A Report on Pregnancy-Related Mortality in South Carolina, 2007-2010

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Acknowledgement

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This report was prepared by Michael G. Smith, MSPH, from the DHEC Bureau of Maternal and Child Health in collaboration with Daniela Nitcheva, PhD, from the DHEC Office of Public Health Statistics and Information Systems. Dr. Nitcheva performed the data linkage and provided the analytic dataset and Mr. Smith conducted the data analysis and prepared the report.

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Introduction to Pregnancy-Related Mortality

This report examines pregnancy-related mortality occurring from 2007-2010 among South Carolina residents. For the purposes of this report pregnancy-related mortality is defined as a death during pregnancy or a death within 42 days of pregnancy with one of the following International Classification of Diseases, 10th revision (ICD-10) cause of death codes: A34, O00-O95, O98, or O99. This is based on the definition used by the National Center for Health Statistics.[1]

A more useful definition of pregnancy-related mortality may be the death of a woman during pregnancy or within one year of pregnancy "that was caused by a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy."[2] However, determining whether a death is truly pregnancy-related using this definition requires a Pregnancy-Associated Mortality Review process. A Pregnancy-Associated Mortality Review process uses a panel of experts to review abstracted medical records for all deaths to women that occur during or with one year of pregnancy. The panel then decides whether the death was truly pregnancy-related. A Pregnancy-Associated Mortality Review process is not currently in place in South Carolina.

Description of Data and Statistical Methods

The analytic dataset for this report was built in the following way. Deaths with one of the ICD-10 codes reference above were selected from the SC vital statistics death records. These codes indicate that the death occurred during pregnancy or within 42 days of pregnancy. These records were than matched to birth certificate records from 2006-2010, if available. Overall, 61 pregnancy-related deaths occurring to South Carolina residents from 2007-2010 were identified.

Pregnancy-related mortality data will be summarized in this report using frequencies, percentages, and rates. All rates are calculated as follows:

$$\text{Pregnancy-Related Mortality Rate} = \frac{\textit{Number of pregnancy-related deaths}}{\textit{Number of live births}} * 100{,}000.$$

Therefore, each rate can be interpreted as the number of pregnancy-related deaths per 100,000 live births. One important note about this pregnancy-related mortality rate (PRMR) is that not all pregnancy-related deaths are associated with a live birth. Pregnancy-related deaths that occur during pregnancy or after pregnancy can be related to a live birth, an induced termination of pregnancy, or a fetal death.

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[1] Hoyert DL. Maernal mortality and related concepts. National Center for Health Statistics. Vital Health Stat. 2007;3(33).

[2] Creanga AA, Berg CJ, Syverson C, Seed K, Bruce FC, et al. Race, ethnicity, and nativity differentials in pregnancy-related mortality in the United States: 1993-2006. Obstet Gynecol. 2012;120:261-8.

Results

Table 1: Number and rate of pregnancy-related deaths by year, 2007-2010			
Year of Death	**Number of Pregnancy-Related Deaths**	**Number of Live Births**	**Pregnancy-Related Mortality Rate per 100,000 Births**
2007	14	62,933	22.2
2008	17	63,077	27.0
2009	18	60,682	29.7
2010	12	58,325	20.6
TOTAL	**61**	**245,017**	**24.9**

Overall from 2007-2010, there were nearly 25 pregnancy-related deaths for every 100,000 live births to SC residents. While there was some fluctuation around this rate from 2007-2010, there is not a meaningful increasing or decreasing trend in pregnancy-related mortality over these years.

Table 2: Number and percent of pregnancy-related deaths by time relative to pregnancy at death, 2007-2010		
Time of Death Relative to Pregnancy	**Number of Pregnancy-Related Deaths**	**Percent**
Pregnant at time of death	23	37.7
Pregnant within 42 days of death	31	50.8
Pregnant from 43 days to one year of death	6	9.9
Unknown	1	1.6
TOTAL	**61**	**100**

Nearly 89% of all pregnancy-related deaths to South Carolina women from 2007-2010 occurred during pregnancy or within 42 days of pregnancy.

Table 3: Number and percent of pregnancy-related deaths by cause of death, 2007-2010		
Cause of Death	**Number of Pregnancy-Related Deaths**	**Percent**
Ectopic pregnancy	2	3.3
Respiratory problems	3	4.9
Sepsis	4	6.6
Hypertensive disorders	5	8.2
Obstetric embolism	5	8.2
Unspecified/unknown	5	8.2
Hemorrhage	7	11.5
Other pregnancy complications	8	13.1
Other cardiovascular problems	22	36.1
TOTAL	**61**	**100**

The leading cause of pregnancy-related deaths from 2007-2010 were cardiovascular problems. This includes conditions such as diabetes, cardiac arrest, cardiomyopathy, and ventricular fibrillation. Other pregnancy complications, including complications such as abruption placentae, complications of sickle cell trait, and inter-cranial hemorrhage, accounted for 13.1% of pregnancy-related deaths. Postpartum and antepartum hemorrhages accounted for 11.5% of pregnancy-related deaths.

