



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 20 2010

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, 2000) and Health-General § 13-1207 –
2010 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. Wynee Hawk, 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: Wynee Hawk, R.N., J.D.
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MARYLAND DEPARTMENT OF HEALTH AND MENTAL HYGIENE
FAMILY HEALTH ADMINISTRATION
CENTER FOR MATERNAL AND CHILD HEALTH

Maternal Mortality Review Program

2010 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, Health-General Article §§13-1201-1207 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 Maryland Department of Health and Mental Hygiene (Department) administers the Maternal Mortality Review Program in consultation with the Maryland State Medical Society (MedChi). Funding has been made available from the Department's Center for Maternal and Child Health 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 policymakers, health care providers, health care facilities, and the general public.

II. National and State Data

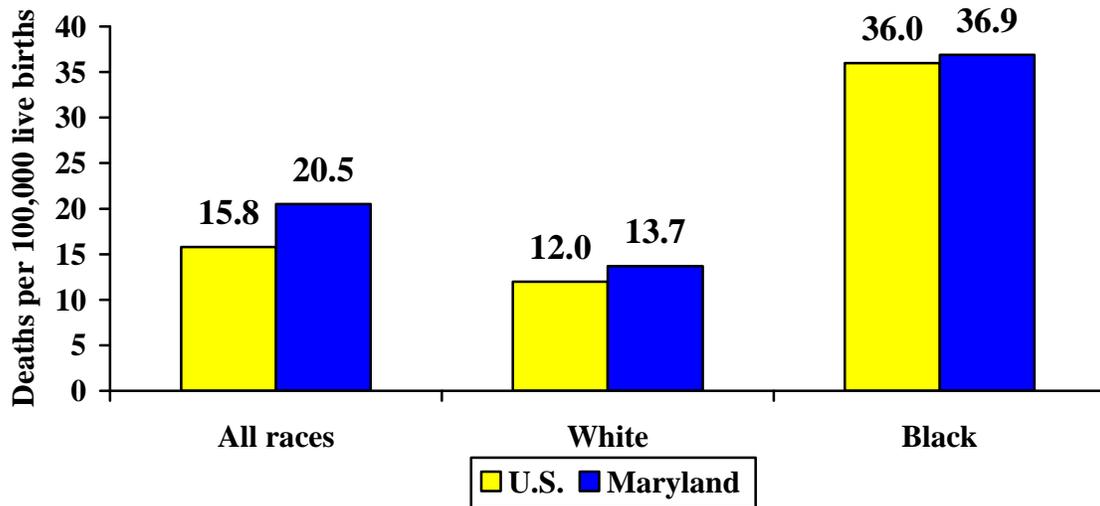
Maternal mortality is complicated by the use of various definitions. A **maternal death** is defined by the World Health Organization's (WHO) International Classification of Diseases Ninth Revision (ICD-9) and Tenth Revision (ICD-10) to be "the death of a woman while pregnant or within 42 days of conclusion 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 an enhanced surveillance definition as an approach to more accurately identify deaths among women in which pregnancy was a contributing factor. This collaboration also defined pregnancy-associated deaths. A **pregnancy-associated death** is "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** was further 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.

