



STATE OF MARYLAND

**DHMH**

Maryland Department of Health and Mental Hygiene

201 W. Preston Street • Baltimore, Maryland 21201

Martin O'Malley, Governor – Anthony G. Brown, Lt. Governor – John M. Colmers, Secretary

**DEC 15 2009**

The Honorable Martin O' Malley  
Governor  
State of Maryland  
Annapolis, MD 21401-1991

The Honorable Thomas V. Mike Miller, Jr.  
President of the Senate  
H-107 State House  
Annapolis, MD 21401-1991

The Honorable Michael E. Busch  
Speaker of the House  
H-101 State House  
Annapolis, MD 21401-1991

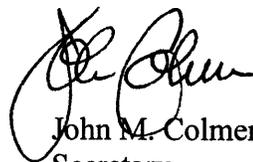
Re: SB 688 (Ch. 262, 2003), formerly SB 459 (Ch. 74) of the Acts of 2000  
2009 Legislative Report on the Maternal Mortality Review Program

Dear Governor O' Malley, President Miller and Speaker Busch:

Pursuant to Health-General Article, §13-1201 through §13-1207, Annotated Code of Maryland, the Department of Health and Mental Hygiene submits this legislative report on the findings, recommendations, and program actions of the Maternal Mortality Review Program.

If you have questions concerning this report, please contact Ms. Anne Hubbard, Director, Office of Governmental Affairs, at (410) 767-6481. The Department looks forward to working with you and other members of the General Assembly as we continue to explore ways to reduce maternal deaths in Maryland.

Sincerely,



John M. Colmers  
Secretary

Enclosure

cc: Frances B. Phillips, R.N., M.H.A.  
Russell W. Moy, M.D., M.P.H.  
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Anne Hubbard, M.B.A.  
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MARYLAND DEPARTMENT OF HEALTH AND MENTAL HYGIENE  
FAMILY HEALTH ADMINISTRATION  
CENTER FOR MATERNAL AND CHILD HEALTH

Maternal Mortality Review Program

2009 ANNUAL REPORT

Martin O'Malley  
Governor

Anthony G. Brown  
Lieutenant Governor

John M. Colmers  
Secretary  
Department of Health & Mental Hygiene

Frances B. Phillips  
Deputy Secretary, Public Health Services  
Department of Health & Mental Hygiene

## I. Introduction

During the 2000 Maryland General Assembly, Senate Bill 459 (Health General Article §§13-1201-1207, Annotated Code of Maryland) was enacted to establish maternal mortality review in Maryland. The statute requires: (1) identification of maternal death cases; (2) review of medical records and other relevant data; (3) determination of preventability of death; (4) development of recommendations for the prevention of maternal deaths; and (5) dissemination of findings and recommendations to policymakers, health care providers, health care facilities and the public. The three-year sunset provision was removed during the 2003 legislative session. The Maryland Department of Health and Mental Hygiene (Department) conducts maternal mortality review in consultation with MedChi, the Maryland State Medical Society. Funding has been made available from the Department's Center for Maternal and Child Health (CMCH) to MedChi since June 2001 to investigate pregnancy-associated deaths in Maryland and identify opportunities to reduce maternal mortality. MedChi's Maternal and Child Health (MCH) Committee provides consultation to the Department regarding maternal mortality review activities, develops recommendations for the prevention of maternal deaths, and disseminates findings and recommendations to policy makers, health care providers, health care facilities, and the general public.

## II. National and State Data

Maternal mortality is complicated by the use of various definitions. A **maternal death** is defined by the World Health Organization's (WHO) International Classification of Diseases Ninth Revision (ICD-9) and Tenth Revision (ICD-10) to be "the death of a woman while pregnant or within 42 days of conclusion 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." This definition is used by the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) in calculating the **maternal mortality ratio (MMR)** in the United States. The MMR is defined as the number of maternal deaths per 100,000 live-births in the same time period. This ratio is utilized for national and international comparisons.

In 1986, the Centers for Disease Control and Prevention (CDC) and the American College of Obstetricians and Gynecologists (ACOG) collaborated to issue a statement recommending the use of two enhanced surveillance definitions as an approach to more accurately identify deaths among women in which pregnancy was a contributing factor. A **pregnancy-associated death** is defined as "the death of a woman while pregnant or within one year or 365 days of pregnancy conclusion, regardless of the cause of death." A **pregnancy-related death** is defined 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 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. An enhanced surveillance method is necessary to determine pregnancy-associated deaths and will be discussed below.

