

MARYLAND DEPARTMENT OF HEALTH AND MENTAL HYGIENE  
PREVENTION AND HEALTH PROMOTION ADMINISTRATION

**MARYLAND MATERNAL  
MORTALITY REVIEW  
2014 ANNUAL REPORT**

**Health – General Article § 13-1207**

Martin O'Malley  
Governor

Anthony G. Brown  
Lieutenant Governor

Joshua M. Sharfstein, M.D.  
Secretary



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<u>Name</u>		<u>Hospital/ Affiliation</u>
Lillian	Blackmon, MD	Maternal Mortality Review Committee Chair, MedChi Maternal and Child Health Subcommittee
Joseph	Morris, MD	Anne Arundel Medical Center
Henry	Sobel, MD	Anne Arundel Medical Center
S. Patrick	Donegan, MD	Baltimore Washington Medical Center
Gia	Firth, CNM	Chase Brexton
Lorraine	Goldstein, CNM	Chase Brexton, Maryland General Hospital
Diana	Cheng, MD	Department of Health and Mental Hygiene
Michele	Beaulieu, LCSW-C	Department of Health and Mental Hygiene
S. Lee	Woods, MD, PhD	Department of Health and Mental Hygiene
Donovan	Dietrick, MD	Franklin Square Hospital Center
Samuel	Smith, MD	Franklin Square Hospital Center
Anne	Burke, MD	Holy Cross Hospital
Lorraine	Milio, MD	Johns Hopkins Bayview Medical Center
Tiffany	McNair, MD, MPH	Johns Hopkins Bloomberg School of Public Health
Meredith	Birsner, MD	Johns Hopkins Hospital
Clark	Johnson, MD	Johns Hopkins Hospital
Roberta	Herbst, MS	MedChi
Shayna	Murphy, MS, CHES	MedChi
Robert	Atlas, MD	Mercy Medical Center
Lauren	Rodgers, MD	Prince George's Hospital Center
Wayne	Kramer, MD	Shady Grove Adventist Hospital
James	Rost, MD	Shady Grove Adventist Hospital
Pedro	Arrabal, MD, MFM	Sinai Hospital
Stephen	Contag, MD, MFM	Sinai Hospital
Deborah	Doerfer, CNM	Sinai Hospital
Chelsea	Crabtree, DO	Sinai Hospital
Lupe	Garcia, MD	Sinai Hospital
Judith	Rossiter, MD	St. Joseph Medical Center
Lindsay	Appel, MD	University of Maryland Medical Center
Ahmet	Baschat, MD, MFM	University of Maryland Medical Center
Shobana	Bharadwaj, MD	University of Maryland Medical Center
Stacey	Fisher, MD	University of Maryland Medical Center
Melinda	Fowler, CNM	University of Maryland Medical Center
Jessica	Galey, MD	University of Maryland Medical Center
Jan	Kriebs, CNM	University of Maryland Medical Center
Michelle	Kush, MD, MFM	University of Maryland Medical Center

## Background

Health-General Article §§13-1203–1207, Annotated Code of Maryland establishes a Maternal Mortality Review Program (Program) in Maryland. The purpose of the Program is to: (1) identify maternal death cases; (2) review medical records and other relevant data; (3) determine preventability of death; (4) develop recommendations for the prevention of maternal deaths; and (5) disseminate findings and recommendations to policymakers, health care providers, health care facilities, and the general public.

The Maryland Department of Health and Mental Hygiene (Department) conducts maternal mortality reviews in consultation with MedChi, the Maryland State Medical Society. The Department provides funding to MedChi to assist in the maternal mortality review process. MedChi's Maternal and Child Health Subcommittee assists in obtaining medical records, abstracting cases, and convening a committee of clinical experts from across the State, the Maternal Mortality Review Committee (MMR Committee), to provide an in-depth review of maternal deaths to determine pregnancy-relatedness and preventability. The Committee then develops recommendations for the prevention of maternal deaths, and disseminates their findings and recommendations to policy makers, health care providers, health care facilities, and the general public.

### *Key Definitions*

- A **maternal death** is defined by the World Health Organization's (WHO) International Classification of Diseases Ninth and Tenth Revisions (ICD-9 and ICD-10) as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes."
- The **maternal mortality ratio (MMR)** is the number of maternal deaths per 100,000 live births in the same time period.
- A **pregnancy-associated death** is defined by the Centers for Disease Control and Prevention (CDC) as "the death of a woman while pregnant or within one year or 365 days of pregnancy conclusion, irrespective of the duration and site of the pregnancy, regardless of the cause of death."
- The **pregnancy-associated mortality ratio** is the number of pregnancy-associated deaths per 100,000 live births.
- A **pregnancy-related death** is defined by the CDC as "the death of a woman while pregnant or within one year of conclusion of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by her pregnancy or its management, but not from accidental or incidental causes."
- The **pregnancy-related mortality ratio** is the number of pregnancy-related deaths per 100,000 live births.

The three terms, "maternal death," "pregnancy-associated death," and "pregnancy-related death", create a challenge when comparing data from different sources and reports for different jurisdictional entities. The WHO monitors maternal deaths worldwide as a key indicator of population health, and of social and economic development. Maternal deaths are identified solely from information on the death certificate or similar registration of the occurrence and cause of death. Maternal deaths are limited in both the time period and causes considered.

In more developed countries with improved medical care, many deaths related to pregnancy occur beyond 42 days after the end of pregnancy. In 1986, the CDC and the American College of Obstetricians and Gynecologists collaborated to recommend the use of expanded definitions to more accurately identify deaths among women in which pregnancy was a contributing factor. This collaboration led to the definitions for pregnancy-associated and pregnancy-related deaths. Enhanced surveillance methods are necessary to determine pregnancy-associated and pregnancy-related deaths and will be discussed below.

## ***Rising Rates of Maternal Mortality***

Nationally, maternal mortality has declined dramatically since the 1930s when the MMR was 670 maternal deaths per 100,000 live births. The national MMR was at its lowest level in 1987 at 6.6 maternal deaths per 100,000 live births. However, the MMR has generally risen since that time, and was 23.5 maternal deaths per 100,000 live births in 2011, the latest year for which national data are available. Maryland's MMR for 2007-2011 was slightly higher than the national rate in 2011 at 24.9 deaths per 100,000 live births. A five-year average is used to stabilize the Maryland rate because maternal deaths are relatively infrequent events that may vary considerably year to year, particularly in a small state like Maryland. The Healthy People 2020 MMR target is 11.4 maternal deaths per 100,000 live births.