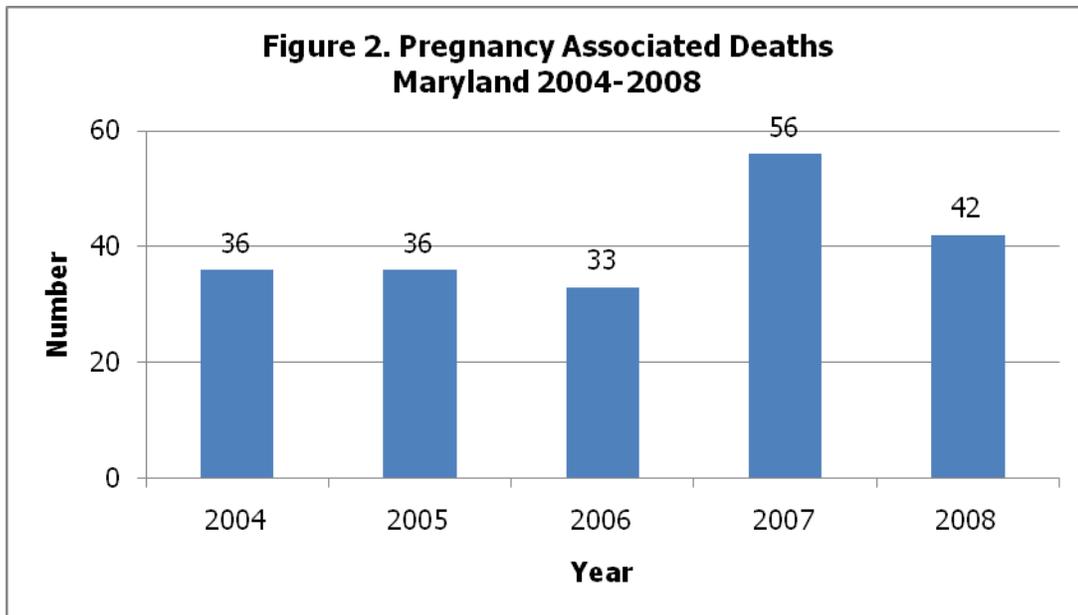
The Healthy People 2010 MMR target is 3.3 deaths per 100,000 live births, the same goal as Healthy People 2000, which was not met. Nationally, maternal mortality has declined dramatically since the 1930s when the MMR was 670 maternal deaths per 100,000 live births. The MMR achieved its lowest levels in the early 1980s. However, the MMR rose in the 1990s. The national MMR for 2003-2007 was 15.8 maternal deaths per 100,000 live births. For the same period, Maryland's MMR was 20.5. 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.

**Figure 1. Maternal Mortality Ratio by Race
U.S. and Maryland 2003-2007**



In the U.S., black women have an MMR three 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. The MMR for white women in Maryland is also elevated above the national average.

In Maryland the number of pregnancy-associated deaths, tracked by the Maternal Mortality Review Program between 2004 and 2008, demonstrated an average of 41 deaths per year. Figure 2 shows the number of pregnancy-associated deaths in Maryland from 2004 to 2008.



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 may not be 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 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's Vital Statistics Administration 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 involves linking death certificates for females 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 are identified through a manual review of files from deaths reported to the Office of the Chief Medical Examiner (OCME), also looking for evidence of pregnancy in deceased women. All deaths occurring within 365 days of pregnancy conclusion are subsequently designated as pregnancy-associated and further investigated. Using these three methods, 42 pregnancy-associated

deaths were identified in 2008. The purpose of this report is to review data for these 42 deaths.

Case Review

Pregnancy-associated deaths for 2008 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, and available death certificates, hospital records and OCME records were reviewed.

The Maternal Mortality Workgroup carries out detailed reviews of selected cases determined to be preventable or potentially preventable. The Workgroup is a subcommittee of the MedChi MCH Committee and includes representatives from 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

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. This 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 are included in a final review of systems issues and

recommendations under the auspices of the MedChi MCH Committee.

The MedChi Maternal Mortality Review Policy Subcommittee met in October 2010 to review the 2008 pregnancy-associated death data and findings from previous years. Additionally, a report of multiple year data analysis from pregnancy-associated deaths from 2000 to 2008 is being prepared which will include a summary of prior findings and recommendations. A meeting has been scheduled for December in 2010 to continue discussions for the report.

IV. Case Findings in Maryland

The most recent data in this report are 2008 pregnancy-associated deaths. There were 42 pregnancy-associated deaths identified for 2008.

Cause of Death Classification

The leading causes of 2008 pregnancy-associated deaths were homicide, cardiac disease, and accident. Figure 3 shows the distribution of pregnancy-associated deaths by manner of death. Among the 42 pregnancy-associated deaths, 60 percent were due to natural causes (excludes homicide, suicide, and substance abuse), 24 percent to intentional injury (homicide), and 14 percent to unintentional injury (accident). Figure 4 shows the distribution of deaths from both medical (natural) and non-medical causes. The leading medical cause of death was cardiac disease, which accounted for 17 percent of all deaths occurring in 2008. As shown in Figure 5, cardiac disease accounted for 28 percent of deaths resulting from medical causes.