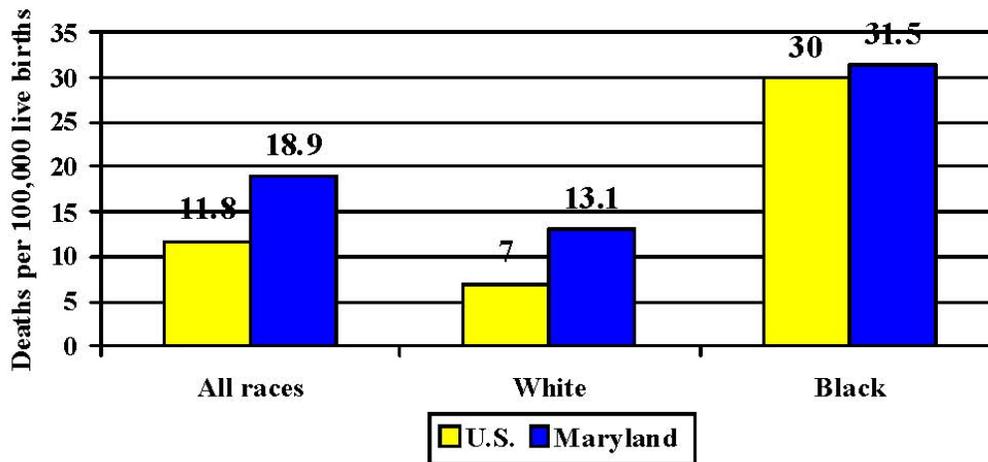
The NCHS uses strict criteria to define deaths included in the MMR based upon information from the death certificates alone. Enhanced surveillance using multiple sources including case review will identify additional cases at the State level, which meet the WHO definition. It is expected that as Maryland and other states enhance surveillance, the MMR will increase by this improved identification process.

The Healthy People 2010 MMR target is 3.3 deaths per 100,000 live births, the same goal as Healthy People 2000, which was not met. Nationally, maternal mortality has declined dramatically since the 1930s when the MMR was 670 maternal deaths per 100,000 live births. The MMR achieved its lowest levels in the early 1980s. However, the MMR rose in the 1990s. The national MMR for 2001-2005 was 11.8 maternal deaths per 100,000 live births. For the same period, Maryland's MMR was 18.9. A five-year average ratio is used because maternal deaths are relatively infrequent events that may vary considerably year-to-year, particularly in a small state like Maryland. Figure 1 below provides a comparison between the maternal mortality ratio for the U.S. and Maryland by race.

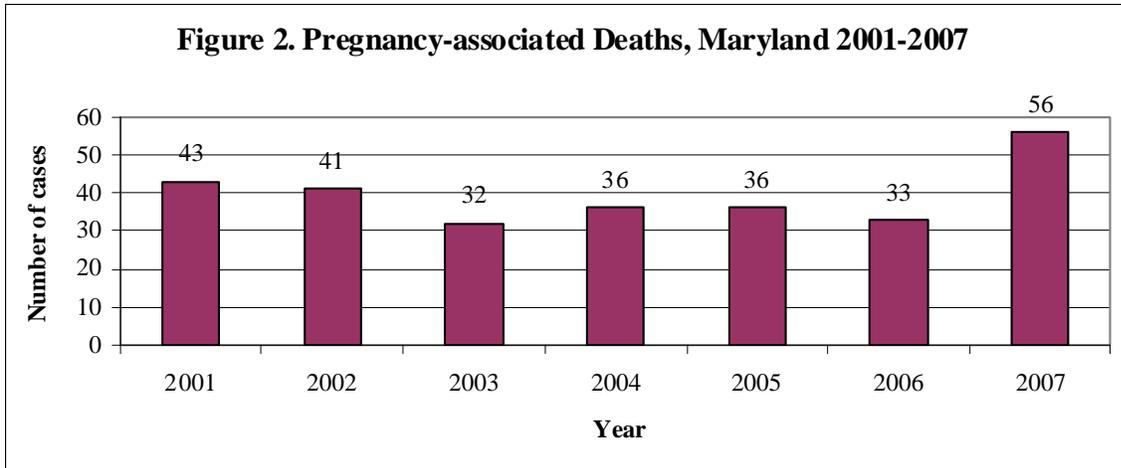
For 2005, the U.S. maternal mortality rate was 15.1 deaths per 100,000 live births. The national rate was 13 in 2004 and 12 in 2003, which was also the first year the maternal death rate was more than 10 since 1977.

In the U.S., black women have an MMR more than four times greater than that for white women, a disparity that has persisted since the 1940s. For Maryland, the MMR for black women is over twice the MMR for white women, and is slightly higher than the U.S. average while that for white women is nearly double the national average.

**Figure 1. Maternal Mortality Ratio by Race  
U.S. and Maryland 2001-2005**



In Maryland, the number of pregnancy-associated deaths, tracked by the Maternal Mortality Review Program between 2002 and 2006, demonstrated a five-year average of 36 deaths per year. Figure 2 shows the number of pregnancy-associated deaths in Maryland from 2001 to 2007.



The number of pregnancy-associated deaths, tracked by the Maternal Mortality Review Program between 2003 and 2007, demonstrates a five-year average of 39 deaths per year.

### **III. Maternal Mortality Review Process in Maryland**

#### 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 jurisdictions 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 jurisdictions. These deaths account for a maximum of two to four per year or approximately 10-15 percent of the total pregnancy-associated deaths.

