MATERNAL MORTALITY

A Global and California Perspective

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Define Maternal Mortality

- Death within 42 days of the end of the pregnancy, no matter when the pregnancy terminates
- Study from rural Guinea Bissau

Høj, L., da Silva, D., Hedegaard, K., Sandström, A., & Aaby, P. (2003). Maternal mortality: only 42 days?. *BJOG: An International Journal of Obstetrics & Gynaecology*, *110*(11), 995-1000.

- 82 deaths during first 42 days, 83% of 3 month deaths, 72% of deaths by 6 months
- 16 deaths during 43-91 days
- 16 deaths between 92-182 days
- 18 deaths during 183-365 days

Define Maternal Mortality

- Any death after 42 days is called a late maternal death and does not count in the tradition Maternal Mortality Ratios calculated by the WHO and CDC and various other organizations.
- A survival analysis of all maternal deaths revealed nothing particular around the 42 day threshold, other than the exclusion of 18% of women who died due to childbirth in 2013
- Lamadrid-Figueroa, Hector, et al. "Towards an Inclusive and evidence-based definition of the maternal mortality ratio: an analysis of the distribution of time after delivery of maternal deaths in Mexico, 2010-2013." *PLoS One* 11.6 (2016): e0157495.

http://www.who.int/en/news-room/fact-sheets/detail/maternal-mortality

- https://data.worldbank.org/indicator/sh.sta.mmrt
- **Every day, approximately 800 women die from preventable causes related to pregnancy and childbirth in 2020**
- **A maternal death occurred every two minutes**
- **World: 200 per 100,000, decreased 34% from 2000**
- **95% of all maternal deaths occurred in low and lower middle-income countries in 2020 (LICs and LMICs)**
- **Sub-Saharan Africa alone accounted for around 70% of maternal deaths**
- **South Asia accounted for a further 16%**
- **More than half of maternal deaths occur in fragile and humanitarian settings.**

http://www.who.int/en/news-room/fact-sheets/detail/maternal-mortality

- https://data.worldbank.org/indicator/sh.sta.mmrt
- The maternal mortality ratio in LICs in 2020 is 430 per 100 000 live births
- 12 per 100 000 live births in HICs
- US, 14 per 100,000
- Cuba, 39 per 100,000
- India, 174 per 100,000
- Guyana 229 per 100,000
- Uganda 343 per 100,000
- UK 9 per 100,000
- Scandinavian countries 3-5 per 100,000

What do the numbers mean?

- At Jacobs, estimate 500 deliveries per month
- 6000 per year
- 14 per 100,000 means 1.4 per 10,000
- Once every year, or less

What do the numbers mean?

- At Georgetown Public Health Corporation in Guyana, newly declared a HIC, estimate 500 per month
- 6000 per year
- 230 per 100,000 is 23 per 10,000
- Approximately one per month

https://data.worldbank.org/indicator/sh.sta.mmrt

- Risk of maternal mortality highest for girls under 15 years old
- complications in pregnancy and childbirth leading cause of death among adolescent girls in developing countries
- the probability that a 15 year old woman will eventually die from a maternal cause – is 1 in 5300 in HICs, versus 1 in 49 in LICs
- countries designated as fragile states, the risk is even higher http://fundforpeace.org/fsi/2018/04/24/fragile-states-index-2018-annual-report/

  Congo, Central African Republic, Syria, Yemen, Somalia, South Sudan

Causes of maternal mortality worldwide

- Hemorrhage, 27%. 2/3 of these occur postpartum
- Hypertension, 14%, preeclampsia and eclampsia
- Sepsis, 11%
- Abortion, 8%, includes abortion, miscarriage, and ectopic pregnancy
- Embolism, 3% amniotic fluid as well as pulmonary
- Other direct causes 10%, complications of delivery, obstructed labor results in a near miss of maternal mortality, ie. Obstetric fistula. Said that for every woman who dies in childbirth, 20 sustain severe morbidity such as obstetric fistula
- Indirect causes, 27%

Global causes of maternal death: Direct causes

- Say, Lale, et al. "Global causes of maternal death: a WHO systematic analysis." *The Lancet Global Health* 2.6 (2014): e323-e333.
- Abortion Embolism includes amniotic fluid embolism and thromboembolism
- Hemorrhage
- Hypertension refers to preeclampsia and eclampsia, which causes half as many deaths as hemorrhage
- Other direct causes: complications of delivery, obstructed labor (let's not forget morbidity, fistulae)