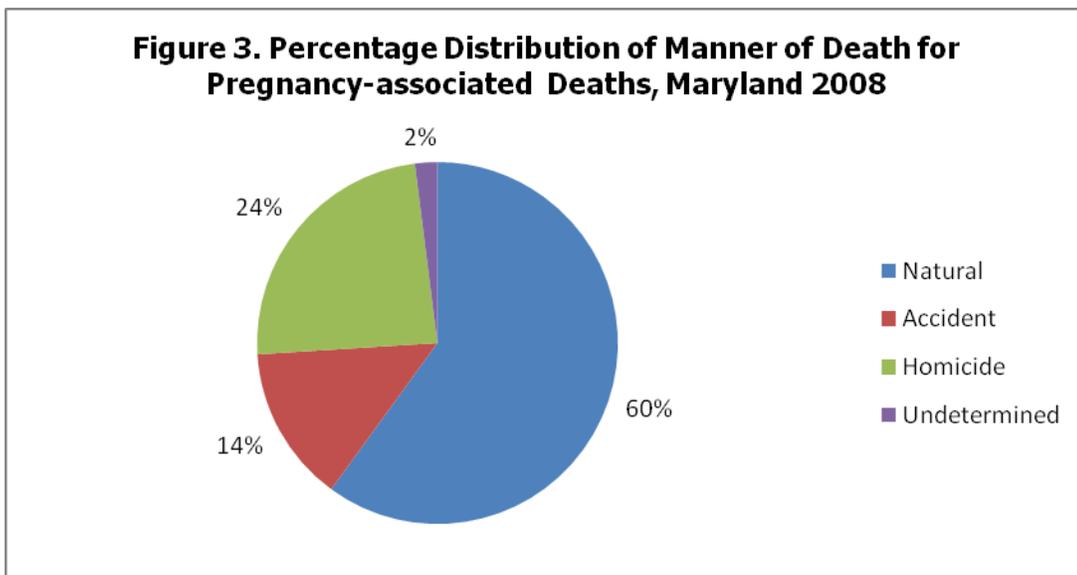


Figure 4. Percentage Distribution of Cause of Death Category for Pregnancy-associated Deaths, Maryland 2008