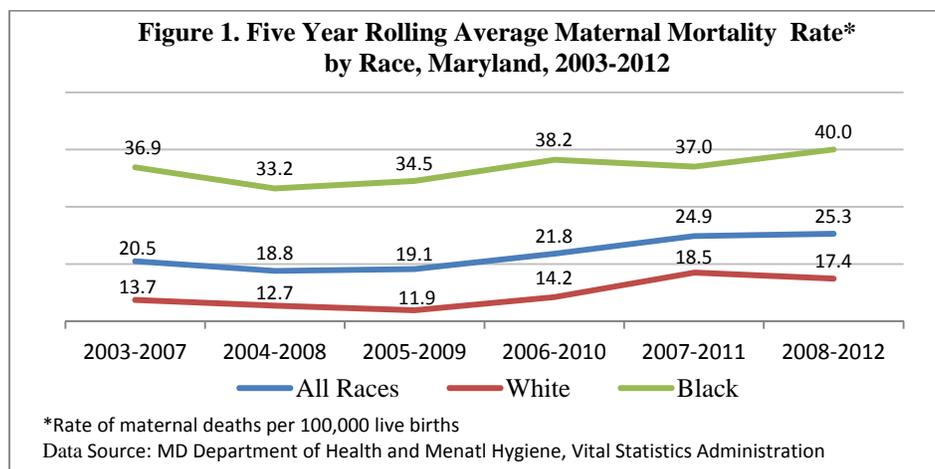
While Maryland's high MMR is concerning, it is also a reflection of the State's intense efforts to more accurately identify maternal deaths since the mid-1990s. To facilitate identification of maternal deaths, the Maryland death certificate was revised in January 2001 to include questions about pregnancy within the year prior to death. This enhanced surveillance resulted in a more than doubling of the number of maternal deaths identified in Maryland compared with data from the 1980s and early 1990s.

Some of the increase in MMR since the mid-1980s is expected because of the recommendations for enhanced surveillance leading to additional cases being identified. Whether the actual risk of a woman dying during pregnancy or within 42 days after has increased is unclear. Many studies have shown an increase in chronic health conditions among pregnant women in the United States, including hypertension,<sup>1</sup> diabetes,<sup>2</sup> and heart disease.<sup>3</sup> These conditions may put pregnant women at higher risk of adverse outcomes.

## ***Racial Disparity***

In the U.S., black women have a MMR more than two and a half times greater than that for white women, a disparity that has persisted since the 1940s. In Maryland, there is a similarly large disparity in the rates among black and white women.

Figure 1 shows the MMR by race in Maryland for six overlapping 5-year periods over the past decade. Compared to 2003-2007, the 2008-2012 white MMR in Maryland increased 27.0 percent and the black MMR increased 8.4 percent. The 2008-2012 black MMR is more than twice the white MMR.



<sup>1</sup> Kuklina EV, Ayala C, Callaghan WM. Hypertensive disorders and severe obstetric morbidity in the United States: 1998–2006. *Obstet Gynecol.* 2009;113(6):1299–1306.

<sup>2</sup> Albrecht SS, Kuklina EV, Bansil P et al. Diabetes trends among delivery hospitalizations in the United States, 1994–2004. *Diabetes Care.* 2010;33(4):768–773.

<sup>3</sup> Kuklina EV, Callaghan WM. Chronic heart disease and severe obstetric morbidity among hospitalizations for pregnancy in the USA: 1995–2006. *Br J Obstet Gynaecol.* 2011;118(3):345–352.

## Methodology

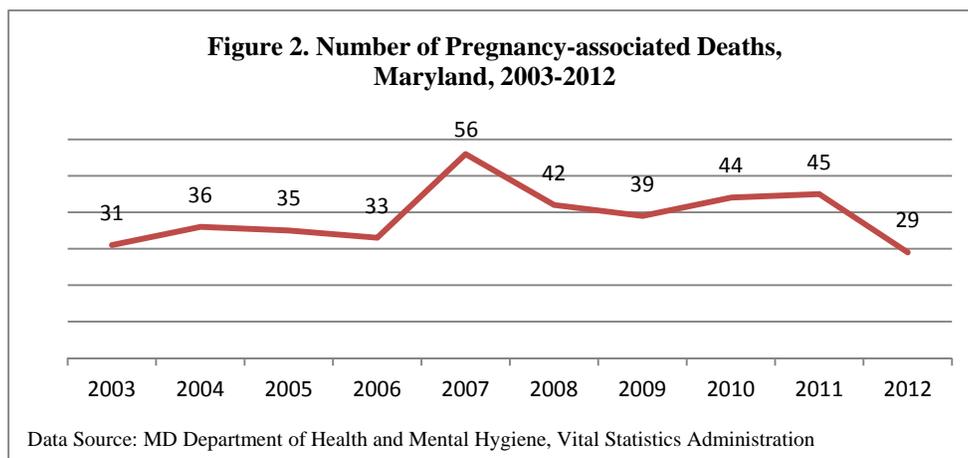
### Case Identification

Cases for review are limited to women of childbearing age who were residents of Maryland at the time of their death. Maryland residents who died in other states are counted in the official Vital Statistics reports, but they are not included in the case reviews because of the difficulty in obtaining records across states. These out-of-state deaths account for a maximum of two to four cases per year, or approximately 5-10 percent of total pregnancy-associated deaths.

Maternal deaths are determined by information on the death certificates alone. The Maryland death certificate was revised in January 2001 to include questions about pregnancy status, pregnancy outcome, and date of delivery for the 12 months preceding death. Maryland is one of 42 states plus the District of Columbia that now include questions specifically designed to improve identification of maternal deaths on the death certificate. The pregnancy checkbox has significantly increased identification of maternal deaths beyond those recognized by cause of death alone. Only 62 percent of Maryland maternal deaths in the years 1993-2000 were identified by cause of death information alone.<sup>4</sup> With the addition of the pregnancy checkbox, 98 percent of maternal deaths are now identified.<sup>5</sup>

Pregnancy-associated deaths are identified in one of three ways in Maryland. Individual death certificates are the first method of identifying pregnancy-associated deaths through the use of checkbox questions on the death certificate, or because the cause of death is clearly related to pregnancy, such as in the case of ruptured ectopic pregnancy. The second method of determining pregnancy-associated deaths comes from linking death certificates for women aged 10-50 years with birth certificates and fetal death certificates to identify additional cases that were not found through examination of death certificates alone. Thirdly, cases reported to the Office of the Chief Medical Examiner (OCME) are subject to a manual review process to identify evidence of pregnancy in deceased women.

All deaths occurring within 365 days of pregnancy conclusion are subsequently designated as pregnancy-associated and investigated further. Using these three methods, 29 pregnancy-associated deaths were identified in 2012 which are reviewed in detail in this report. Two additional cases identified by checkbox questions on the death certificate were not reviewed by the MMR Committee due to inability to find any further evidence or records of pregnancy. Figure 3 shows the numbers of pregnancy-associated deaths in Maryland from 2003 to 2012. There was an average of 39 pregnancy-associated deaths per year during this period.



<sup>4</sup> Horon IL. Underreporting of maternal deaths on death certificates and the magnitude of the problem of maternal mortality. *Am J Public Health*. 2005; 95:478-82.

<sup>5</sup> Horon IL, Cheng D. Effectiveness of pregnancy check boxes on death certificates in identifying pregnancy-associated mortality. *Pub Health Reports*. 2011; 126:195-200.