Global causes of maternal death: Indirect causes

- Say, Lale, et al. "Global causes of maternal death: a WHO systematic analysis." *The Lancet Global Health* 2.6 (2014): e323-e333.
- 27% of worldwide mortality, similar to death from hemorrhage
- Pre-existing medical conditions (NCDs such as cardiovascular, respiratory, cancer, diabetes)
- 70% due to HIV

Global causes of maternal death: Direct causes

- Hemorrhage, 27%
- 66% intra or post partum
- Uterotonic agents: Oxytocin, Methergonovine, Carboprost, Misoprostol.
- The WHO Essential Medications List
- Tranexamic acid

Tranexamic acid: WOMAN Trial
Administer within three hours

	Tranexamic acid group	Placebo group	Relative risk (95% confidence interval)
Bleeding deaths	155/10,036 (1·5%)	191/9985 (1·9%)	0·81 (0·65–1·00)
Any cause deaths	227/10,036 (2·3%)	256/9985 (2·6%)	0·88 (0·74–1·05)
Bleeding deaths in those receiving treatment within 3 hours	89/7520 (1·2%)	127/7408 (1·7%)	0·69 (0·52–0·91)
Thromboembolic events	30/10,036 (0·3%)	34/9985 (0·3%)	0·88 (0·54–1·43)

Data extracted from: Shakur *et al* (2017). https://doi.org/10.1016/s0140-6736(17)30638-4. Published under the terms of the Creative Commons Attribution-NonCommercial-No Derivatives License (CC BY NC ND).

Tranexamic acid : Prophylactic administration

- **Postpartum Hemorrhage**
- 2,020 participants across the studies, 2.6% (26/1,013) in the TXA group experienced PPH compared with 6.3% (63/1,007) in the control group.
- Results showed that TXA led to 57% less risk of PPH than control (RR: 0.43; 95% CI: 0.28–0.67).
- Lee A, Wang MY, Roy D, Wang J, Gokhale A, Miranda-Cacdac L, Kuntz M, Grover B, Gray K, Curley KL. Prophylactic Tranexamic Acid Prevents Postpartum Hemorrhage and Transfusions in Cesarean Deliveries: A Systematic Review and Meta-analysis. American Journal of Perinatology. 2023 Jul 21.

Tranexamic acid : Prophylactic administration

- **Blood Transfusion**
- 2,077 participants. Transfusion events occurred in 1.3% (13/1,029) of participants in the TXA group compared with 3.6% (38/1,048) in the control group.
- Lee A, Wang MY, Roy D, Wang J, Gokhale A, Miranda-Cacdac L, Kuntz M, Grover B, Gray K, Curley KL. Prophylactic Tranexamic Acid Prevents Postpartum Hemorrhage and Transfusions in Cesarean Deliveries: A Systematic Review and Meta-analysis. American Journal of Perinatology. 2023 Jul 21.

Tranexamic acid : Prophylactic administration What is the risk?

- Meaidi A, Mørch L, Torp-Pedersen C, Lidegaard O. Oral tranexamic acid and thrombosis risk in women. EClinicalMedicine. 2021 May 1;35.
- 63,896 women (3·2%) filled 146,729 prescriptions of oral tranexamic acid during follow-up with median filled prescription per user being one of 15 g
- rate of venous thromboembolism was 11·8 (95% CI 4·6 to 30·2) per 10,000 person-years in oral tranexamic acid use compared to 2·5 (2·4 to 2·6) per 10,000 person-years in non-use
- Number needed to harm per five days of treatment was 78,549 women for venous thromboembolism
- US births annually about 3.6 million. If they all got TXA there would be 46 venous thromboemboli annually based on the above data

