

**MARYLAND DEPARTMENT OF HEALTH AND MENTAL HYGIENE
FAMILY HEALTH ADMINISTRATION
CENTER FOR MATERNAL AND CHILD HEALTH**

Maternal Mortality Review Program

2006 ANNUAL REPORT

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I. Introduction

During the 2000 Maryland General Assembly, Health-General Article, §13-1201 through §13-1207, 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 Maryland Department of Health and Mental Hygiene (the 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 to MedChi since June 2001 to investigate pregnancy-associated deaths in Maryland and identify opportunities for reduced maternal mortality. MedChi's Maternal and Child Health Committee provides consultation regarding maternal mortality review activities, conducts case reviews, and develops recommendations for the Department.

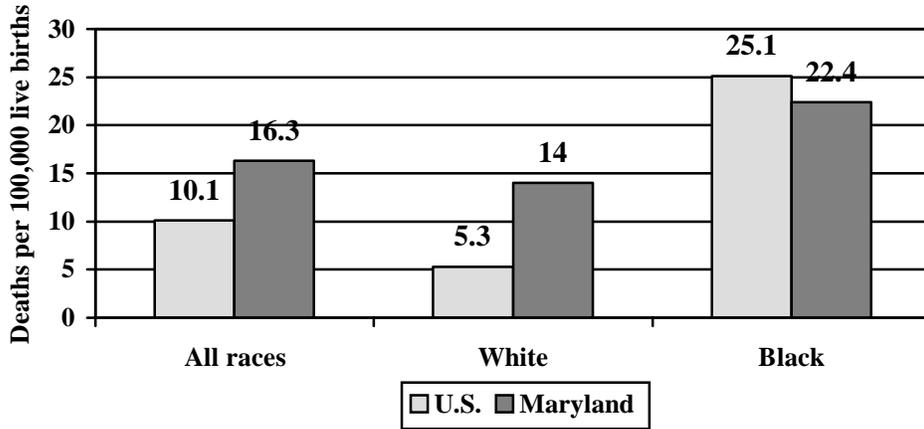
II. National and State Data

Defining the maternal mortality is complicated by the use of various definitions. The three terms "maternal death," "pregnancy-associated death," and "pregnancy-related death" are utilized and create a challenge when comparing data from different sources and reports for different entities. 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." A pregnancy-associated death is the death of a woman while pregnant or within one year (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. All three definitions are considered in the case review process in Maryland.

The National Center for Health Statistics uses strict criteria to define deaths included in the maternal mortality ratio (MMR) based upon information from the death certificates alone. Enhanced surveillance using multiple sources and 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 1999-2003 was 10.1 maternal deaths per 100,000 live births. At least part of the increase is attributed to increased ascertainment of maternal deaths. The most current year for which national maternal death data is currently available is 2003. A five-year average ratio is used because these relatively infrequent events may vary considerably year-to-year, particularly in a small State like Maryland.

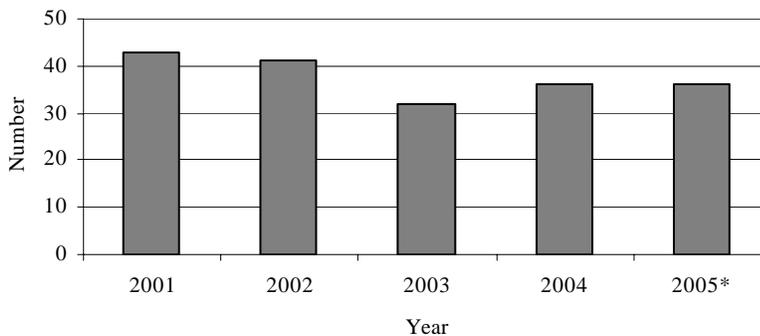
**Figure 1. Maternal Mortality Ratio by Race
U.S. and Maryland 1999-2003**



Like the national MMR, the Maryland MMR has also shown no improvement in recent years. For 1999-2003, the average Maryland MMR was 16.3 per 100,000 live births, higher than the MMR for the United States, and substantially higher than the Healthy People 2010 goal of 3.3 per 100,000 live births.

