Pregnancy-Related Deaths: Data from 14 U.S. Maternal Mortality Review Committees, 2008-2017

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Key Findings

Data from the Maternal Mortality Review Information Application

- Approximately 1 in 3 deaths among women during or within a year of pregnancy were pregnancy-related.
- Pregnancy-related deaths occurred during pregnancy, delivery, and up to a year postpartum.
- Leading causes of pregnancy-related deaths varied by race/ethnicity.
- 2 out of 3 deaths were determined to be preventable.

Maternal Mortality Review Committees (MMRCs) are multi-disciplinary committees that convene at the state or local level to comprehensively review deaths of women during or within a year of pregnancy. MMRCs have access to clinical and non-clinical information (e.g., vital records, medical records, social service records) to more fully understand the circumstances surrounding each death, and to develop recommendations for action to prevent similar deaths in the future.

A total of 14 MMRCs voluntarily shared 2008-2017 data with CDC through the Maternal Mortality Review Information Application (MMRIA). Among 1,404 deaths to women during or within a year of pregnancy, 454 (32%) were determined by the 14 MMRCs to be pregnancy-related.

Table 1. Characteristics of pregnancy-related deaths, data from 14 maternal mortality review committees, 2008-2017 (N=454).*

	N	%
Race/Ethnicity		
Hispanic	38	8.6
non-Hispanic Black	173	39.2
non-Hispanic White	212	48.1
Other	18	4.1
Age at death		
15-19	21	4.8
20-24	92	20.9
25-29	98	22.2
30-34	117	26.5
35-39	77	17.5
≥40	36	8.2
Education		
High school or less	221	52.9
Some college	84	20.1
Associate or Bachelor degree	77	18.4
Advanced degree	36	8.6

*Race/ethnicity and age were missing for 13 (3%) pregnancy-related deaths; education was missing for 36 (8%) deaths

Approximately 24% of deaths occurred during pregnancy, 34% occurred on the day of delivery or within a week after delivery, 19% occurred between 7-42 days postpartum, and 24% occurred in the later postpartum period (43-365 days postpartum, Table 2).

Table 2. Distribution of pregnancy-related deaths by timing of death in relation to pregnancy, data from 14 maternal mortality review committees, 2008-2017.*

	N	%
During pregnancy	91	23.9
Day of delivery	59	15.5
1-6 days postpartum	70	18.4
7-42 days postpartum	71	18.6
43-365 days postpartum	90	23.6

*Specific timing information is missing for 73 (16%) pregnancy-related deaths

Cardiovascular conditions[‡], hemorrhage, infection, embolism, cardiomyopathy, mental health conditions[§], and preeclampsia/eclampsia accounted for nearly 75% of pregnancy-related deaths (Table 3). In addition, there were at least 5 pregnancy-related deaths due to each of the following: amniotic fluid embolism (4.8%), cerebrovascular accidents (4.1%), unintentional injury (2.6%), homicide (2.1%), autoimmune diseases (1.9%), seizure disorders (1.9%), malignancies (1.7%), pulmonary conditions (1.7%), anesthesia complications (1.4%), blood disorders (1.4%), and metabolic or endocrine conditions (1.2%). The leading underlying causes of death varied by race/ethnicity. Cardiomyopathy and cardiovascular conditions were the two leading underlying causes of pregnancy-related deaths among non-Hispanic Black women. In contrast, the leading underlying cause of death among non-Hispanic White women was mental health conditions. There were not sufficient data to examine the leading causes of pregnancy-related deaths among Hispanic women.

Table 3. Leading underlying causes of pregnancy-related deaths, overall and by race-ethnicity, data from 14 maternal mortality review committees, 2008-2017.*

	Total		non-Hispanic Black		non-Hispanic White	
	N	%	n	%	n	%
Cardiovascular Conditions[‡]	58	13.8	22	13.9	27	13.4
Hemorrhage	55	13.1	17	10.7	27	13.4
Infection	48	11.4	16	10.1	25	12.4
Embolism	40	9.5	16	10.1	16	8.0
Cardiomyopathy	39	9.3	22	13.9	16	8.0
Mental Health Conditions[§]	37	8.8	--	--	30	14.9
Preeclampsia and Eclampsia	35	8.3	18	11.4	13	6.5

*Specific cause of death was missing or listed as "Unknown" for a total of 34 (7.5%) pregnancy-related deaths. Numbers are not presented when cell size is <5. Deaths among women not classified as non-Hispanic Black or non-Hispanic White are included in the total number of deaths.