## ***Case Review***

Pregnancy-associated deaths undergo several stages of review. Once cases are identified, medical records are obtained from the hospitals of death and delivery, when applicable. Physician and nurse-midwife consultants review death certificates, hospital records, and Office of the Chief Medical Examiner records for all cases and prepare summaries on those cases that will go to workgroups of the MMR Committee for review of pregnancy-relatedness. All 2012 cases involving death from medical causes, substance abuse, injury, homicide, or suicide were reviewed for pregnancy-relatedness.

Pregnancy-relatedness and opportunities for prevention of deaths are determined through workgroup discussion. The MMR Committee workgroups include general obstetric, perinatology, nurse-midwifery, and nursing specialties, as well as representatives from the Department's Maternal and Child Health Bureau, Vital Statistics Administration, and the Office of the Chief Medical Examiner. Representatives from all birthing hospitals in Maryland are encouraged to participate. The workgroup discussions incorporate the CDC framework for case review outlined in "Strategies to Reduce Pregnancy-Related Deaths: From Identification and Review to Action."<sup>6</sup> This approach takes into account medical and non-medical factors contributing to maternal death, and examines quality and content of medical care (see Appendix A, *Maryland Maternal Mortality Review Case Discussion Guide*). Cases discussed by MMR Committee workgroups are de-identified and members sign confidentiality agreements. The full MMR Committee meets to review issues identified through case reviews and to develop recommendations.

## **Case Findings**

A total of 29 pregnancy-associated deaths were identified in 2012 for a pregnancy-associated mortality rate of 38.5 deaths per 100,000 live births. Of the 29 deaths, 14 were determined to be pregnancy-related, while the remaining 15 were either determined not to be related to pregnancy or the relatedness to pregnancy could not be determined. The resulting pregnancy-related mortality rate was 19.2 deaths per 100,000 live births.

## **Cases by Classification of Death**

Figure 3 shows the categories of causes of death for pregnancy-associated and pregnancy-related deaths.

### ***Pregnancy-associated Deaths***

The leading causes of pregnancy-associated deaths in 2012 were non-cardiovascular medical conditions and substance abuse, followed by injuries and pregnancy-induced hypertension. Fifty-five percent of pregnancy-associated deaths were due to natural causes (excludes unintentional injury, homicide, suicide, and substance abuse). An additional 21 percent were due to substance abuse, 14 percent to unintentional injury, four percent to homicide, and four percent to suicide.

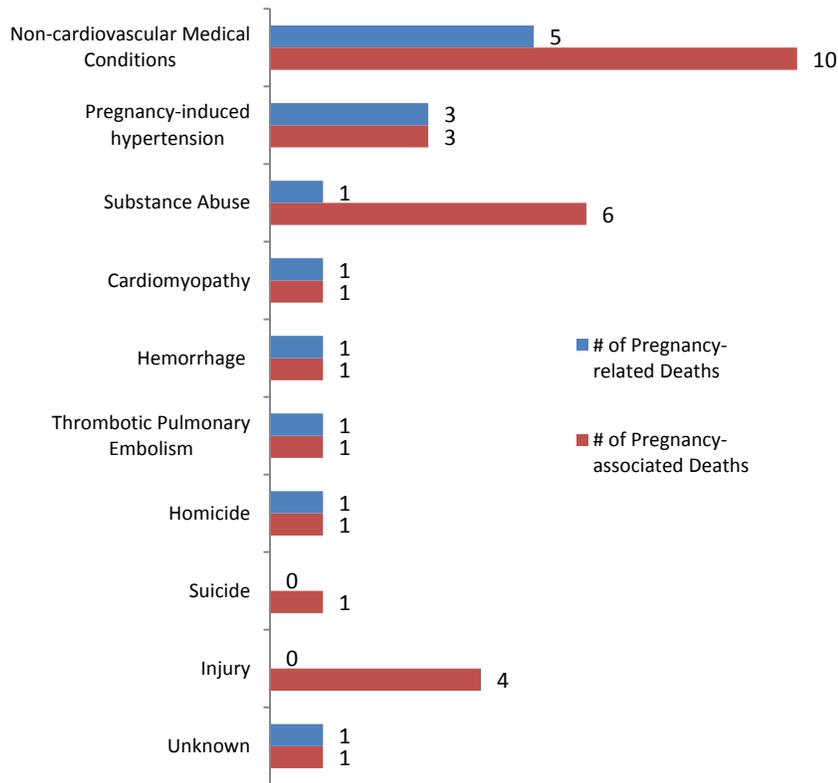
### ***Pregnancy-related Deaths***

Among the 14 pregnancy-related deaths in 2012, the leading cause of death was non-cardiovascular medical conditions, accounting for 38 percent of pregnancy-related deaths. There were three deaths due to pregnancy-induced hypertension, representing 21 percent of the pregnancy-related deaths. Cardiomyopathy and other medical conditions accounted for another 21 percent of pregnancy-related deaths. There was one homicide that was considered to be pregnancy-related and one substance abuse death, together accounting for 14 percent of pregnancy-related deaths.

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<sup>6</sup> Strategies to Reduce Pregnancy-Related Deaths: From Identification and Review to Action. Centers for Disease Control and Prevention: [http://www.cdc.gov/reproductivehealth/ProductsPubs/PDFs/Strategies\\_taged.pdf](http://www.cdc.gov/reproductivehealth/ProductsPubs/PDFs/Strategies_taged.pdf).

**Figure 3. Number of Pregnancy-associated and Pregnancy-related Deaths by Category of Cause of Death\*, Maryland, 2012**

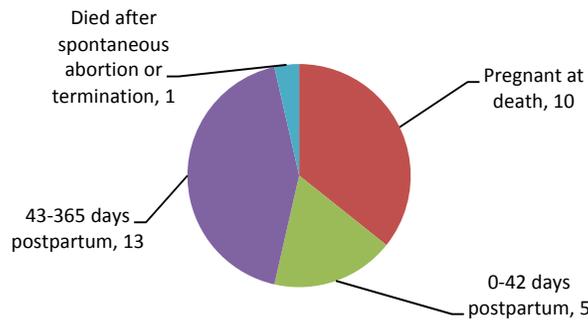


\*Category as determined by Maternal Mortality Review Committee  
 Data Source: MD Department of Health and Mental Hygiene, Vital Statistics Administration

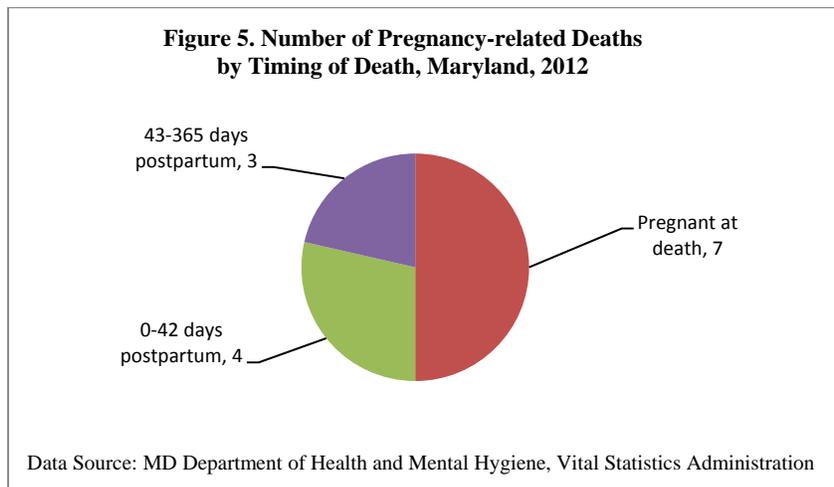
**Cases by Timing of Death in Relation to Pregnancy**

Of all pregnancy-associated deaths in 2012, 35 percent occurred during pregnancy, 17 percent within 42 days postpartum, 45 percent between 43-365 days postpartum, and 3 percent died following a spontaneous abortion or termination (see Figure 4). Among pregnancy-related deaths in 2012, 50 percent occurred during pregnancy, 29 percent within 42 days postpartum, and 21 percent between 43-365 days postpartum (see Figure 5).