Table 4: Number and rate of pregnancy-related deaths by maternal age, 2007-2010			
Maternal Age	**Number of Pregnancy-Related Deaths**	**Number of Live Births in Age Group, 2007-2010**	**Pregnancy-Related Mortality Rate per 100,000 Births**
<20 years	2	31,548	6.3
20-24 years	17	70,673	24.1
25-29 years	18	68,535	26.3
30-34 years	14	47,917	29.2
≥35 years	10	26,330	38.0
TOTAL	**61**	**245,003**	**24.9**

The rate of pregnancy-related death per 100,000 live births from 2007-2010 was lowest for women less than 20 years of age, increased sharply for women 20-24 years of age, and steadily increased as maternal age increased.

Note: There were 14 women delivering live births from 2007-2010 whose age was not available in the birth certificate data.

Table 5: Number and rate of pregnancy-related deaths by maternal race/ethnicity, 2007-2010			
Maternal Race/ Ethnicity	**Number of Pregnancy-Related Deaths**	**Number of Live Racial/Ethnic Group, 2007-2010**	**Pregnancy-Related Mortality Rate per 100,000 Births**
Non-Hispanic White	23	136,574	16.8
Non-Hispanic African American	31	79,927	38.8
Hispanic and Other	7	28,516	24.5
TOTAL	**61**	**245,017**	**24.9**

The pregnancy-related mortality rate is highest among non-Hispanic African American women in South Carolina at nearly 39 deaths per 100,000 live births. The pregnancy-related mortality rate among non-Hispanic African American women is over two times the rate among non-Hispanic white women.

Table 6: Number and percent of pregnancy-related deaths by delivery method, 2007-2010		
Delivery Method	**Number of Pregnancy-Related Deaths**	**Percent**
No live birth delivered	34	55.7
Cesarean delivery	17	27.9
Vaginal delivery	10	16.4
TOTAL	**61**	**100**

Most (55.7%) pregnancy-related deaths did not involve a live birth. Among those that were linked to a live birth, the majority (nearly 63%) were cesarean deliveries.

Table 7: Number and percent of pregnancy-related deaths by plurality, 2007-2010		
Delivery Method	**Number of Pregnancy-Related Deaths**	**Percent**
No live birth delivered	34	55.7
Singleton delivery	25	41.0
Twin delivery	2	3.3
TOTAL	**61**	**100**

Among pregnancy-related deaths matched to a live birth, nearly all (92.6%) were singleton deliveries. Two pregnancy-related deaths were associated with twins from 2007-2010 and there were no pregnancy-related deaths matched to higher-order multiple births.

Table 8: Number and percent of pregnancy-related deaths by delivery by previous live births, 2007-2010		
Number of Previous Live Births	**Number of Pregnancy-Related Deaths**	**Percent**
No live birth delivered	34	55.7
First live birth delivered	9	14.7
Second live birth delivered	12	19.7
Third live birth delivered	4	6.6
Fifth live birth delivered	2	3.3
TOTAL	**61**	**100**

Among pregnancy-related deaths matched to a live birth, the majority (77.8%) were either first or second live births. Among all live births from 2007-2010 not matched to a pregnancy-related death, 74.1% were either first or second live births. There is no statistically significant association between the prevalence of first or second births and pregnancy-related deaths (chi-square p-value = 0.66).

Summary

These data suggest that there may be pregnancy-related deaths that occurred in South Carolina from 2007-2010 that resulted from potentially preventable causes of death, such as ectopic pregnancy. However, it is impossible to confidently determine whether any pregnancy-related deaths were preventable without a more in-depth review of the medical circumstances surrounding each death. Another limitation of the data presented in this report is that there could be deaths that were truly pregnancy-related that were not coded using one of the ICD-10 codes used to generate these data and, therefore, erroneously excluded.

The most effective way to improve the quality of these data to make an accurate determination as to whether preventable pregnancy-related deaths are occurring in South Carolina is to systematically review medical records for all deaths to pregnant women and deaths to women that were pregnant within one year of death (often referred to as pregnancy-associated deaths). One approach that is taken in other states is using a qualified reviewer examine medical records for pregnancy-associated deaths and categorize them as either "not pregnancy-related" or "potentially pregnancy-related." Then, a pre-determined board of experts from the medical and public health fields reviews all "potentially pregnancy-related" deaths to determine whether or not they were truly pregnancy-related and whether or not they were potentially preventable. This process is called a Pregnancy-Associated Mortality Review.

A Pregnancy-Associated Mortality Review process must have the support of both the medical and public health communities within a state in order to be effective. This process must also use only de-identified records abstracted by qualified abstractors in order to ensure the confidentiality of both the patients and medical professionals involved in all cases. It is not anticipated that a Pregnancy-Associated Mortality Review would be costly to operate in South Carolina because there are relatively few estimated pregnancy-related deaths in state annually and because the existing infrastructure for the Regionalized System of Perinatal Care may facilitate the necessary de-identified abstraction of medical records.

Please forward any suggestions, comments, or requests concerning this report to:

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