[‡] Cardiovascular conditions include deaths to coronary artery disease, pulmonary hypertension, acquired and congenital valvular heart disease, vascular aneurysm, hypertensive cardiovascular disease, Marfan Syndrome, Conduction defects, vascular malformations, and other cardiovascular disease; and excludes cardiomyopathy and preeclampsia, eclampsia, and chronic hypertension with superimposed preeclampsia which are categorized separately.

[§] Mental health conditions include deaths to suicide, overdose/poisoning, and unintentional injuries determined by the MMRC to be related to a mental health condition.

Among the 454 pregnancy-related deaths, a preventability determination was made by the 14 MMRCs for 354 (78.0%). Among these, 233 (65.8%) were determined to be preventable (Table 4). The percent of deaths determined to be preventable did not significantly differ between non-Hispanic Black (63.0%) and non-Hispanic White (68.2%) women (p-value=0.4) nor between Hispanic (61.8%) and non-Hispanic White women (p-value=0.5).

Table 4. Percent of pregnancy-related deaths determined by MMRCs to be preventable, overall and by race-ethnicity, data from 14 maternal mortality review committees, 2008-2017.*

	# preventable	% preventable
Hispanic	21	61.8
non-Hispanic Black	87	63.0
non-Hispanic White	103	68.2
Total**	233	65.8

*A preventability determination was missing (n=81) or unable to be determined (n=19) for a total of 100 (22.0%) pregnancy-related deaths.
**A total of 22 deaths among race-ethnicities not classified as Hispanic, non-Hispanic Black, or non-Hispanic white were also determined to be preventable.

Data Sources and Methods

Data shared by 14 state MMRCs through the maternal mortality review information application (MMRIA) were analyzed. MMRIA supports and standardizes record abstraction, case summary development, documentation of committee decisions, and routine analysis. Data shared included information on pregnancy-associated and pregnancy-related deaths that occurred between 2008 and 2017; Arizona (2016), Colorado (2008–2012, 2014-2015), Delaware (2009–2017), Florida (2017), Georgia (2012–2014), Hawaii (2015–2016), Illinois (2015), Louisiana (2017), Mississippi (2016–2017), North Carolina (2014–2015), Ohio (2008–2016), South Carolina (2014–2018), Tennessee (2017) and Utah (2014–2016). In some cases, only partial years of data may have been received.

We used race and ethnicity data from the birth certificate when available and from death certificates when a birth certificate was unavailable. Race and ethnicity were categorized consistent with Office of Management and Budget Race and Ethnic Standards for Federal Statistics and Administrative Reporting (Revisions 1997). However, available data did not support analysis beyond non-Hispanic white, non-Hispanic black and Hispanic groupings. Age at death was based on information from the death certificate. The timing of death in relation to pregnancy was calculated as the number of days between the date of death on the death certificate and the date of birth or fetal death on the linked birth or fetal death certificate. In addition, death certificates with the standard pregnancy checkbox marked as "Pregnant at the time of death" were used to indicate deaths that occurred during pregnancy. The percentage of deaths determined by MMRCs to have been preventable, as defined below, were calculated, and chi-squared tests were used to assess whether preventability significantly differed by race-ethnicity.

Definitions

Pregnancy-Associated: 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. All deaths that have a temporal relationship to pregnancy are included.

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. In addition to having a temporal relationship to pregnancy, these deaths are causally related to pregnancy or its management.

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, community, provider, facility, and/or systems factors. MMRIA allows MMRCs to document preventability decisions in two ways: 1) determining preventability as a "yes" or "no", and/or 2) determining the chance to alter the outcome using a scale that indicates "no chance", "some chance", or "good chance". Any death with a "yes" response or a response that there was "some chance" or a "good chance" to alter the outcome was considered "preventable"; deaths with a "no" response or "no chance" were considered "not preventable".

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