**Figure 4. Number of Pregnancy-associated Deaths by Timing of Death, Maryland, 2012**

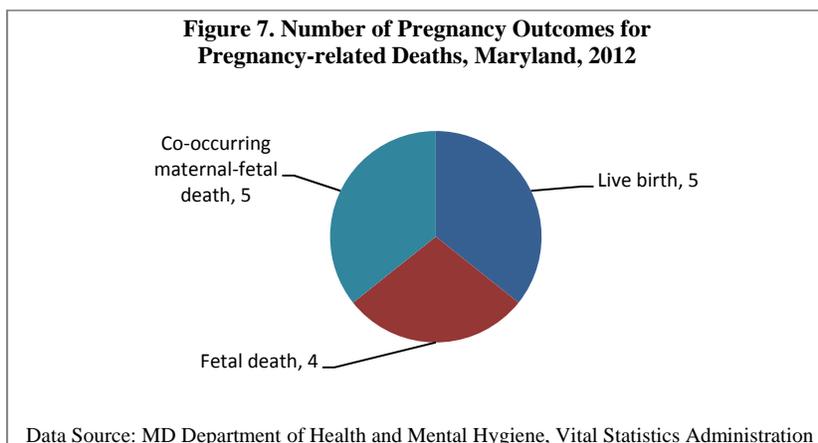
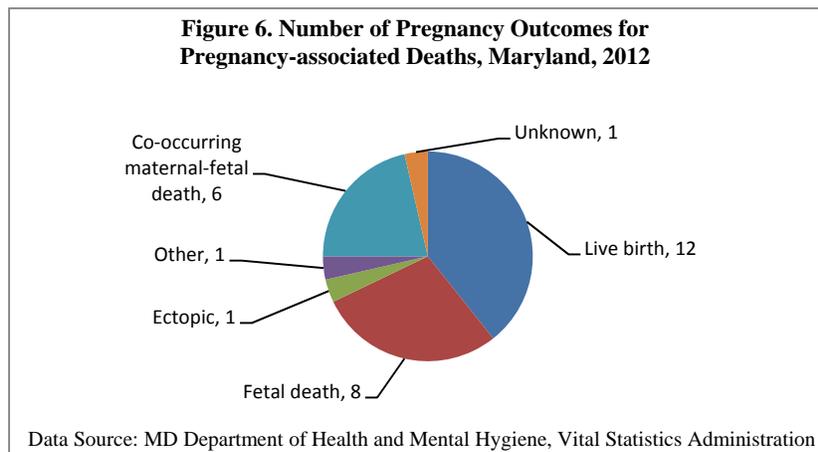


Data Source: MD Department of Health and Mental Hygiene, Vital Statistics Administration



### Cases by Outcome of Pregnancy

In 2012, among pregnancy-associated death cases, 41 percent had a live birth, 28 percent had a fetal death, 21 percent had co-occurring maternal and fetal deaths, three percent had an ectopic pregnancy and seven percent were classified as other or unknown, as shown in Figure 6. Among pregnancy-related death cases, 36 percent had live births, 36 percent were co-occurring maternal and fetal deaths, and 28 percent had a fetal death (see Figure 7). The pregnancy-related death rate among women ages 30-34 years was 6.9 per 100,000 live births. Death rates for other age groups are not reported due to small numbers of deaths leading to unstable rates.

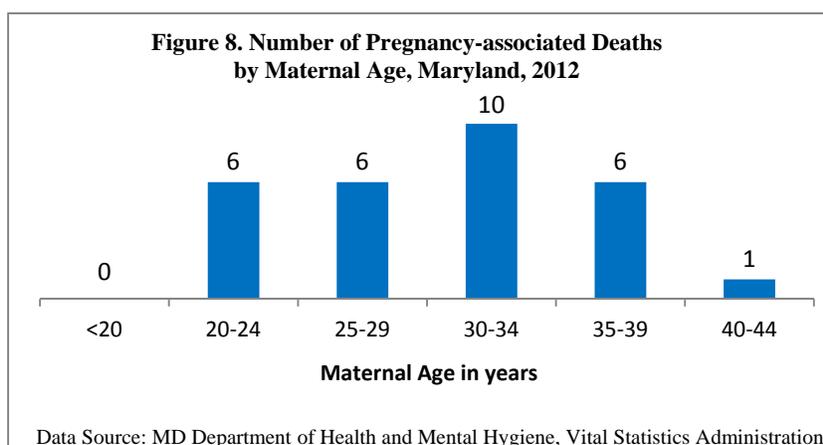


### Cases by Maternal Race and Ethnicity

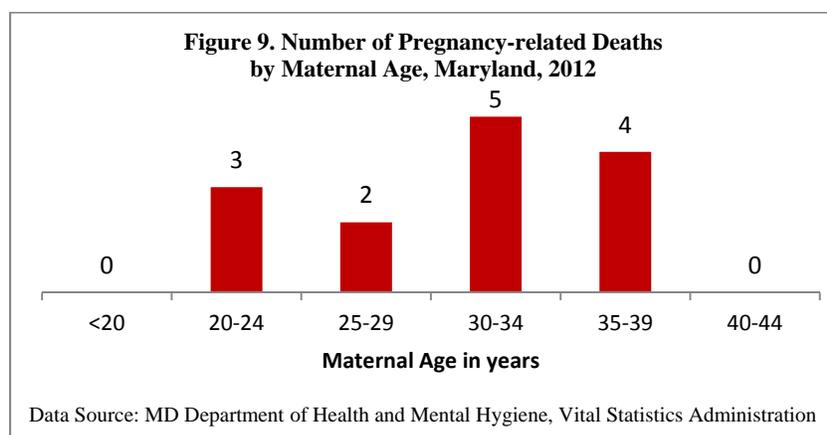
There were 13 pregnancy-associated deaths among non-Hispanic white women, 13 among non-Hispanic black women, and three among non-Hispanic Asian women. There were no pregnancy-associated deaths among Hispanic women in 2012. There were four pregnancy-related deaths among non-Hispanic white women, nine among non-Hispanic black women, and one non-Hispanic Asian death.