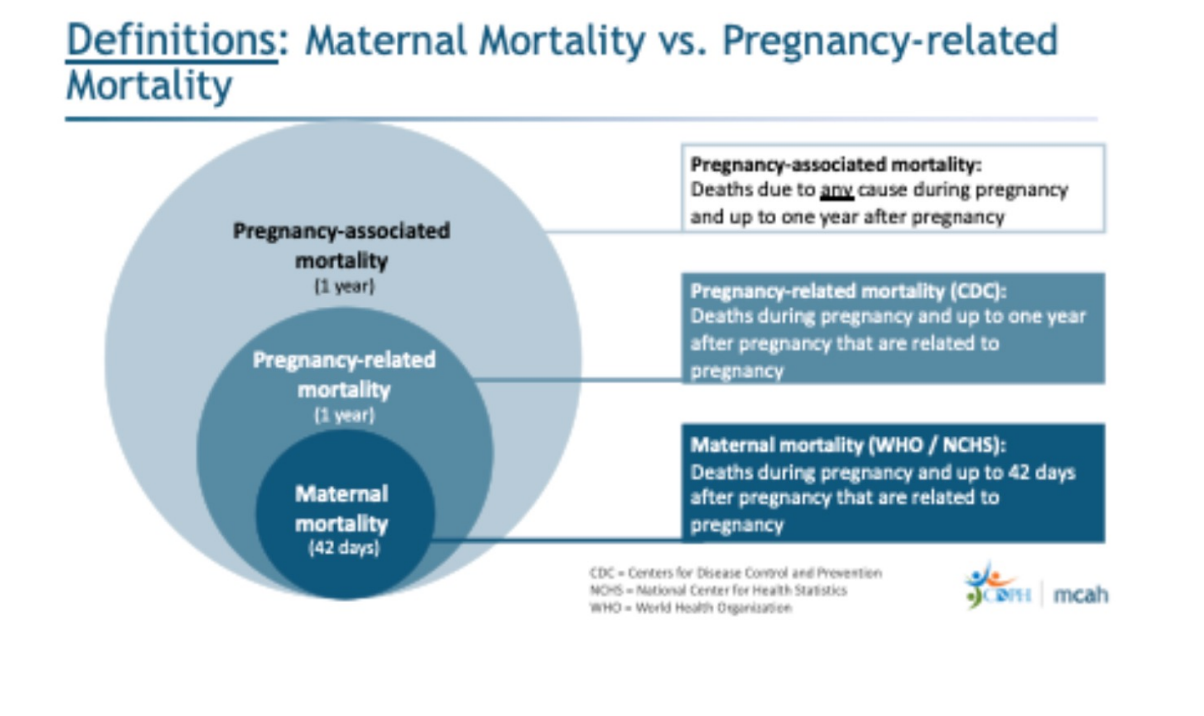
California maternal mortality

- Of the 700 to 900 maternal deaths each year in America, the CDC estimates that 60 percent are preventable
- CMQCC is California Maternal Quality Care Collaborative, founded 2006
- PAMR is Pregnancy Associated Mortality Review
- https://www.cmqcc.org/research/ca-pamr-maternal-mortality-review

