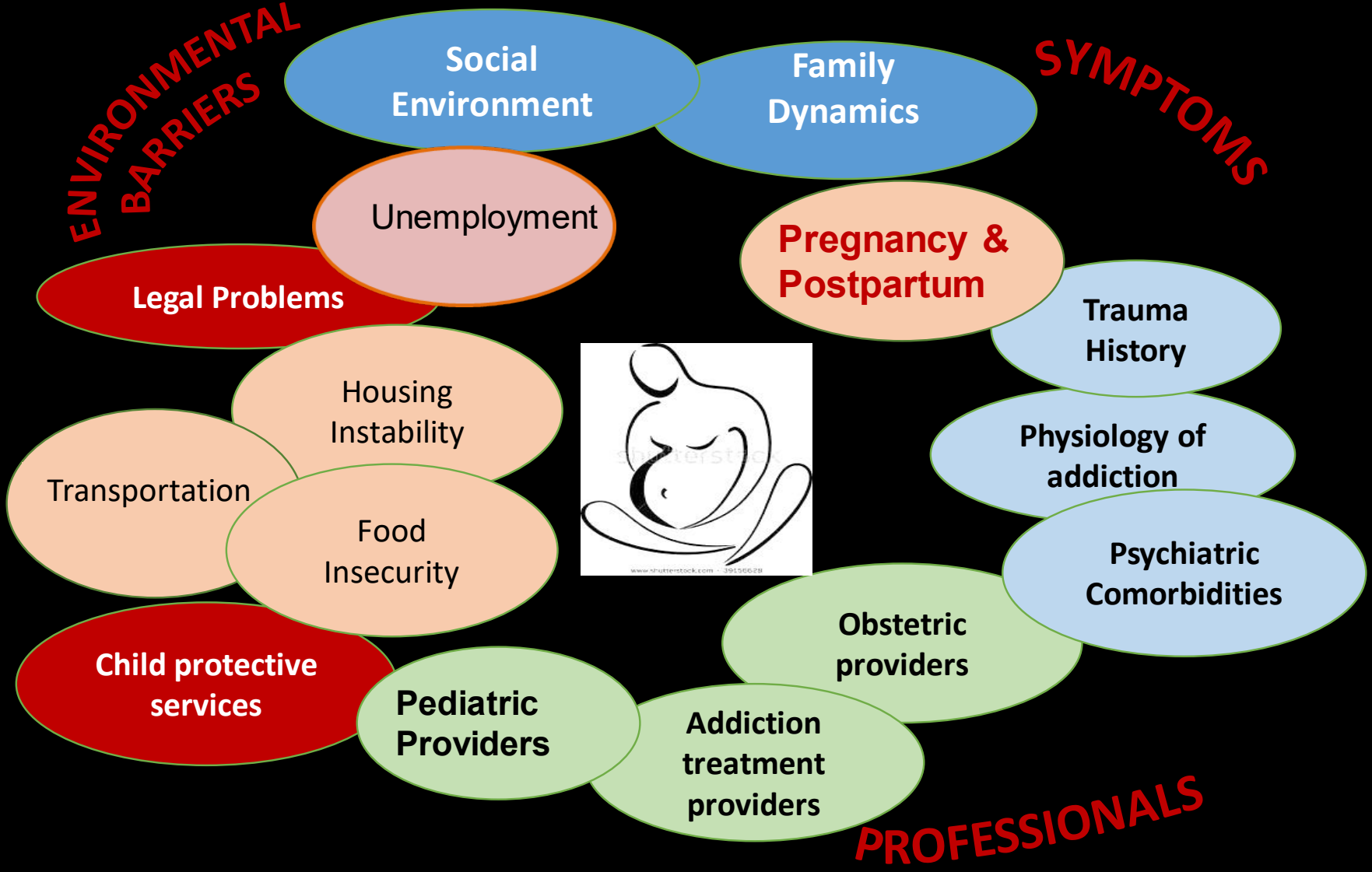
The Council on P
Health Care is pleased to sponsor and