### Cases by Maternal Age

The distribution of pregnancy-associated deaths by maternal age group is shown in Figure 8. The highest pregnancy-associated mortality rate occurred among women ages 30-34 years, at 13.7 deaths per 100,000 live births. Intermediate were death rates for women ages 20-24, 25-29, and 35-39 years, all at 8.2 deaths per 100,000. The death rate for women >39 years is not reported due to the small number of deaths leading to unstable rates.



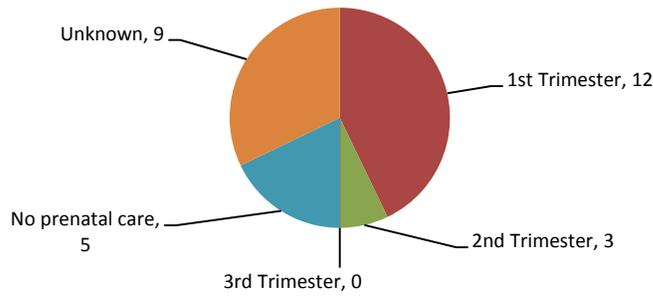
The distribution of pregnancy-related deaths by maternal age group is shown in Figure 9. The pregnancy-related death rate among women ages 30-34 years was 6.9 per 100,000 live births. Death rates for other age groups are not reported due to small numbers of deaths leading to unstable rates.



### Cases by Timing of Prenatal Care Initiation

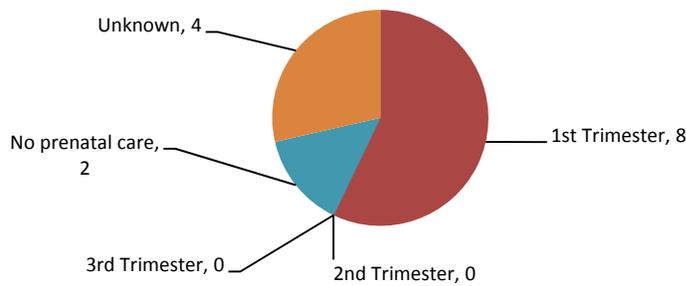
The distribution of pregnancy-associated and pregnancy-related deaths by the trimester when women initiated prenatal care are shown in Figures 10 and 11, respectively. Forty-one percent of pregnancy-associated deaths were among women who initiated care in the first trimester of pregnancy. Fifty-seven percent of the pregnancy-related deaths were among women who received first trimester prenatal care.

**Figure 10. Number of Pregnancy-associated Deaths by Timing of Prenatal Care Initiation, Maryland, 2012**



Data Source: MD Department of Health and Mental Hygiene, Vital Statistics Administration

**Figure 11. Number of Pregnancy-related Deaths by Timing of Prenatal Care Initiation, Maryland, 2012**

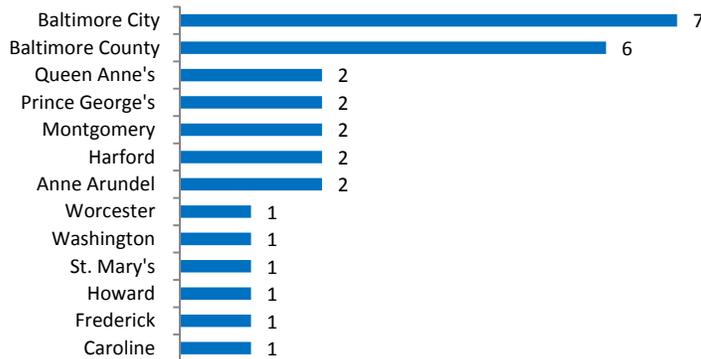


Data Source: MD Department of Health and Mental Hygiene, Vital Statistics Administration

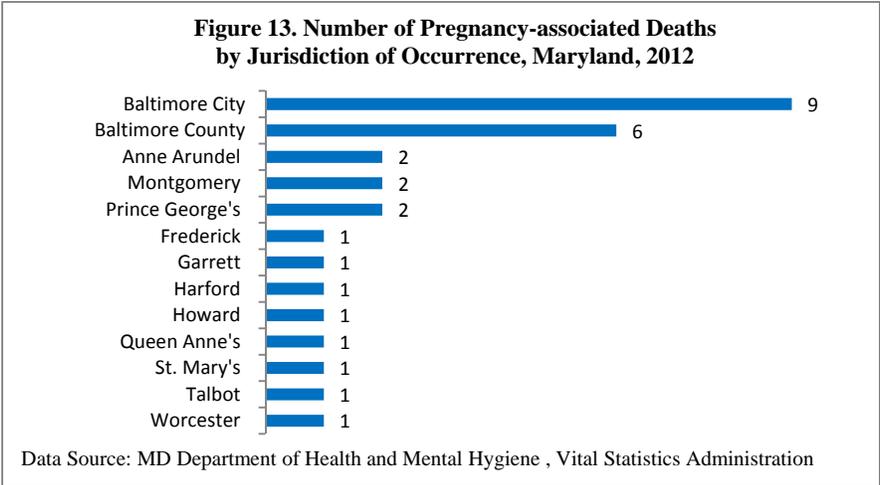
### Cases by Jurisdiction of Residence and Occurrence

Forty-five percent of the 2012 pregnancy-associated deaths were among residents of Baltimore City and Baltimore County, 24 percent and 21 percent respectively (Figure 12). Thirty-one percent of the pregnancy-associated deaths occurred in Baltimore City and 21 percent in Baltimore County (Figure 13).

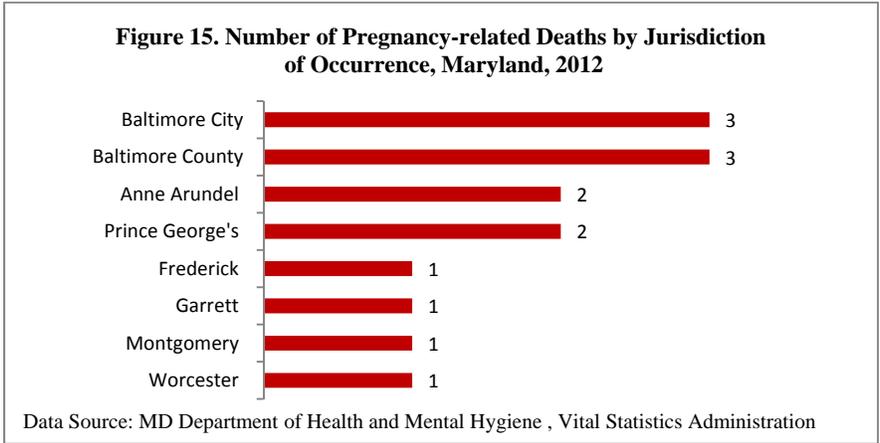
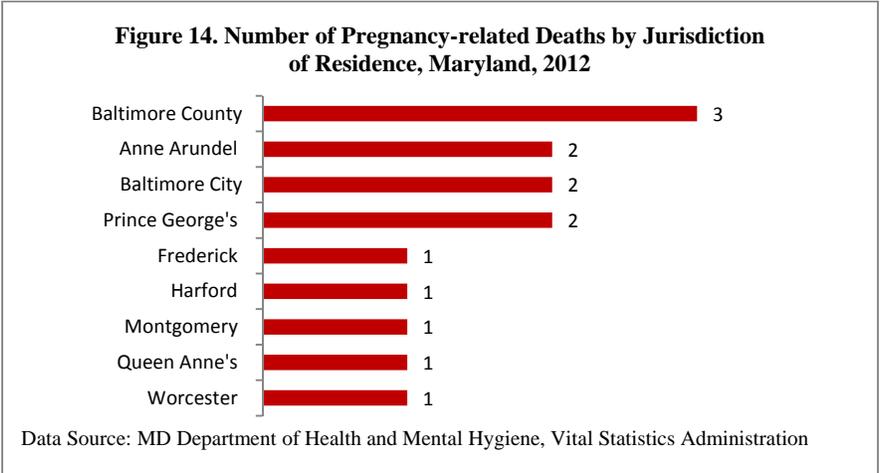
**Figure 12. Number of Pregnancy-associated Deaths by Jurisdiction of Residence, Maryland, 2012**