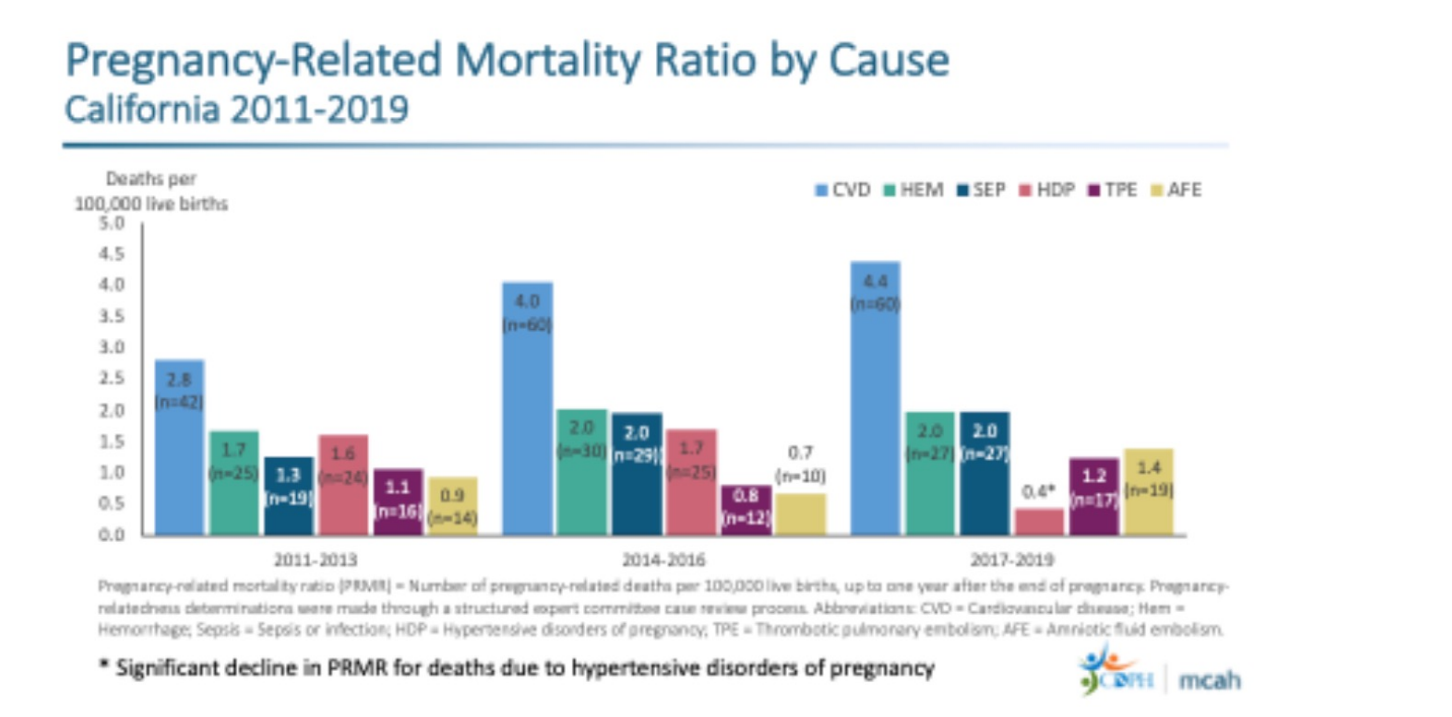
California maternal mortality

- In 2008-2016, 1,934 women died while pregnant or within one year of the end of a pregnancy; 31% (608) of these deaths were related to pregnancy or its management.
- Only 31% attributable to direct causes
- The top five leading causes of pregnancy-related deaths were cardiovascular disease (28%), sepsis or infection (17%), hemorrhage (15%), hypertensive disorders (13%) and thrombotic pulmonary embolism (7%).
- Eighteen percent (18%) of pregnancy-related deaths occurred while pregnant
- remaining 82% that occurred after pregnancy ended, nearly half (44%) of the deaths were within six days of childbirth (or end of pregnancy), 24% occurred 7-42 days after pregnancy ended and 14% were 43-365 days after pregnancy.