In the United States, black women have an MMR nearly five times greater than that for white women, a disparity that has persisted since the 1940s. The national MMR for black women was 25.1 maternal deaths per 100,000 live births while the MMR for white women was 5.3 per 100,000 live births over the period 1999-2003. In the same period, Maryland’s MMR averaged 22.4 per 100,000 live births for black women compared to 14.0 among white women. The difference between black and white women is much smaller in Maryland because black women have a lower mortality than the U.S. average and white women have nearly double the rate of death than the United States overall.

Figure 2. Pregnancy-Associated Deaths, Maryland



* preliminary

In Maryland, the number of pregnancy-associated deaths, tracked by the Maternal Mortality Review Program, demonstrates an average of 38 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. Deaths are identified in one of three ways in Maryland: (1) identifying individual death certificates through the checkbox questions or a cause of death clearly related to pregnancy, such as ruptured ectopic pregnancy; (2) linking death certificates for women aged 10-50 years with birth certificates and fetal death certificates; and (3) reviewing manually death files from the Office of the Chief Medical Examiner (OCME) looking for evidence of pregnancy in deceased women. Using these three methods, 36 pregnancy-associated deaths were identified in 2004.

Case Review

Pregnancy-associated deaths for 2004 underwent several stages of review under the auspices of the MedChi Maternal and Child Health 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 small workgroup reviewed the data on all deaths from 2004.

The Maternal Mortality Workgroup (Workgroup) reviews selected cases determined to be preventable or potentially preventable for detailed review. The Workgroup is a subcommittee of the MedChi Maternal and Child Health (MCH) Committee and includes general obstetric, perinatology, family practice, pediatric and nurse-midwifery specialties. The Workgroup's discussion follows 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.

Non-medical or social causes underlying the 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

Quality and content of medical care 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 Policy Subcommittee then 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 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 Maternal and Child Health Committee.

IV. Case Findings in Maryland

The most recent data are 2004 deaths. There were 36 pregnancy-associated cases identified for 2004. A similar number of deaths have been identified for 2005. Case abstraction and review is under way for those deaths and will be included in the 2007 Annual Report.

Cause of Death Classification

The leading causes of 2004 pregnancy-associated deaths were accident (vehicle or motorcycle collision) or injury, cardiovascular disease, substance abuse, and infection. Approximately 60 percent of pregnancy-associated deaths were due to medical or natural causes, and forty percent were due to non-medical or non-natural causes. Figures 3 and 4 shows the leading causes of death for both medical (natural) and non-medical causes.

Figure 3. Percentage Distribution by Manner of Death, 2004 Pregnancy-Associated Deaths, Maryland

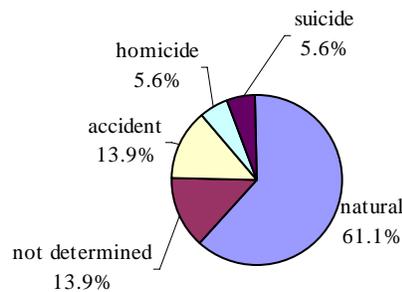
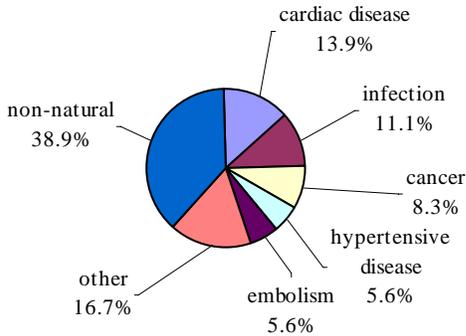


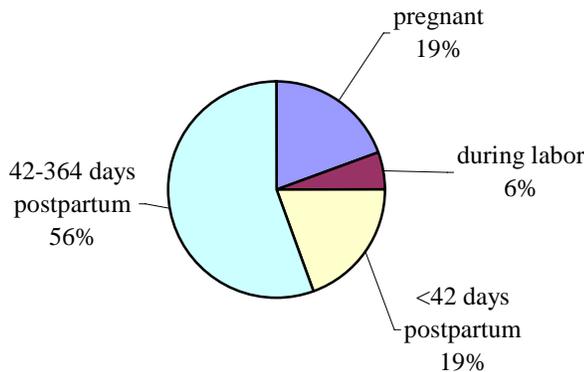
Figure 4. Percentage Distribution by Category of Death, 2004 Pregnancy-Associated Deaths, Maryland



Cases by Timing of Death

The majority of deaths occurred after 42 days, or six weeks, postpartum. Twenty percent of deaths occurred during pregnancy or within the first six weeks postpartum.