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 the checkbox questions or because the cause of death is clearly related to pregnancy, such as ruptured ectopic pregnancy. The Maryland death certificate was revised in January 2001 to include questions about pregnancy status and date of delivery for the 12 months preceding death. Maryland is one of at least 18 jurisdictions that include questions specifically designed to improve identification of maternal deaths on the death certificate. The pregnancy checkbox has significantly increased identification of pregnancy-associated deaths from those recognized by cause of death alone. In a 2005 article in the American Journal of Public Health, Dr. Isabelle Horon of the Department reported that only 62% of Maryland maternal deaths in the years 1993-2000 were identified by cause-of-death information alone. One would expect even fewer pregnancy-associated deaths to be identified in this manner. The second method of determining cases 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 by examining death certificates alone. Thirdly, cases were identified by looking for evidence of pregnancy in deceased women through a manual review of files from deaths reported to the Office of the Chief Medical Examiner (OCME). All deaths occurring within 365 days of pregnancy conclusion were subsequently designated as pregnancy-associated and further investigated. Using these three methods, 56 pregnancy-associated deaths were identified in 2007. The purpose of this report is to review these 56 deaths.

## Case Review

Pregnancy-associated deaths for 2007 underwent several stages of review under the auspices of the MedChi MCH Committee. Once cases were identified, medical records were obtained from the hospitals of death and delivery when applicable. A physician consultant reviewed death certificates, hospital records and OCME records for all cases. A group of clinical experts representing perinatal centers around the State reviewed the data on all deaths from 2007.

The Maternal Mortality Workgroup reviews selected cases determined to be preventable or potentially preventable for detailed review. Pregnancy-relatedness and opportunities for prevention of cases are determined through discussion. The Workgroup includes general obstetric, perinatology, family practice, pediatric and nurse-midwifery specialties. The Workgroup's discussion incorporates the CDC framework for case review outlined in "Strategies to Reduce Pregnancy-Related Deaths: From Identification to Action." This approach takes into account medical and non-medical factors contributing to maternal death and examines quality and content of medical care.

Medical, non-medical or social causes underlying the maternal death include factors such as:

- Intendedness of pregnancy
- Woman's and her family's knowledge about pregnancy
- Timeliness on the part of the woman in recognizing a problem
- Accessibility and acceptability of health care
- Cultural competence and communication skills of health care providers
- Woman's adherence or non-adherence to medical advice and health interventions
- Individual factors such as pre-existing medical conditions, obesity, and substance abuse

Quality and content of medical care on a provider team and institutional level includes factors such as:

- Preventive services
- Community and patient education
- Nutrition, substance abuse, and social services
- Preconception services
- Prenatal care
- Labor and delivery services
- Postpartum care and follow-up
- Treatment and management
- Diagnostic procedures
- Medical interventions
- Patient education and follow-up

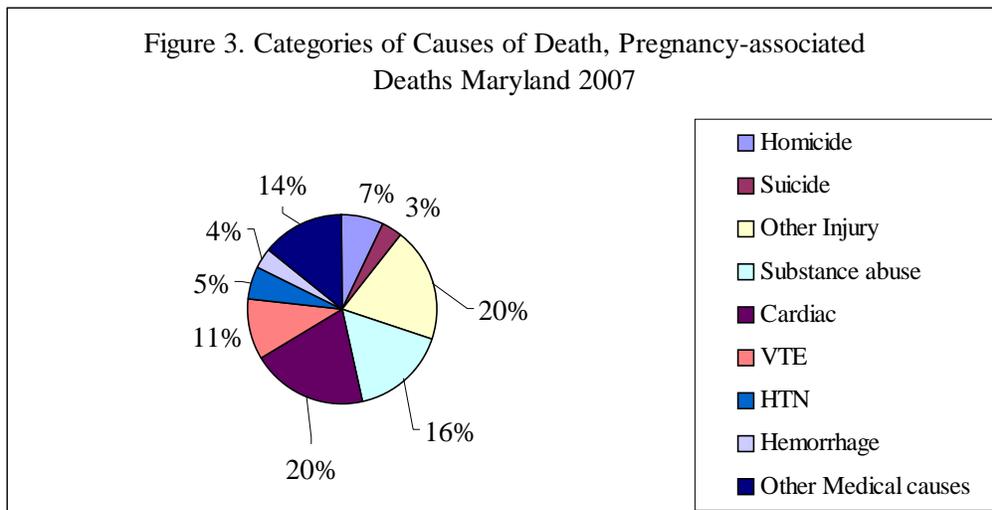
The Maternal Mortality Workgroup is a subcommittee of the MedChi MCH Committee. Cases discussed by the Workgroup are de-identified and members sign confidentiality statements. The Maternal Mortality Policy Subcommittee meets to review system issues identified through case reviews and to develop recommendations. The Policy Subcommittee includes representation from managed care, nursing and social work in addition to the Maternal Mortality Workgroup members. All those involved in any phase of the case review process were included in a final review of systems issues and recommendations under the auspices of the MCH Committee.

#### IV. Case Findings in Maryland

As previously indicated, a total of 56 pregnancy-associated cases were found for 2007. There were 19 deaths that were determined to be pregnancy-related, while the remaining 37 were either determined not to be related to pregnancy or the relatedness to pregnancy could not be determined. The resulting estimated pregnancy-related mortality ratio was 24.3 maternal deaths per 100,000 live births. The estimated 2007 pregnancy-related mortality ratios in Maryland were 19.4 per 100,000 live births for white women, 38.0 per 100,000 live births for black women, and 18.9 per 100,000 live births for Hispanic women.