California maternal mortality



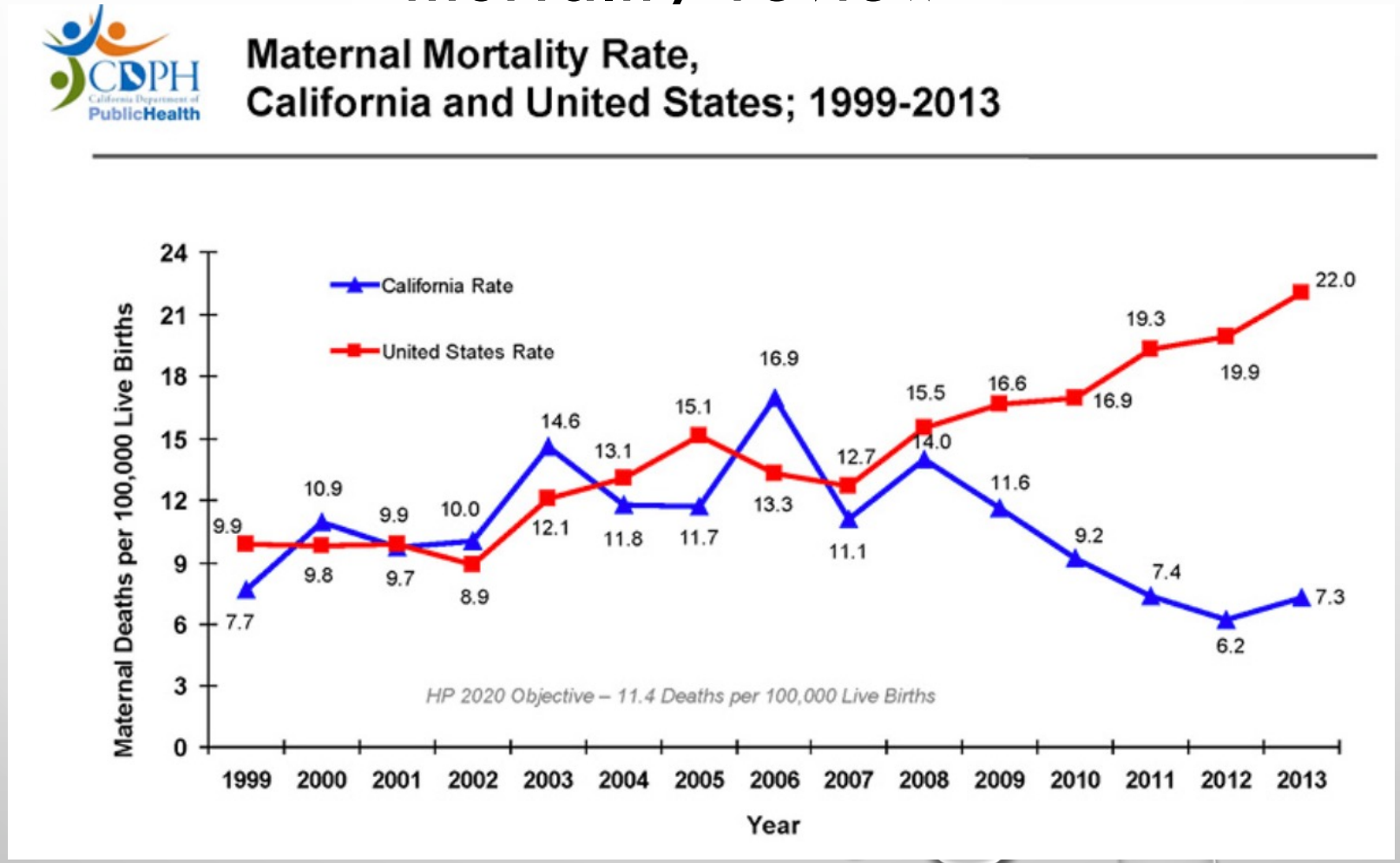
California maternal mortality



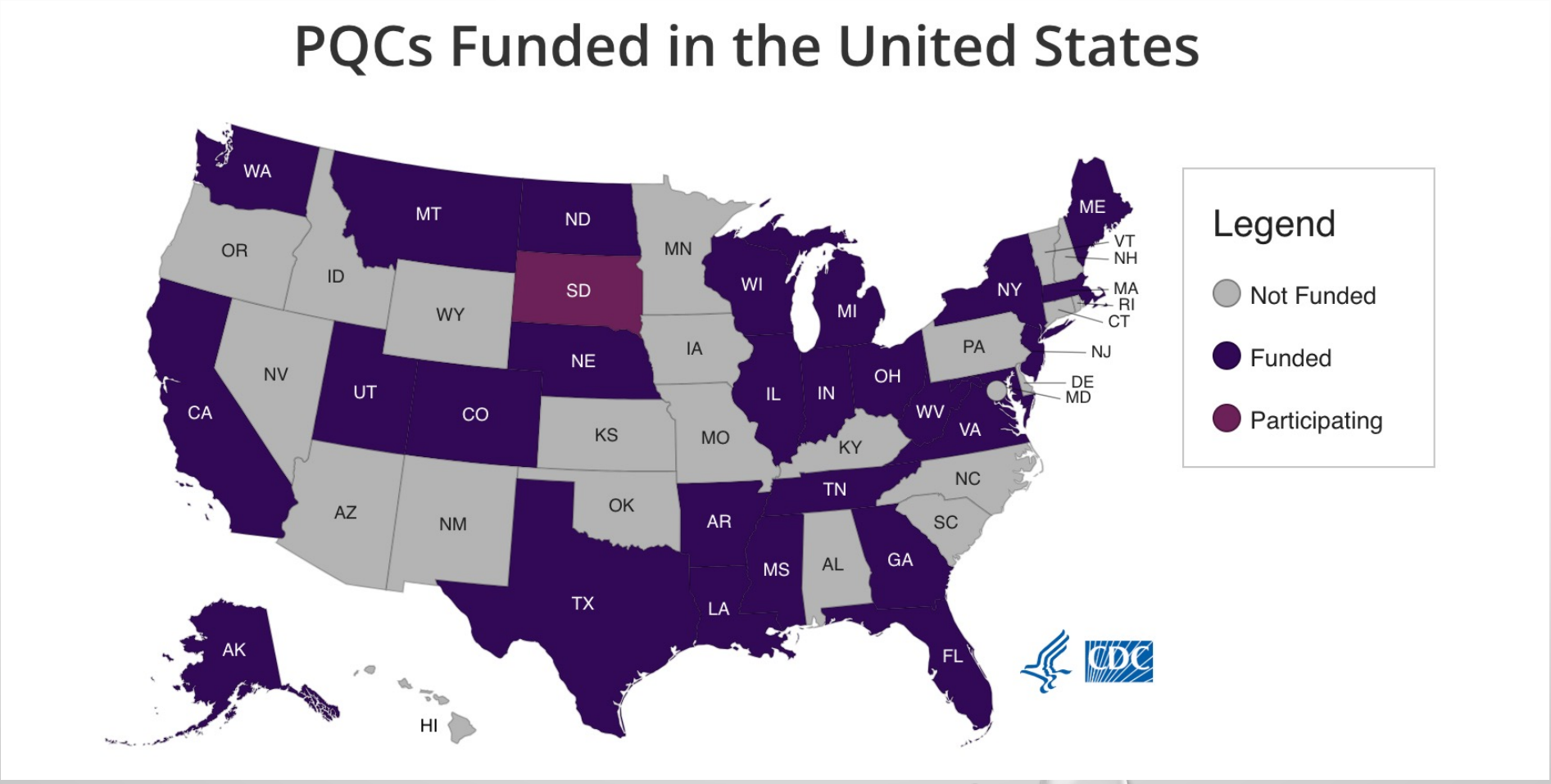
California maternal mortality

- older age (35 years or older), pre-pregnancy obesity (body mass index 30 or greater),
- public insurance (e.g., Medi-Cal)
- no high school diploma.
- The pregnancy-related mortality ratio was highest for women living in the least advantaged communities (16.4 deaths per 100,000 live births), more than twice the mortality ratio for women living in the most advantaged communities (6.8).
- Pregnancy-related mortality ratios varied by geographic region, from 10.8 to 17.8 deaths per 100,000 live births