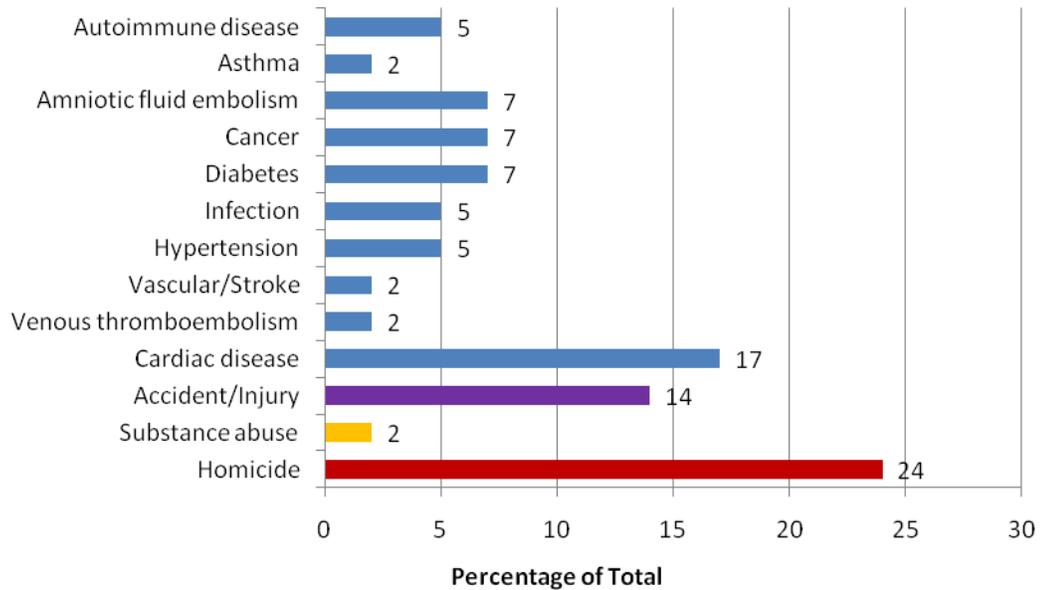
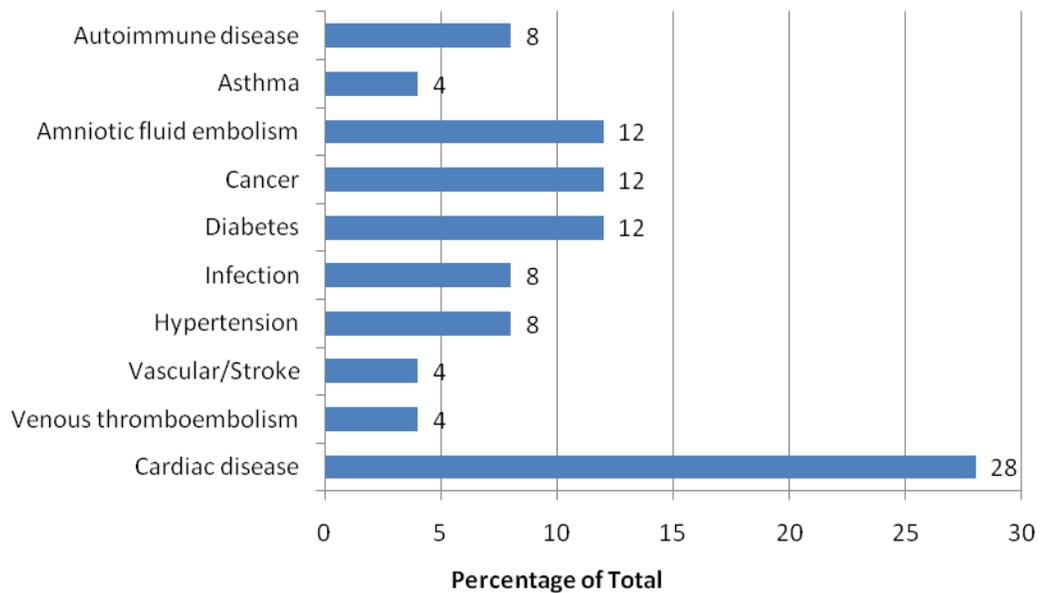
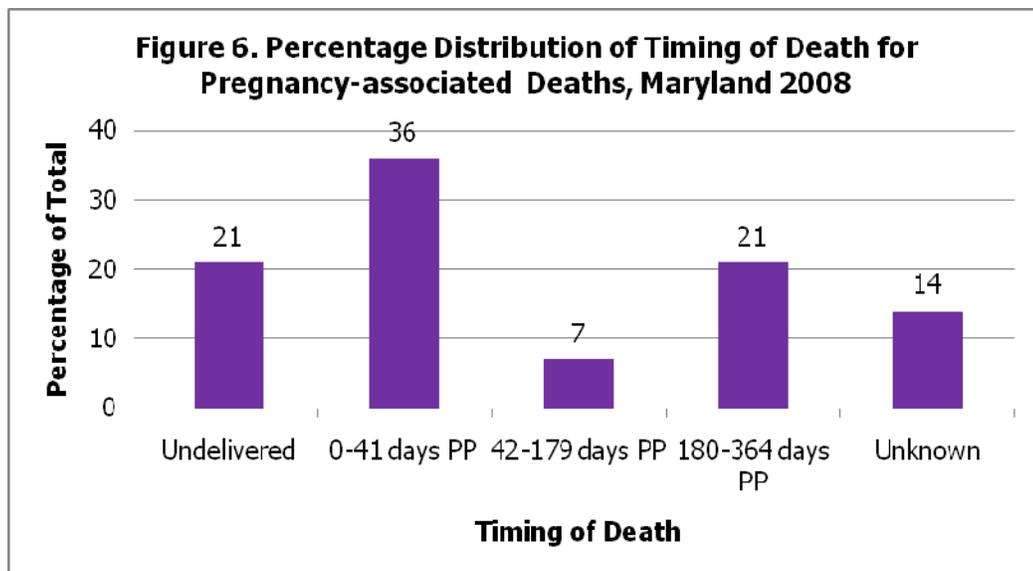