##### Cause of Death Classification

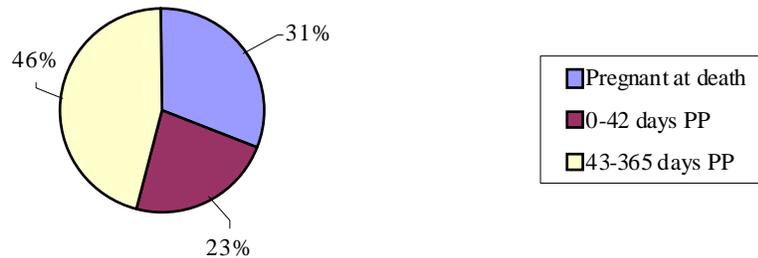
The leading causes of 2007 pregnancy-associated deaths were cardiovascular disease, injury, and substance abuse. Approximately 54 percent of pregnancy-associated deaths were due to natural causes (excludes homicide, suicide, and substance abuse), 10 percent to intentional injury (homicide and suicide), and 20 percent to unintentional injury. The remaining 16 percent of deaths were a result of substance abuse, but the manner of death was undetermined for these deaths. Figure 3 shows the leading causes of death for both medical (natural) and non-medical causes.



##### Cases by Timing of Death

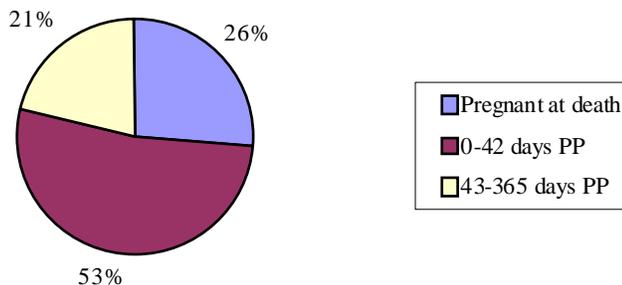
The majority of pregnancy-associated deaths occurred after 42 days postpartum. Of all the deaths, 31 percent occurred during pregnancy, 23 percent during the intrapartum period or within six weeks postpartum, and the remaining 46 percent occurred between 43 and 365 days postpartum. Figure 4 shows the distribution of deaths by timing of death.

Figure 4. Percentage Distribution of Timing of Pregnancy-associated Deaths, Maryland 2007



For pregnancy-related deaths (Figure 5), the majority (53%) occurred within six weeks post-partum and 26 percent while pregnant. The 21 percent of deaths that occurred after six weeks postpartum were all from cardiac disease. The deaths occurring after the six-week postpartum period were identified as a result of the enhanced surveillance approach to accurately estimate deaths related to pregnancy.

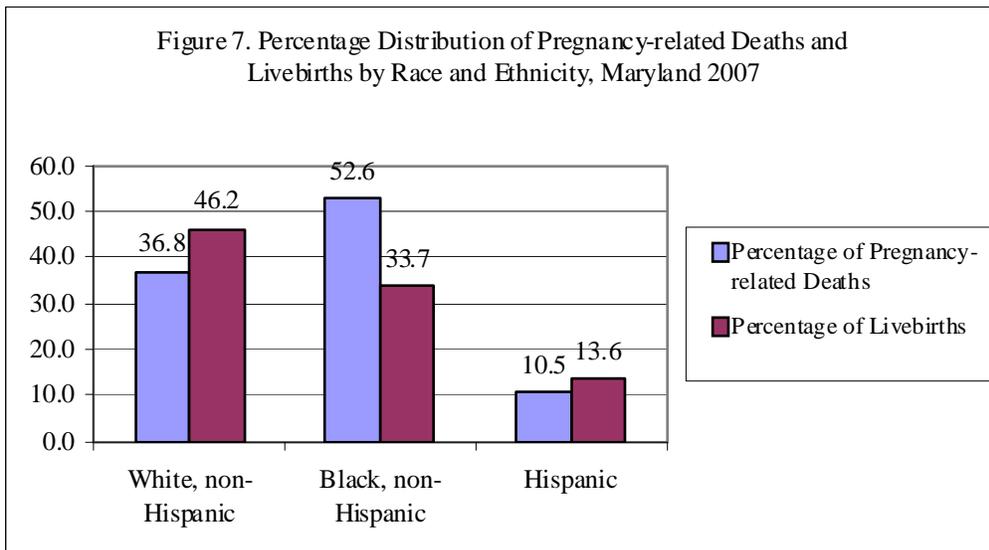
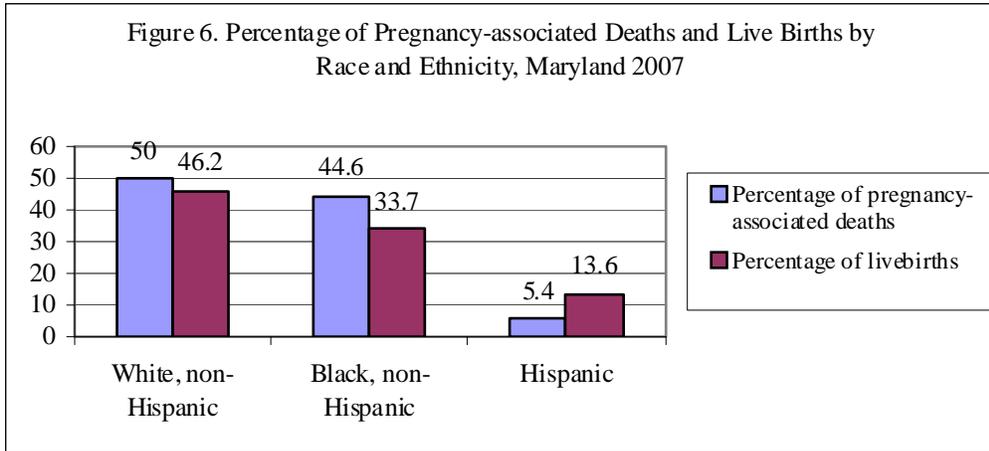
Figure 5. Percentage Distribution of Timing of Pregnancy-related Deaths, Maryland 2007