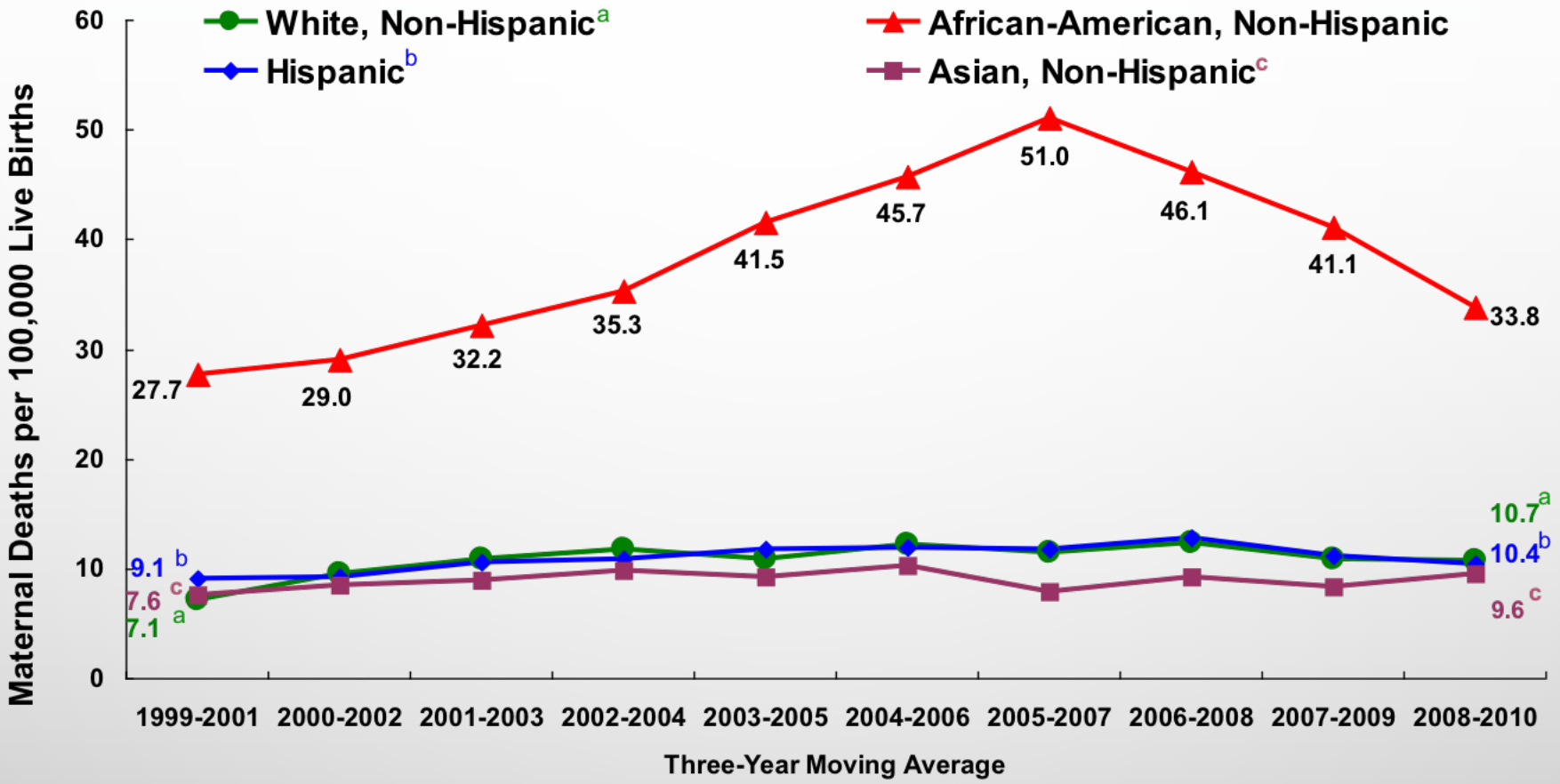
https://www.cmqcc.org/research/ca-pamr-maternal-mortality-review



Perinatal Quality Collaboratives by State: Funding by the CDC



Maternal Mortality Rates by Race/Ethnicity, California Residents; 1999-2010



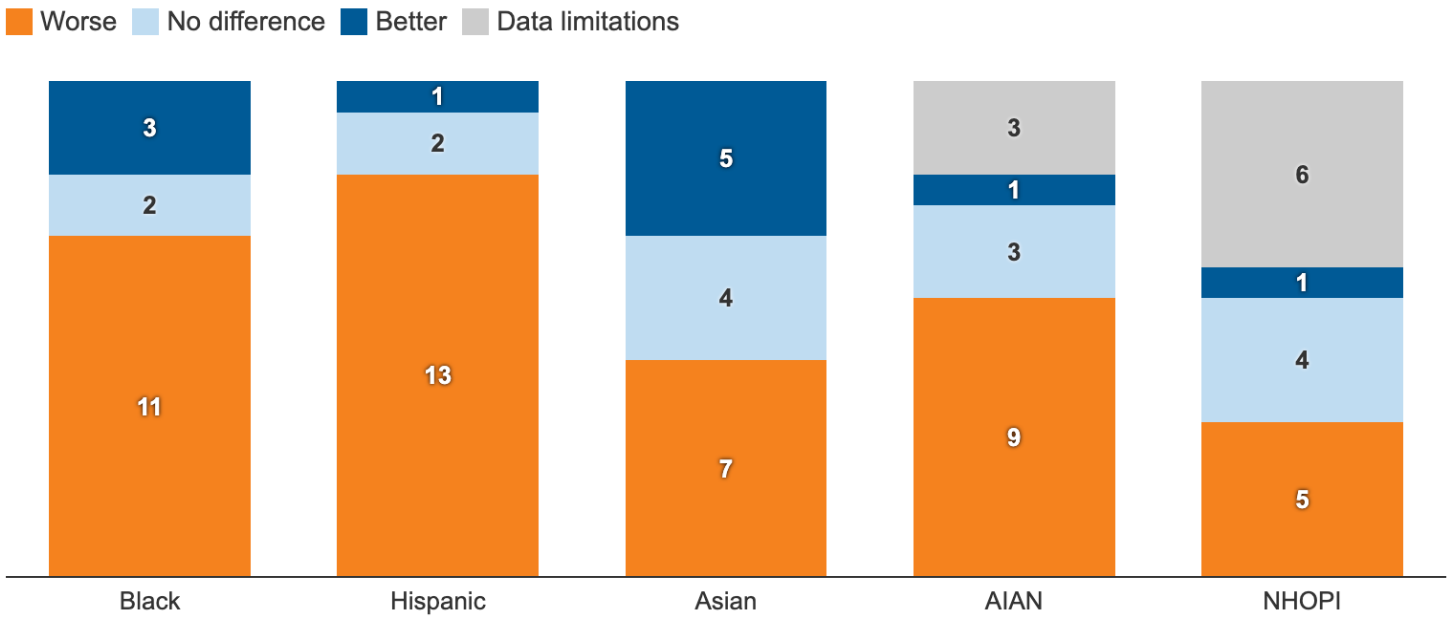
SOURCE: State of California, Department of Public Health, California Birth and Death Statistical Master Files, 1999-2010. Maternal mortality rates for California (deaths ≤ 42 days postpartum) were calculated using the ICD-10 codes for 1999 to 2010. Produced by California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division, December, 2012.