Figure 5. Percentage Distribution of Pregnancy-associated Deaths by Medical Cause of Death, Maryland 2008



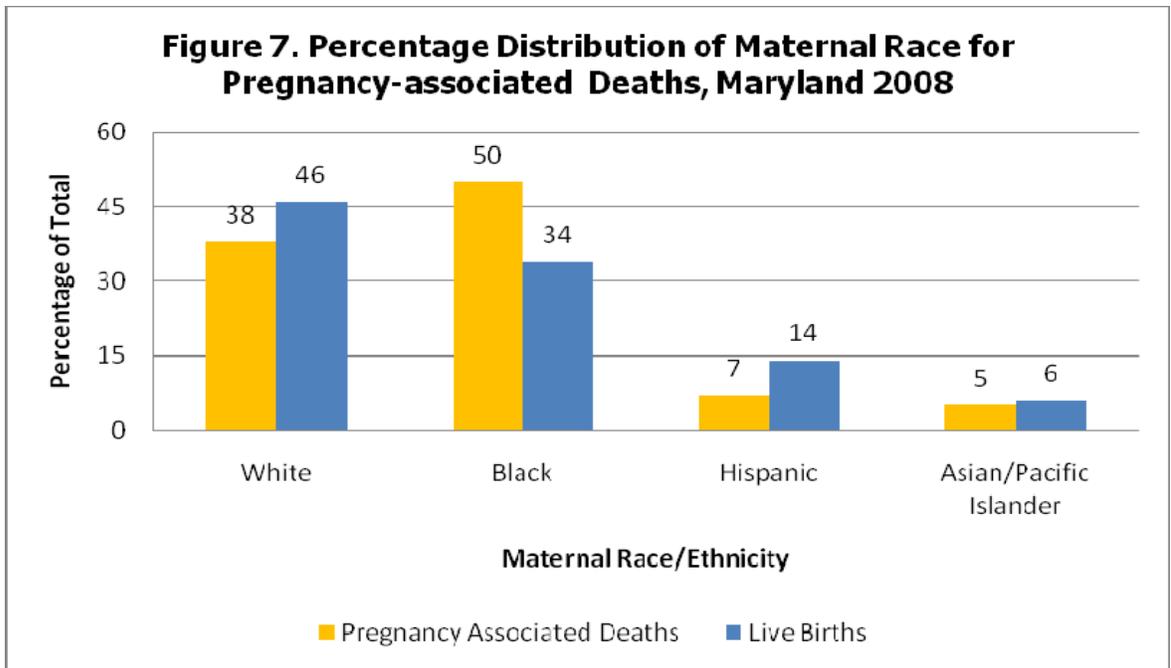
Timing of Death

Figure 6 illustrates the distribution of deaths by timing of death. The majority of pregnancy-associated deaths occurred after delivery or postpartum. Among the 42 pregnancy-associated deaths, 36 percent occurred within 41 days postpartum, and 28 percent between 42 and 365 days postpartum. Twenty-one percent of the deaths were among women who were pregnant or undelivered at the time of death. The timing of death in relation to pregnancy was unknown for 14 percent of deaths. Intentional and unintentional injury was the most frequent cause of death (60%) among women who died while pregnant or between six months and one year postpartum. Among women who died within six weeks of the conclusion of pregnancy, medical causes accounted for 93 percent of deaths, with cardiac disease being the most frequent (27%) cause of death within that time period.