Data Source: MD Department of Health and Mental Hygiene, Vital Statistics Administration



In 2012, 21 percent of pregnancy-related deaths were among residents of Baltimore County, and 14 percent each among residents of Baltimore City, Anne Arundel, and Prince George’s Counties (Figure 14). Twenty-one percent of the pregnancy-related deaths occurred in Baltimore City and 21 percent in Baltimore County (Figure 15).

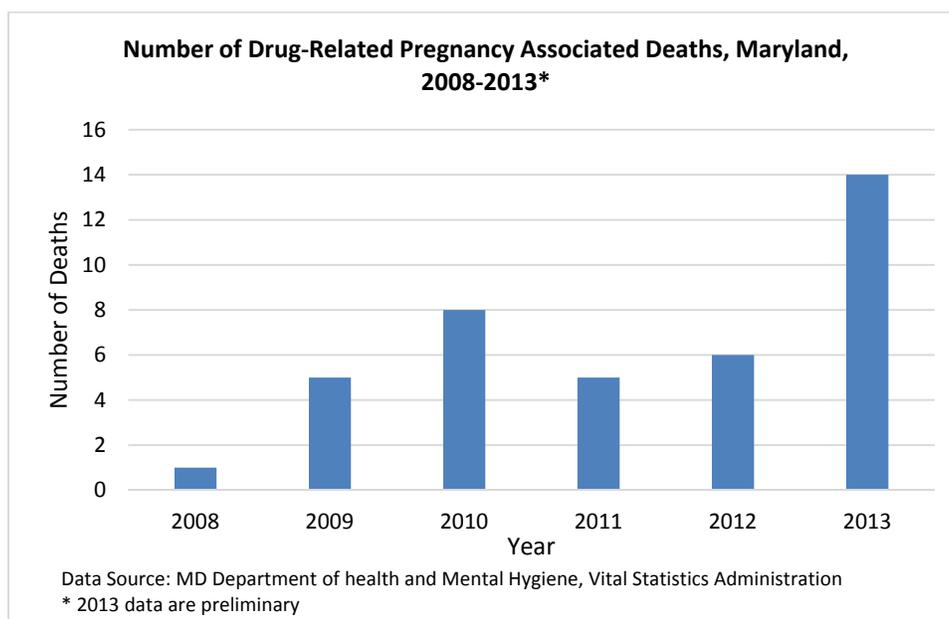


## Focus on Substance Abuse Related Deaths

Substance abuse or substance use disorders in pregnant women are an emerging area of concern for both perinatal care providers and substance abuse treatment providers. According to the National Survey on Drug Use and Health 2012 (NSDUH), among pregnant women ages 15-44, 5.9 percent of women nationwide acknowledged current illicit drug use.<sup>7</sup> In the NSDUH survey, between 2008-2011 7.8 percent of pregnant women ages 15-44 in Maryland acknowledged current illicit substance use but only 3.8 percent indicated that they received treatment in a specialized treatment program for pregnant women.

Substance use during pregnancy may result in premature birth, miscarriage, Neonatal Abstinence Syndrome in exposed newborns, as well as maternal and fetal death. While pregnant substance abusing women are given priority when requesting substance abuse treatment in Maryland, many treatment providers do not feel comfortable providing services for pregnant women, and several geographic areas in the state have few substance abuse treatment resources in general.

In a five year review of maternal deaths, there were 25 pregnancy-associated deaths related to substance abuse in Maryland during the period from 2008-2012 (see Figure 16). Seventy-four percent of these deaths occurred in the last 3 years and substance abuse was the leading cause of pregnancy-associated death in 2010. Oxycodone, morphine, and methadone were the most frequently abused drugs in substance abuse-related deaths, followed by heroin. These drugs were frequently used in combination with other drugs, such as alcohol, cocaine, and psychotropic medication (such as benzodiazepines). The average age at death was 31 years, and 70 percent of deaths were among non-Hispanic white women. While 80 percent of the decedents received some prenatal care, only 35 percent received any substance abuse treatment. Recent data released by the Maryland Vital Statistics Administration report 14 substance abuse-related pregnancy-associated deaths in 2013, with one out of every three pregnancy-associated deaths related to substance abuse, more than any other listed cause of death.<sup>88</sup> The MMR Program is currently reviewing all 2013 pregnancy-associated deaths.



<sup>7</sup> Substance Abuse and Mental Health Services Administration, Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings, NSDUH Series H-46, HHS Publication No. (SMA) 13-4795. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2013.

<sup>8</sup> The complete brief is available at [http://dhmh.maryland.gov/newsroom1/Documents/PA%20death%20brief\\_final.pdf](http://dhmh.maryland.gov/newsroom1/Documents/PA%20death%20brief_final.pdf)

Prenatal care visits provide an important opportunity to screen all pregnant women for substance use disorders and to provide referral to substance abuse treatment. Substance abuse treatment during pregnancy can improve maternal and neonatal outcomes among substance using women. Recognizing the importance of treatment during pregnancy, the Department requires state-funded substance abuse treatment programs to prioritize pregnant women and provide them with services within 24 hours of request. In October 2014, the Department sent a letter to all providers of obstetric care across the State encouraging them to: (1) use clinical tools to identify women with substance use disorders during and after pregnancy; (2) refer patients with substance use disorders to treatment; and (3) register with and use the Maryland Prescription Drug Monitoring Program.<sup>9</sup> The Department launched the Prescription Drug Monitoring Program in December 2013 to support health care providers and their patients in the safe and effective use of prescription drugs, and in identifying potentially harmful drug interactions. The Prescription Drug Monitoring Program assists providers and public health professionals in reducing the misuse, abuse, and diversion of prescription drugs. A letter was also sent to all local health departments requesting their assistance in addressing the opioid overdose public health crisis in Maryland by promoting naloxone to Medicaid patients at high-risk for opioid overdose, promoting Overdose Response Program trainings in their jurisdictions, and continuing to refer people to treatment.