https://www.kff.org/racial-equity-and-health-policy/report/key-data-on-health-and-health-care-by-race-and-ethnicity/

Figure 5

Coverage, Access, and Use of Care among People of Color Compared to White People

NUMBER OF MEASURES FOR WHICH GROUP FARED BETTER, THE SAME, OR WORSE COMPARED TO WHITE PEOPLE:



NOTE: Measures are for the most recent year for which data are available. "Better" or "Worse" indicates a statistically significant difference from White people at the p<0.05 level. No difference indicates no statistically significant difference. "Data limitation" indicates no separate data for a racial/ethnic group, insufficient data for a reliable estimate, or comparisons not possible due to overlapping samples. AIAN refers to American Indian or Alaska Native. NHOPI refers to Native Hawaiian or Other Pacific Islander. Persons of Hispanic origin may be of any race but are categorized as Hispanic for this analysis; other groups are non-Hispanic.

PNG

Toolkits available from CMQCC

- Venous thromboembolism
- Cardiovascular Disease
- Support Vaginal Birth and Reduce Primary Caesareans
- Improving Response to Obstetric Hemorrhage
- Improving Response to Preeclampsia
- Elimination of elective deliveries before 39 weeks

Planning for and Responding to Obstetric Hemorrhage

California Maternal Quality Care Collaborative

Obstetric Hemorrhage Version 2.0 Task Force

This project was supported by Title V funds received from the California Department of Public Health; Maternal, Child and Adolescent Health Division

Key 2008 CMQCC Hemorrhage Task Force Survey Findings

- 40% of hospitals did not have a hemorrhage protocol
- Inconsistent definitions of hemorrhage were used among responding hospitals
- 70% of hospitals were not performing drills

  MDs were not regularly participating in drills in hospitals that were doing them
- Most had access to all 4 uterotonics
- Many hospital reported they did not have access to alternative treatment methods, e.g., Balloons

Note: 173 hospitals responded to the first baseline survey. The response rate is 66.3% based on 173/261 hospitals (2008) with annual delivery volume > 50 births.

OB Hemorrhage: We Can Do Better

- Most maternal mortalities and near misses due to hemorrhage are preventable
- 1/3 of patients will have no risk factors prior to labor
  - Must be prepared for every patient
  - QBL every delivery so can respond early
- Requires reliance not on individuals but on team approach

Summary of Recommendations

- Quantification of blood loss for all
- Active management of the 3rd stage for all
- Vital sign triggers
- “Move along” on uterotonic medications
- Intrauterine balloon/B-Lynch suture
- A new approach to blood products
- The value of a formal protocol
- Toolkit at **www.cmqcc.org/ob_hemorrhage**