Cases by Maternal Race and Ethnicity

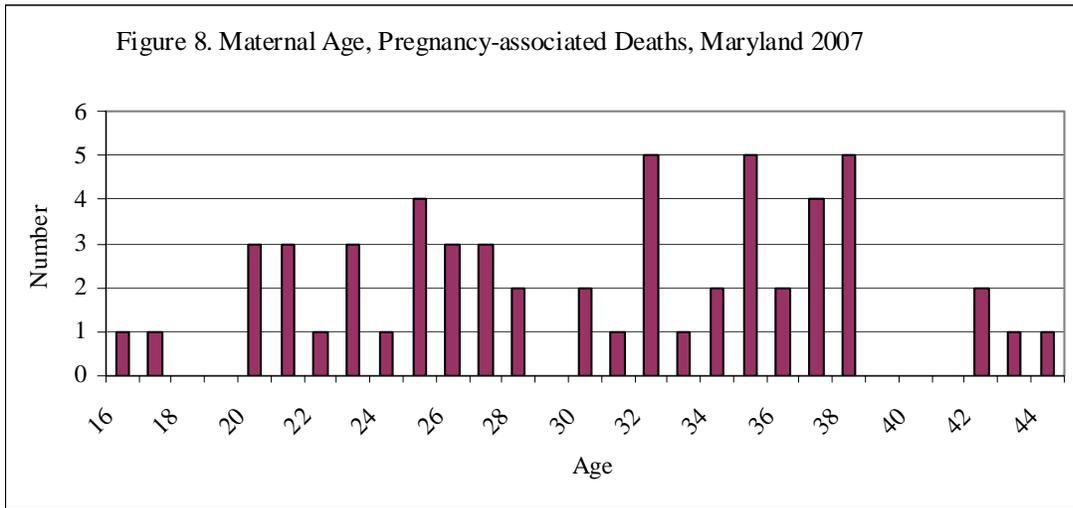
Figure 6 illustrates the racial distribution of pregnancy-associated deaths, while pregnancy-related deaths are presented in Figure 7. Among the 56 pregnancy-associated deaths, 44.6 percent occurred among black women, 50 percent among white women, and 5.4 percent among Hispanic women. In comparison, the distribution of live births is as follows: 33.7 percent among black women, 46.2 percent among white women, and 13.6 percent among Hispanic women. The persistent racial

disparity is clearly evident in the distribution of pregnancy-related deaths: 52.6 percent for black women, 36.8 percent for white women, and 10.5 percent for Hispanic women.

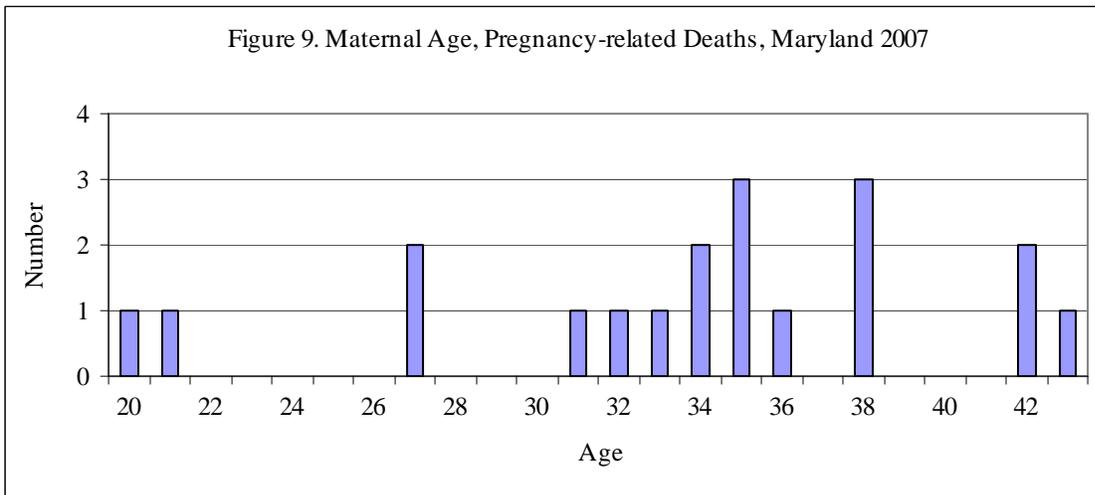


Cases by Maternal Age

The ages of the decedents for pregnancy-associated deaths ranged from 16 to 44 years, as shown in Figure 8.