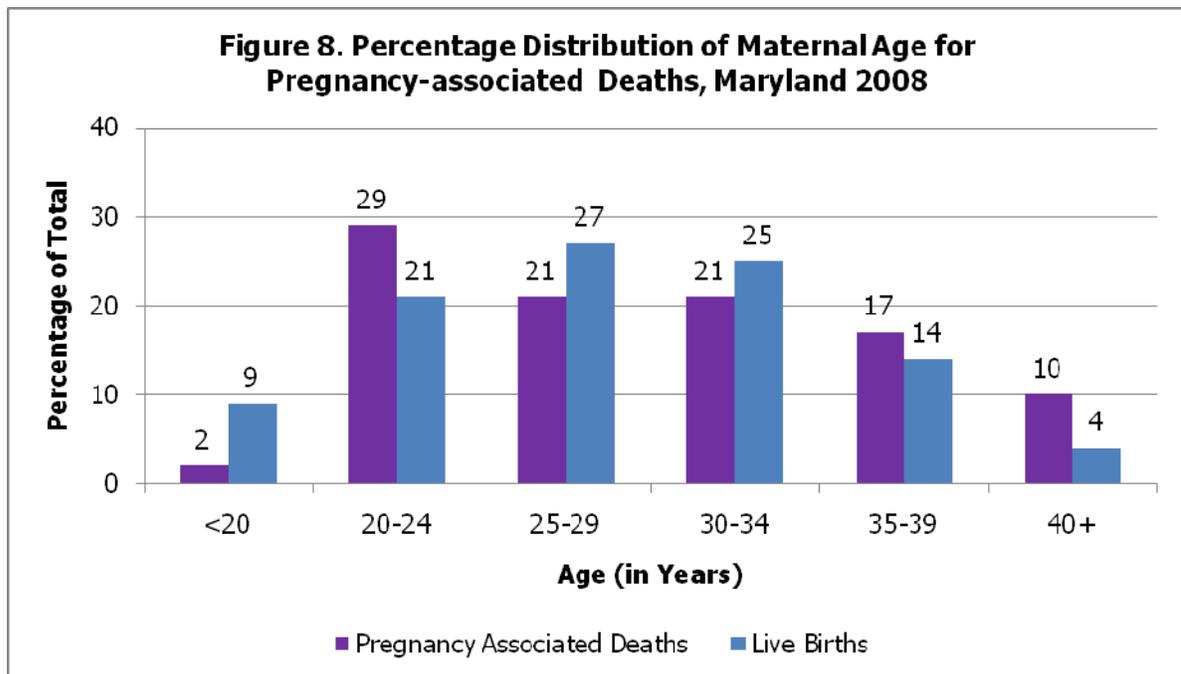
Cases by Maternal Race and Ethnicity

Figure 7 illustrates the racial/ethnic distribution of pregnancy-associated deaths and live births. Among the 42 pregnancy-associated deaths, 50 percent occurred among black women, 38 percent occurred among white women, 7 percent among Hispanic women, and 5 percent among Asian/Pacific Islander women. In comparison the distribution of live births is as follows: 34 percent among black women, 46 percent among white women, 14 percent among Hispanic women, and 6 percent among Asian/Pacific Islander women. A persistent racial disparity is evident in the greater proportion of black women who died while pregnant or within 365 days of pregnancy compared to the proportion of black women who had a live birth. Among white women, the leading causes of death were homicide, injury, and cardiac disease. Homicide and cardiac disease were the leading causes among black women. Women of other race/ethnicity were too few in number to identify any trends in cause of death.