Levels of Maternal Care

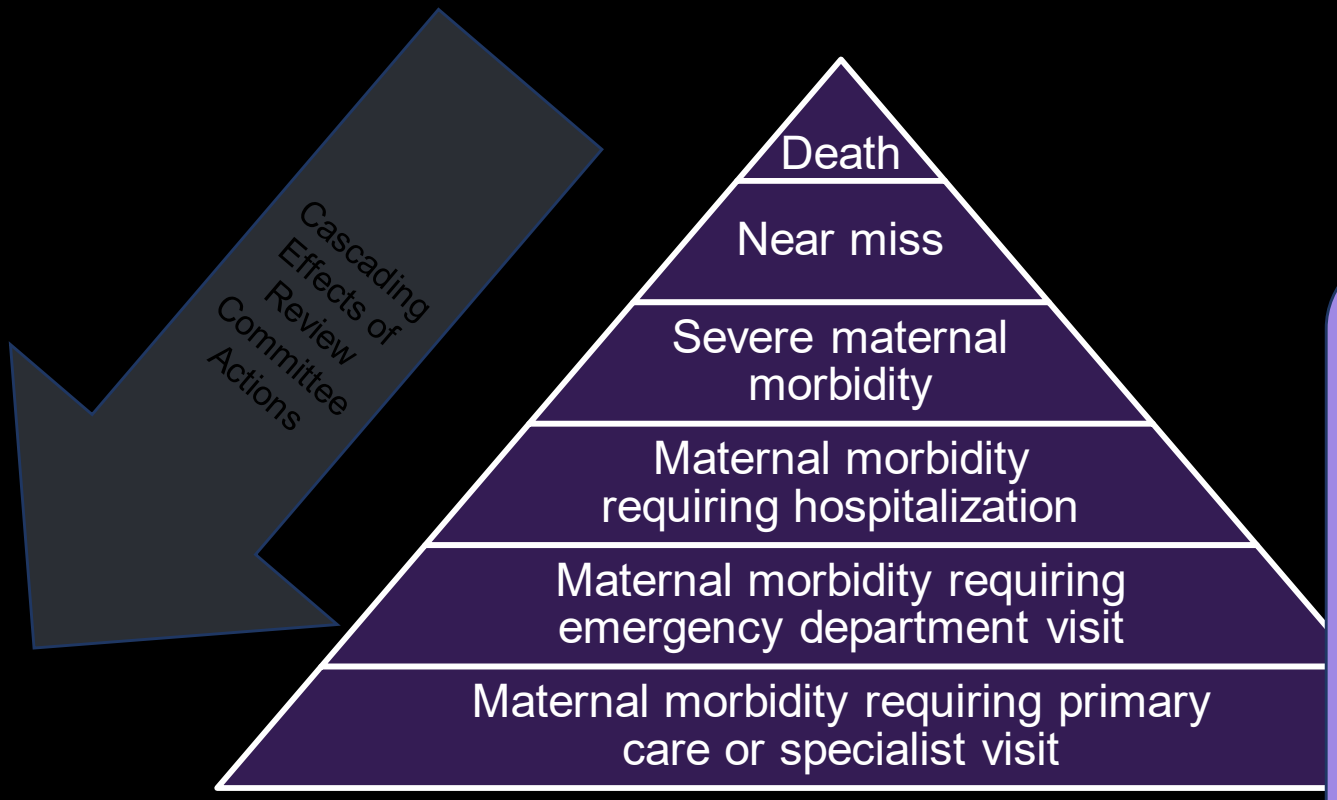
- CDC implemented Levels of Care Assessment Tool (LOCATe) to help determine maternal levels of care
- Goal to get women to deliver in an appropriate birth setting based on individual needs and level of risk
- Maternal LOC verification program piloted in GA, IL and WY

Zahn et al Obstet Gynecol 2018

Hidden Context of Prenatal Visit



Tip of the Iceberg



Long-Term Outcomes

Elimination of preventable maternal deaths

Reductions in maternal morbidity

Population-level improvements in the health of reproductive aged women

Thank you!

- CDC Staff
  - Dave Goodman, Julie Zaharatos, Nicole Davis, Amy St Pierre
- AMCHP and Merck for Mothers
- Colorado MMRC
- Utah PMRC
- Camille Hoffman, Elliott Main, William Callaghan, Robert Silver

Maternal Mortality: *Current Commentary*

Eliminating Preventable Maternal Deaths in the United States

Progress Made and Next Steps

Torri D. Metz, MD, MS

"Let us celebrate our successes while remaining clear about our direction moving forward."