Additionally, in fiscal year 2015, the Department is undertaking two innovative pilot programs to improve substance use treatment providers' ability to treat women while pregnant. The first project will support an expert consultant to provide a statewide phone-based consultation service, offering treatment guidance to substance abuse treatment providers managing pregnant and post-partum women. The second project will fund development of training for substance use treatment providers on best practices for treating pregnant women. Both services will be provided by physicians who are board certified in both obstetrics and addiction medicine. With the provision of additional training and support, the goal of these programs is to improve the quality of care and to encourage more providers to treat pregnant women with substance use disorders, thereby increasing the capacity to provide services to this vulnerable group of Maryland women.

A toolkit for prenatal care providers entitled "*Substance Abuse in Pregnancy: A Clinicians Toolkit for Screening, Counseling, Referral and Care*" was completed by the Regional Perinatal Advisory Group, a public health consortium based at the Baltimore County Health Department that draws participants from multiple local health departments in central Maryland as well as several State agencies. The statewide distribution of the Regional Perinatal Advisory Group toolkit will begin in the fall of 2014. The MMR Committee will be providing information about the toolkit to delivery hospitals and providers. The MMR Committee is also establishing a liaison to the MedChi Addictions Committee, and has invited representation from the Department of Health and Mental Hygiene Behavioral Health Administration to attend substance abuse case reviews and discussions (see Appendix B).

## **Update on Activities Related to Homicide Deaths**

There was one identified homicide among pregnancy associated deaths occurring in 2012. This case was the result of intimate partner violence. Intimate partner violence (IPV) and the risk of homicide continue to be a reality facing too many Maryland women. Recommendations made in the Maryland Maternal Mortality Review 2012 Annual Report included: (1) making training and education about IPV assessment available to health care providers, (2) increasing provider awareness that homicide is a leading cause of pregnancy-associated death and that IPV has a large impact on health, and (3) continuing review of all homicide cases going forward for pregnancy-relatedness and reporting on homicide cases in future annual reports.

To achieve these aims, the Department convened a Maryland IPV Task Force in 2012 to examine the use of screening tools for IPV assessment in the health care setting. The Task Force, comprised of health care

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<sup>9</sup> The letter can be read at <http://dhmh.maryland.gov/newsroom1/Documents/October%202014%20Letter%20to%20OB%20Providers.pdf>.

providers representing the fields of emergency medicine, obstetrics and gynecology, internal medicine, family practice, psychiatry, social work, nursing, nurse practitioner practice, nurse midwifery, physician assistance practice, public health, and pediatrics, recommended routine IPV screening for all women ages 15-50. This recommendation is in agreement with the recent United States Preventive Services Task Force report of evidence-based research to support routine screening of all reproductive aged women for IPV, along with interventions for those who screen positive.<sup>10</sup> To facilitate IPV assessment, the Maryland IPV Task Force developed an algorithm for IPV assessment using a simple 3-question IPV screening tool adapted from evidence-based screens. The screening tool and other information on IPV are available at <http://phpa.dhmh.maryland.gov/mch/SitePages/IPV.aspx>. The Department is conducting ongoing trainings to educate clinicians about IPV assessment and improve screening. Over 800 health care providers have received training to date.

January 2013, Maryland was selected as one of six states and five health sites serving Native communities to receive a Project Connect grant. *Project Connect: A Coordinated Public Health Initiative to Prevent Violence Against Women* is a three year grant supported by the United States Department of Health and Human Services, Office on Women's Health, in partnership with the nonprofit corporation Futures Without Violence. The project is funded through the Violence Against Women Reauthorization Act of 2005. Project Connect Maryland initially integrated intimate partner violence assessment into all health care visits at five pilot Title X family planning sites in the State. Providers were trained to screen all women for abuse and reproductive coercion, to discuss the impact of unhealthy relationships on health, and to connect women who disclose abuse to resources to help them stay safe. In 2014, the second year of the grant, staff at fifteen additional family planning sites have been trained. The goal is to complete training at all Title X family planning sites in grant year 3. Additionally, the Department has initiated a pilot training program for obstetrics and gynecology faculty, residents, medical students and clinic staff at Johns Hopkins University practice sites. These pilot programs will serve as models for expansion of trainings to other locations and programs statewide.

## **Update on Activities Related to Hemorrhage Deaths**

Included in the Maryland Maternal Mortality Review 2013 Annual Report were recommendations in response to the review of obstetric hemorrhage deaths, emphasizing that every delivery hospital should have a written protocol to respond to massive obstetric hemorrhage, and a plan to maximize accuracy in determining blood loss. In 2014, the Maryland Perinatal System Standards for all delivery hospitals in the State were updated. The MMR recommendations related to obstetric hemorrhage were incorporated into the Standards as a requirement for delivery hospitals of all levels of care. The updated Perinatal System Standards are available at [http://phpa.dhmh.maryland.gov/mch/SitePages/perinatal\\_standards.aspx](http://phpa.dhmh.maryland.gov/mch/SitePages/perinatal_standards.aspx). Additionally, obstetric hemorrhage has been adopted as a perinatal quality improvement project by the Maryland Patient Safety Center's Perinatal-Neonatal Learning Network for fiscal year 2015. Learning Network activities include educational events on obstetric hemorrhage, and developing, disseminating, and monitoring implementation of best practices related to hemorrhage in all Maryland delivery hospitals.

## **Summary**

Maryland continues to have a slightly higher maternal mortality rate compared to the U.S. average, and a substantially higher rate than the Healthy People 2020 goal of 11.4 deaths per 100,000 live births. This in part reflects Maryland's increased surveillance efforts to accurately identify maternal deaths in the State. Maryland has been at the forefront of states working to implement enhanced surveillance methods to identify pregnancy-associated deaths. These methods include revision of the death certificate to include

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<sup>10</sup> Recommendation Summary. U.S. Preventive Services Task Force. September 2014. <http://www.uspreventiveservicestaskforce.org/Page/Topic/recommendation-summary/intimate-partner-violence-and-abuse-of-elderly-and-vulnerable-adults-screening>

questions about pregnancy within the year prior to death, review of medical examiner records, linkage of women's death certificates with birth certificates and fetal death certificates from the previous year, and detailed case review by the MMR Committee. Twenty-nine pregnancy-associated deaths were identified in 2012. While this represents a marked decrease in maternal deaths from the previous year, subsequent years will determine if this is a continuing trend.

Non-cardiovascular medical conditions were the leading cause of pregnancy-associated deaths, followed by deaths related to substance abuse. Seventeen of the 29 pregnancy-associated deaths (59 percent) were considered preventable or potentially preventable. Of the six substance abuse related deaths, all were determined to be preventable or potentially preventable. Eight deaths were determined not to be preventable and preventability could not be determined for four deaths.

All cases were reviewed for pregnancy-relatedness. Fourteen cases were determined to be pregnancy-related, with the cause of death related to or aggravated by the pregnancy or its management. Again, non-cardiovascular medical conditions were the leading cause of pregnancy-related deaths, followed by pregnancy-induced hypertension. Ten of the 14 pregnancy-related deaths (71 percent) were considered preventable or potentially preventable. Two deaths were determined not to be preventable and preventability could not be determined for two deaths.