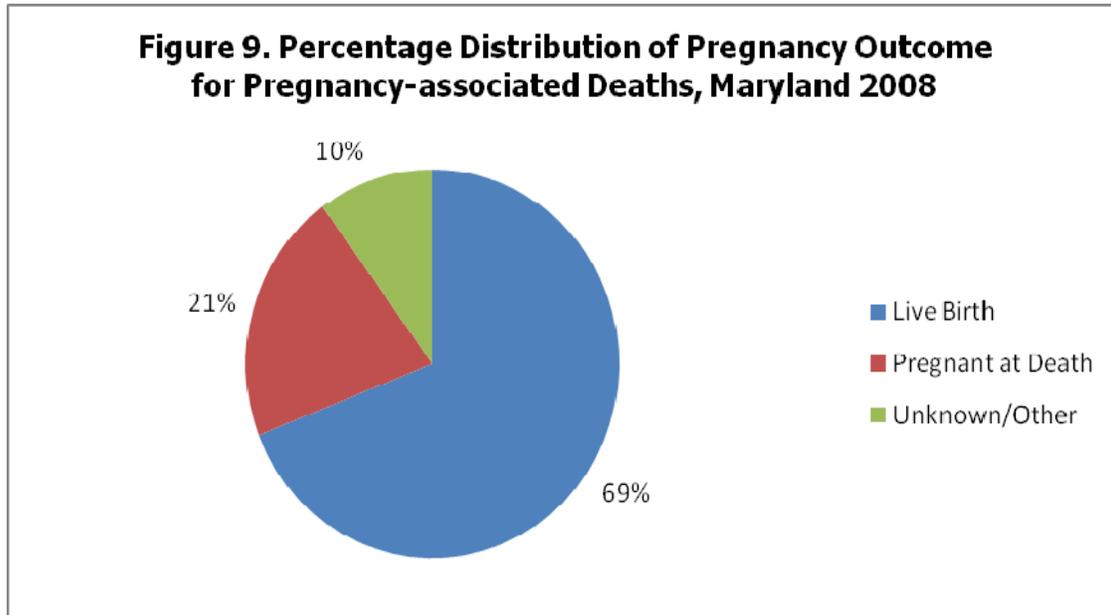
Cases by Maternal Age

Pregnancy-associated deaths occurred in women ranging in age from 17 to 42 years, as shown in Figure 8. The majority (62%) of deaths among women less than 25 years of age were a result of homicide and accident/injury, while the majority (69%) of deaths among women 25 years of age and older were due to natural causes. Among women 20 to 24 years of age, diabetes was the leading medical cause of death, accounting for 25 percent of deaths, and cardiac disease accounted for 33 percent of deaths among women aged 25 to 29 years of age.



Pregnancy Outcome

The outcome of pregnancy among the pregnancy-associated deaths in 2008 is shown in Figure 9. Sixty-nine per cent of cases had a live birth, 21% were pregnant at time of death, and in 10% the pregnancy outcome was unknown.



V. Recommendations

Finding 1: Homicide accounted for 24 percent of all pregnancy-associated deaths in 2008 and 54 percent of deaths among women younger than 25 years of age.

Recommendation 1: Providers should include a thorough injury evaluation for pregnant and postpartum women presenting to the emergency department (ED), including consideration of possible intimate partner or domestic violence. This recommendation will require ongoing education of ED and obstetric providers about injury evaluation and management.

Finding 2: Cardiac disease was the leading medical cause of death for all women, and for women younger than 30 years of age.

Recommendation 2: Health care providers should screen all pregnant and postpartum women for cardiac disease if presenting with symptoms, even at young ages. Ongoing consultation is needed between obstetric and cardiology providers.

Finding 3: Diabetes was the leading medical cause of death for women 20 to 24 years of age.

Recommendation 3: Diet and weight management should be included in prenatal counseling for women diagnosed with or at risk for diabetes.

Finding 4: Obesity and over-weight may be major contributing factors to maternal mortality, particularly to deaths resulting from cardiac disease and diabetes.

Recommendation 4: Documentation of pre-pregnancy height and weight should be included in the prenatal medical record. Height and weight should be documented on all inpatient admissions and including in the evaluation of all deceased individuals.

Finding 5: Pregnancy-associated deaths occurred most frequently within the first six weeks after pregnancy. For patients at high risk for postpartum complications, routine six-week follow-up may be too late and postpartum discharge instructions may not be adequate for ideal care.

Recommendation 5: Women with identified risk factors should follow up with their obstetric providers earlier than six weeks postpartum. Scheduling the postpartum visit prior to discharge from the hospital may help to ensure that high-risk women will return for follow-up.

VI. Maternal Mortality Review Related Activities

The Maryland Patient Safety Center Perinatal Learning Network

The Maryland Patient Safety Center Perinatal Learning Network (PLN), a collaboration between the Delmarva Foundation and the Maryland Hospital Association, was continued in FY10. The PLN provides a forum for hospitals that provide obstetrical services to Maryland residents to share protocols and information to improve team communication and patient safety. Teams communicate through a Listserv maintained by the PLN. 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 PLN. Both Listservs have provided an opportunity for the exchange of knowledge and ideas on a wide variety of topics pertinent to perinatal care.

Maryland Advanced Perinatal Systems and Services (MAPSS) Program

The University of Maryland School of Medicine, in collaboration with Johns Hopkins, established the Maryland Advanced Perinatal Systems Services (MAPSS) Program. The program is administered by the 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 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 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 the University of Maryland and Johns Hopkins University have served in an advisory capacity to the Maryland Patient Safety Center Perinatal Learning Network.