The age range was 20 to 43 years for pregnancy-related deaths (see Figure 9.)



Cases by Outcome of Pregnancy

In 2007, among the pregnancy-associated deaths, the outcome of pregnancy was as follows: live birth (64%), pregnant at time of death (29%), and termination of pregnancy (7.0%). There were no deaths following fetal losses or ectopic pregnancies in 2007.

Figure 10. Pregnancy Outcome for Pregnancy-associated Deaths, Maryland 2007



## V. Recommendations

### Problem#1: Thirty-two Percent of the Pregnancy-associated Deaths Were Directly Attributable to Substance Abuse and/or Involved Women with a History of Substance Abuse.

Substance abuse continues to be associated with a large number of pregnancy-associated deaths. The types of substances abused included alcohol, cocaine, heroin, methadone, and prescription medications. Significant issues facing these women include lack of prenatal care, lack of programs and services to manage substance abuse in pregnancy, co-morbid conditions (especially psychiatric conditions), polysubstance use, fear of Child Protective Services action if identified as a substance user, and delayed care due to fears and lack of access to care. Substance abuse during pregnancy impacts the health and well-being of infants of the affected women at the birth directly through preterm delivery, placental abruption and other medical consequences, as well as longer-term consequences on child health and well-being.

Recommendation #1a: Convene a Statewide panel of stakeholders to develop strategies for addressing the issue of substance abuse during pregnancy and the impact on child health and well-being.

Stakeholders should include hospitals, managed care organizations (MCOs), specialty societies, the Maryland Hospital Association, the Department's Alcohol and Drug Abuse Administration, local health departments, providers, policymakers and the community at large. The exchange of information possible with such a panel will allow the development of strategies to prevent pregnancy-related deaths related to substance abuse, such as programs in which addiction specialists are key partners in prenatal and postnatal care (both outpatient and inpatient) with medical providers. Furthermore, State policies and public funding should reflect the need for pregnant and postpartum women to receive obstetric care that includes an addiction specialist. An example would be funding allocated to outpatient facilities that are staffed and equipped for obstetric and postpartum patients with substance abuse problems.

Recommendation #1b: Increase identification of pregnant women with substance abuse problems.

Substance abuse screening should be considered for pregnant women at entry into prenatal care and at admission to labor and delivery. Emergency departments are often the point of entry for care among women with substance abuse problems, and may be the only source of care during the antenatal period, and provide another opportunity for substance abuse screening.

Problem #2: Cardiac Causes Made Up 20 Percent of the Pregnancy-associated Deaths and 42 Percent of the Pregnancy-related Deaths in 2007.

There were 11 pregnancy-associated and eight pregnancy-related deaths due to cardiac causes in which the majority of women had BMIs greater than 30 or weighed more than 200 pounds during their pregnancies. Additionally, complaints of shortness of breath among obese postpartum patients could be due to cardiac problems. Although the cardiac-related deaths were likely not preventable at the time they presented for care, early recognition of cardiac dysfunction during pregnancy may have some impact on optimizing antenatal and postpartum care for these women in Maryland.

Recommendation #2: Conduct antenatal cardiac evaluations for obese women with co-existing hypertension or symptoms of cardiac disease and for asymptomatic women who are morbidly obese. It is essential that key stakeholders (e.g. hospitals, medical societies, MCOs, providers) are made aware of these findings and recommendation.

Problem #3: Venous Thromboembolism is a Risk During the Postpartum Period.

There were three women who died of pregnancy-related venous thromboembolism during the postpartum period, all of whom underwent cesarean section delivery. There was no documentation in their medical records of the use of prophylaxis for deep venous thrombosis (DVT) after their procedures.

Recommendation #3: All birthing hospitals in Maryland should have a protocol for DVT risk assessment and prophylaxis for cesarean section delivery.

Problem #4: Lack of Prenatal Care Increases the Risk of Hypertension.

Two of the three deaths from pregnancy-related hypertension occurred in women who had no prenatal care. These deaths were determined as being preventable if the women had received prenatal care and had early recognition of high blood pressure and earlier delivery.

Recommendation #4: Increase community and patient awareness about the danger of hypertensive disorders during pregnancy and the need to seek prenatal care prior to delivery.

Problem #5: Death Certificates Contain Incomplete Pregnancy-related Data.

A number of death certificates had the unknown box checked off instead of the pregnancy-related information being completed.

Recommendation #5: The Vital Statistics Administration should audit death certificates and medical records to determine the need for staff training in completion of death certificate data.

Problem #6: There is a Lack of Medical Records for Cases Identified Through Enhanced Surveillance.

Access to complete medical records was a significant problem in conducting the review of 2007 deaths, especially for deaths from medical causes in 2007.