Moving forward, the Maternal Mortality Review Program will broaden its dissemination of findings and recommendations in this report, and promote communication and collaboration with providers outside of obstetrics (including substance abuse treatment and mental health) to support efforts to reduce pregnancy-related deaths in Maryland. Appendix B to this report outlines the complete recommendations of the MMR Committee based on review of 2012 deaths.

**Appendix A**

**Maryland Maternal Mortality Review  
Case Discussion Guide**

Date: \_\_\_\_\_ Case # \_\_\_\_\_

Purpose: To review pregnancy-associated deaths in order to classify cases, identify trends in mortality, and develop recommendations for systems change.

Case Definition: Death of a woman while pregnant or within 365 days of pregnancy conclusion

1. Medical Care and Non-medical Causes Underlying the Death

**Quality/content of medical care**

- |  |  |
|--|--|
| <input type="checkbox"/> Preventive services                             | <input type="checkbox"/> Postpartum care and follow-up   |
| <input type="checkbox"/> Community and patient education                 | <input type="checkbox"/> Management & treatment          |
| <input type="checkbox"/> Nutrition, substance abuse, and social services | <input type="checkbox"/> Diagnostic procedures           |
| <input type="checkbox"/> Preconception services                          | <input type="checkbox"/> Medical interventions           |
| <input type="checkbox"/> Prenatal care                                   | <input type="checkbox"/> Patient education and follow-up |
| <input type="checkbox"/> Labor and delivery services                     |  |

**Non-medical (social) causes underlying the death**

- Intendedness of pregnancy
- Woman's and her family's knowledge about pregnancy & its possible complications
- Timeliness on the part of the woman in recognizing a problem & taking action
- Accessibility/acceptability of healthcare (cultural/experience/financial/geographic/transportation/logistic)
- Cultural competence and communication skills of health care providers
- Woman's adherence or non-adherence to medical advice and health interventions

2. Issues specific to this case

Individual Behavior: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Provider Practice: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Institutional/ Systems Issues: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Additional issues: \_\_\_\_\_  
\_\_\_\_\_

Sources of Information: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Information Missing: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

1. Type of Case:

Pregnancy-related (causes related to or aggravated by pregnancy or its management)

Not Pregnancy-related (cause unrelated to pregnancy)

Undetermined

Due to: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. This case was:

Preventable ( individual  provider  institutional/systems issues)

Potentially Preventable ( individual  provider  institutional/systems issues)

Undetermined

Not Preventable

3. Resources or services needed but  not used or  not available:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Recommendation(s) to address issues in this case:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Appendix B

**Maryland Maternal Mortality Review Committee  
Health Systems Issues and Recommendations  
2012 Deaths**

In fiscal year 2014, the Maternal Mortality Review Committee reviewed 29 deaths that occurred in 2012. The MMR Committee has decided to focus its recommendations on substance abuse, cardiomyopathy, and preeclampsia. The MMR Committee would like to address these causes of death with the following recommendations:

Cause of Death	Key Findings	Recommendations	Action Items
<b>Substance Abuse</b>	<ol style="list-style-type: none"> <li>1. Lack of communication between prenatal care providers and substance use disorder treatment programs, including providers of methadone and buprenorphine. (This information is federally protected.)</li> <li>2. Lack of ongoing case worker intervention after delivery.</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase the awareness of the need for specific substance abuse treatment during pregnancy.</li> <li>2. Take steps to improve communication between providers.</li> <li>3. Promote the Regional Perinatal Advisory Group Substance Abuse Tool Kit.</li> <li>4. Establish communication with the Behavioral Health Administration at DHMH.</li> </ol>	<ol style="list-style-type: none"> <li>1. Send out blast fax and/or emails with information about how to obtain the Regional Perinatal Advisory Group tool kit to chairs of Maryland hospitals with delivery services and to MedChi members specializing in OB/Gyn, Internal Medicine, and Family Medicine.</li> <li>2. Establish liaison from MMR to attend MedChi Addictions Committee Meetings and report relevant updates.</li> <li>3. Invite a representative from the Behavioral Health Administration to attend MMR workgroup meetings in reference to substance abuse cases.</li> </ol>
<b>Cardiomyopathy</b>	<ol style="list-style-type: none"> <li>1. Delay in diagnosis</li> <li>2. Late postpartum death</li> </ol>	<ol style="list-style-type: none"> <li>1. Screening should occur if symptoms or exam are out of proportion to changes expected with pregnancy.</li> <li>2. Screening should consist of questions related to activity level, chest pain, and shortness of breath as in any pre-operative assessment.</li> <li>3. If there is concern about screening questions or activity level such as shortness of breath with a recovery time &gt;3 minutes walking up steps, then further assessment with EKG, Echo, and possibly cardiac consultation should follow.</li> </ol>	<ol style="list-style-type: none"> <li>1. Create a special bulletin/ newsletter to send to the Cardiology community regarding postpartum deaths (Maryland Chapter, American College of Cardiologists).</li> <li>2. Create bulletin/ newsletter that will focus on screening for early cardiac disease and send to practicing OB/Gyn and Family Medicine physicians, and nurse midwives through Maryland chapter of American College of Obstetrics and Gynecology, Maryland Association of Family Physicians (MAFP), MedChi listserv, Hospital OB/Gyn Chairs, and Maryland Chapter of American College of Nurse Midwives (ACNM).</li> </ol>

<b>Preeclampsia</b>	<ol style="list-style-type: none"> <li>1. Delay in recognition or diagnosis</li> <li>2. Variation in treatment</li> <li>3. Late postpartum onset unrecognized</li> </ol>	<ol style="list-style-type: none"> <li>1. All obstetric patients should be educated about the risks, symptoms, and signs of preeclampsia; women with a history of preeclampsia requiring preterm birth before 34 weeks or preeclampsia in more than one previous pregnancy may be started on ASA 81 mg in late first trimester.</li> <li>2. Patients with preeclampsia with severe features, who are being induced, should make progress toward delivery within 24 hours or less. (Confirmation of fetal presentation prior to induction is standard practice.)</li> <li>3. Patients presenting with preeclampsia requiring immediate delivery should be stabilized prior to transfer to the operating room; this includes the administration of a magnesium sulfate bolus and lowering blood pressure out of the severe range.</li> <li>4. Patients with preeclampsia should have a postpartum visit within 1 week of discharge from the delivery hospital to assess for risk of blood pressure elevation and severe postpartum preeclampsia.</li> </ol>	<ol style="list-style-type: none"> <li>1. Create grand rounds template using resources from recent American College of Obstetrics and Gynecology publications and send to Maryland hospital OB/Gyn Chairs.</li> <li>2. Create a one page bulletin/ alert regarding new pregnancy induced hypertension management guidelines to be brought to the attention of the obstetric and nursing staff. This will be sent to all Maryland OB/Gyn Dept. Chairs and the Maryland Chapter of American College Nurse Midwives.</li> </ol>
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