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 Strategic Goal is to reduce infant mortality in Maryland by 10% 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 which would be Maryland's lowest recorded infant mortality rate. In 2009, Maryland's infant mortality rate fell by 10% to 7.2. Efforts continue under the GDU in 2010, however, to further address infant mortality and reduce racial disparities.

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. The GDU Plan concentrates proven intervention strategies at different points along the women's life span:

Preconception - interventions before pregnancy to ensure healthier women at time of conception.

Prenatal - interventions during pregnancy to ensure earlier entry into prenatal care.

Perinatal and neonatal - interventions around and immediately after pregnancy to ensure comprehensive, high quality follow-up care.

Baltimore City, Prince George's County, and Somerset County, three jurisdictions with high infant mortality rates, were initially targeted by the GDU Plan. The Plan builds upon efforts currently taking place in those jurisdictions, including the Baltimore City Health Department's "Strategy to Improve Birth Outcomes," which was subsequently renamed "B'More for Healthy Babies," Prince George's County Health Department's "Healthy Women, Healthy Lives Program," and the Somerset County Health Department's "Babies Born Healthy Program." Efforts developed in these jurisdictions will subsequently be expanded to other jurisdictions in order to effect a systems change throughout the State.

Women's Health

The Center for Maternal and Child 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, 2010

These cards were updated in 2010 and 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 the cards

for teens through to 40s. The information on these cards is available on the CMCH women's health Web page <http://fha.maryland.gov/mch/women.cfm>.

Women's Health Report

The CMCH "Report of Maryland Women 2008" is being updated and will be published as a report in February 2011. This report will include current data on major causes of death, chronic disorders, health care access, perinatal health, and health status.

Intimate Partner Violence

Since 1993, homicide has been a leading cause of maternal mortality in Maryland. The majority of these deaths are 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 (BCDVFR), a multi-disciplinary team established in 2006 representing domestic violence agencies, the State Attorney's office, law enforcement, hospitals, and the criminal justice system. Past pregnancy histories are now a routine part of case reviews. Sixteen other counties in Maryland currently participate in DVFR.

The Maryland Healthcare Coalition Against Domestic Violence developed a toolkit on domestic violence for health care providers. This 2010 toolkit workbook, "Health Care Response to Domestic Violence: A Toolkit for Hospitals, Facilities, & Providers," includes information on domestic violence definitions and statistics, screening tools, danger assessments, safety planning, privacy issues, medical coding, consent forms, reporting requirements, and recommendations for documentation, intervention, resources, referral sites, and steps to take for the establishment of hospital-based domestic violence programs. The Women's Health Program contributed to the content of the toolkit.

Prince George's Hospital Center implemented a new hospital-based domestic violence program in 2010. To commemorate the new program, a documentary film, "Domestic Violence and Health Care: Best Practices in Action" was premiered at the hospital. The movie featured interviews with many Baltimore health care professionals and will serve to increase awareness of abuse.

A research article, "Intimate Partner Homicide Among Pregnant and Postpartum Women," by Drs. Diana Cheng (CMCH) and Isabelle Horon (Maryland Vital Statistics Administration) was published in the June 2010 issue of *Obstetrics & Gynecology*.

Pregnancy Risk Assessment Monitoring System (PRAMS)

The Center for Maternal and Child Health works with the CDC on PRAMS to survey mothers who have recently delivered live born infants in Maryland. Approximately 2,000 women are surveyed each year. Recent data analyses using Maryland PRAMS data include *The Maryland PRAMS Report: 2009 Births*, *Maryland PRAMS Report 2004-2008 Births*, and focus briefs entitled "Alcohol Use During Pregnancy," "Medicaid Births," and "Comments from Postpartum Mothers." These reports are available at www.marylandprams.org.

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 and review of non-medical causes of death such as substance abuse. 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. Cardiac disease and diabetes are two areas for medical intervention in the provision of health services to pregnant and postpartum women that can impact the risk of maternal mortality. Additional areas of work include conducting injury workups and enhancing medical records information. 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 Department of Health and Mental Hygiene's Vital Statistics Administration and the Office of the Chief Medical Examiner. The Maternal Mortality Review Committee would like to offer special thanks to the volunteer members of MedChi's MCH 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.