Recommendation #6: Communicate records requests with hospital directors and departmental Chairs of Obstetrics and Gynecology, in addition to requesting records from the medical records departments of the hospitals.

## **VI. Maternal Mortality Review Related Activities**

### **The Maryland Patient Safety Center Perinatal Learning Network**

The Maryland Patient Safety Center (MPSC) Perinatal Collaborative began in February 2007. The MPSC is a collaboration between the Delmarva Foundation and the Maryland Hospital Association. The Perinatal Collaborative brought together hospitals that provide obstetrical services to Maryland residents. Teams from each hospital's labor and delivery unit participated in learning sessions and were able to share experiences and practice methods via a Web-based electronic portal. The work of the Perinatal Collaborative has been continued as the Perinatal Learning Network. The mission of the Perinatal Learning Network is to reduce maternal and infant harm through the implementation and integration of systems improvements and team behaviors into maternal-fetal care. The Planning Committee for the Perinatal Learning Network was also expanded to include representation from teams at all three nursery levels. Participants now represent 25 hospitals in Maryland and two in the District of Columbia. Two new teams joined the Network in 2008—Sibley Memorial Hospital and University of Maryland Medical Center.

A vital resource that has developed from the creation of the Perinatal Learning Network is their Listservs. There are currently two Listservs that are active: Obstetrical Chair Listserv for Department Chairs in Maryland and Washington, DC, and another for all participants of the Learning Network. Both Listservs have provided an opportunity for the exchange of knowledge and ideas on a wide variety of topics pertinent to labor and delivery. Since the Perinatal Collaborative Listservs inception on February 15, 2007, there have been 902 messages exchanged on wide variety of topics. There are 263 members on the Perinatal Collaborative Listserv.

In November of 2009 the Maryland Patient Safety Center will partner with the the Department's Family Health Administration to host a Webinar, "A Strategic Approach for Reducing Infant Mortality in Maryland - Focusing on Comprehensive Women's Health." The target audience for the Webinar includes legislators, local health officers, Maryland hospitals, the Maryland Judiciary, and the Governor's Office - a total of at least 200 participants.

### **Maryland Advanced Perinatal Systems and Services (MAPSS)**

The University of Maryland School of Medicine, in collaboration with Johns Hopkins, has established the Maryland Advanced Perinatal Systems and Services (MAPSS) Program. The program is led by Hugh E. Mighty, MD, FACOG, Chairman, Department of Obstetrics, Gynecology & Reproductive Sciences at the University of Maryland. MAPSS provides high-risk perinatal consultation to community physicians for the management of complications associated with poor

pregnancy outcomes, including maternal death. The University of Maryland uses telemedicine to provide high-risk perinatal consultation to local health care providers in under-served communities, while Johns Hopkins University perinatal consultation is offered on-site upon request from local physicians. These high-risk obstetrics services help to address the shortage of obstetrical providers throughout the State as well as to increase the capacity of providers to manage complications of pregnancy at the community level. This enables women to have access to specialized consultative services while remaining in their local communities. Both University of Maryland and Johns Hopkins University have served in an advisory capacity to the Maryland Patient Safety Center Perinatal Collaborative.

### **The Governor's Delivery Unit**

In 2008, Governor O'Malley created the Governor's Delivery Unit as an extension of State Stat to work with State agencies to align State and federal resources around 15 strategic and visionary goals to improve the quality of life in Maryland. Recognizing that infant mortality is the most sensitive indicator of the overall health of a community, the Governor has developed a strategic goal to specifically address this issue. The Governor's overall Strategic Goal is to reduce infant mortality in Maryland by 10 percent by 2012. By the end of 2012, Maryland aims to have 60 fewer infant deaths, resulting in an infant mortality rate of 7.2/1,000 births, which would be Maryland's lowest recorded infant mortality rate.

The strategic approach focuses on: (1) assessing the data and targeting disparities, (2) building on strengths and partnerships, and (3) taking a comprehensive systems approach. Initially, Baltimore City, Prince George's County, and Somerset County – three jurisdictions with high infant mortality rates – will be targeted by the Plan. The Plan will build upon efforts currently taking place in those jurisdictions, including the Baltimore City Health Department's "Strategy to Improve Birth Outcomes," Prince George's County Health Department's "Healthy Women, Healthy Lives Program," and the Somerset County Health Department's "Babies Born Healthy Program." With time, the comprehensive women's health services and outreach efforts developed in these jurisdictions will be expanded to other jurisdictions in order to effect a comprehensive systems change throughout the State.

Proven interventions will be concentrated at different points along the women's life span:

Preconception: Interventions before pregnancy will ensure healthier women at time of conception.

Prenatal: Interventions during pregnancy will ensure earlier entry into prenatal care.

Perinatal and neonatal: Interventions around and immediately after pregnancy will ensure comprehensive, high quality follow-up care.

### **Women's Health**

CMCH has adopted a life-span approach to women's health, viewing it as a critical adjunct to preconception, inter-conception and prenatal health. This is based on the realization that comprehensive women's health care from infancy, childhood, adolescence, and adulthood, regardless of pregnancy intention or status, will ultimately ensure good health through future pregnancies and afterwards.

Recent women's health activities that impact maternal health include:

### *Women's Health Screening Cards*

These cards are sorted by each decade of life: teens, 20s, 30s, 40s, 50s, and 60s and beyond. Each card lists the recommended screening tests and immunizations for women to prevent or lessen their risk for chronic conditions in the future. Age appropriate health tips are provided on the back of each card. A section on "Reproductive Health" is included on cards for those in their teens through 40s. The information on these cards is available on the Department's Women's Health Web page.

### *Women's Health Report*

Data from the CMCH "Report of Maryland Women 2008" have been updated and are available on the women's health Web page. This report includes current data on major causes of death, chronic disorders, health care access, perinatal health and health status.

### *Maternal Depression Activities*

The CMCH Women's Health Medical Director, Dr. Diana Cheng, participates as a member of the national expert advisory group for the "Perinatal Depression Information Network," established in May 2009 to provide a platform for sharing information about perinatal depression among providers and organizations.

The Mental Health Association of Maryland's campaign, "Healthy New Moms," continues to offer a 24/7 phone line to help mothers with perinatal depression. A comprehensive Web site for providers also provides information on screening and treatment of perinatal depression.

The women's health brochure, "Women and Depression Across the Lifespan," was updated in 2009 and is available on the CMCH Web page. It includes a section on perinatal depression. The brochure, "About Postpartum Depression," is still available on the same Web site and can be downloaded in seven languages.

Information about perinatal depression was added to the CMCH Babies Born Healthy Web page in 2009.

### *Intimate Partner Violence*

Since 1993, homicide has been a leading cause of maternal mortality in Maryland. A significant portion of these deaths is the result of intimate partner violence. A representative from CMCH's Women's Health Program is a member of the Baltimore City Domestic Violence Fatality Review Team (DVFRT), a multi-disciplinary team established in 2006 representing domestic violence agencies, the State Attorney's Office, law enforcement, hospitals, and the justice system. A case review in 2009 of a woman who died during pregnancy brought out the unique features of partner abuse and pregnancy outcomes. Past pregnancy histories are now a routine part of case reviews. Sixteen other counties in Maryland currently participate in DVFRT. Information about intimate partner violence was added to the CMCH Babies Born Healthy Web page in 2009.

## **Pregnancy Risk Assessment Monitoring System (PRAMS)**

CMCH works with the CDC on PRAMS to survey mothers who have recently delivered live born infants in Maryland. Approximately 2000 women are surveyed each year. Recent data analyses using Maryland PRAMS data include:

### *Focus on Oral Health*

An oral health brief will be released in December 2009 and focuses on routine dental cleanings among pregnant women. A poster presentation, "Assessment of Maternal Oral Health Status with Perinatal Health Factors," will be presented by Terri-Ann Thompson, a Johns Hopkins University Bloomberg School of Public Health student, at the Annual American Public Health Association Meeting in November 2009.

### *Smoking During Pregnancy and Postpartum*

Lee Hurt, Epidemiologist, and Dr. Diana Cheng, both of CMCH, will make oral presentations on smoking during pregnancy and postpartum based on Maryland PRAMS data. This information will be presented at the Annual American Public Health Association Meeting in November 2009 and the CMCH Epidemiology Meeting in December 2009.

### *Unintended Pregnancy*

A research article, "Unintended Pregnancy and Associated Maternal Preconception, Prenatal and Postpartum Behaviors," by Dr. Diana Cheng, Eleanor B. Schwarz, Erica Douglas, and Dr. Isabelle Horon was published in the March 2009 issue of the journal *Contraception*.

## **VII. Summary**

Maryland continues to experience high maternal mortality compared to the US average and the Healthy People 2010 goal of 3.3 deaths per 100,000 live births. The use of multiple sources for identifying pregnancy-associated deaths and extending the definition of maternal death to one year after delivery has resulted in a more complete detection of cases (35 percent more pregnancy-related cases) and review of non-medical causes of death such as substance abuse. Fifty-six pregnancy-associated deaths were reviewed for 2007. Information identified in the maternal mortality review process will continue to be incorporated into activities throughout the State by members of the Department, MedChi, and their perinatal partners in an effort to eliminate preventable maternal deaths. Areas for intervention include substance abuse prevention, prevention of deep venous thrombosis, and the impact of cardiovascular disease on risk of maternal mortality in the provision of health services to pregnant and postpartum women. Additional areas of work include enhancing the medical records acquisition process for the program. Some of these efforts can be addressed immediately, while others may require long-term advocacy and educational intervention.

## **VIII. Acknowledgements**

The review of deaths would not be possible without the data, cooperation, and expertise of the DHMH Vital Statistics Administration and the Office of the Chief Medical Examiner. The Maternal Mortality Review Program would like to offer special thanks to the volunteer members of MedChi's

Maternal and Child Health Committee, chaired by Lillian Blackmon, M.D., and those who joined the Maternal Mortality Policy Subcommittee for the hours spent in discussion and the serious attention given to this important public health project. The Program is also grateful for the diligent work of Sayeedha Uddin, MD, MPH, Physician Consultant, for her careful and thorough abstraction of the cases.