Figure 5. Percentage Distribution by Timing of Death, 2004 Pregnancy-Associated Deaths, Maryland



Cases by Maternal Race and Ethnicity

Racial disparity in mortality is a persistent concern. Among the 36 pregnancy-associated deaths, 47.2 percent occurred among black women (includes 8.3 percent foreign-born), 41.7 percent among white women, and 8.3 percent among Hispanic women. Race was not recorded for one woman. As an approximate comparison, the 2004 births in Maryland were distributed as follows: 50.9 percent among non-Hispanic white women, 32.6 percent among black women, 10.2 percent among Hispanic women, and 6.1 percent among Asian women.

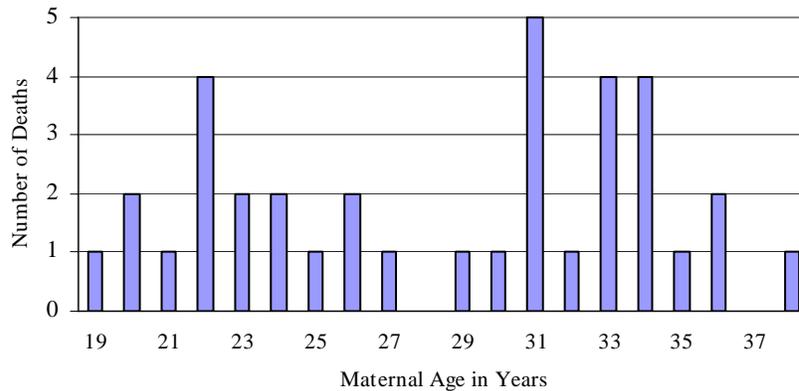
Table 1. Racial and ethnic distributions of pregnancy-associated deaths and births, Maryland 2004

Racial/ Ethnic Category	Percentage of Total Pregnancy-associated Deaths	Percentage of Total 2004 Births
White	41.7	50.9
Black	47.2	32.6
Hispanic	8.3	10.2
Asian	0.0	6.1

Cases by Maternal Age

The ages of the decedents ranged from 19 to 38 years as shown in the figure below.

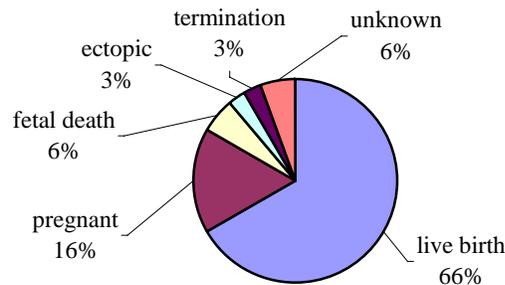
Figure 6. Age Distribution of Pregnancy-associated Deaths, Maryland, 2004



Cases by Outcome of Pregnancy

In 2004, among the pregnancy-associated deaths, the outcome of pregnancy was as follows: live birth (66.7 percent), pregnant at time of death (16.7 percent), fetal death (5.6 percent), ectopic pregnancy and termination of pregnancy (2.8 percent each), and unknown (5.6 percent).

Figure 7. Percentage Distribution of Pregnancy Outcome, 2004 Pregnancy-Associated Deaths, Maryland



V. Recommendations

Problem: A significant proportion of deaths are due to non-obstetric causes.

Recommendation #1: A multidisciplinary (substance abuse, mental health, intimate partner violence, nutrition, chronic disease) collaboration is needed to improve all women's health, especially during the preconception or interconception periods. Specific factors include ensure screening, education, and referrals for violence, depression, substance abuse, and car safety are done routinely during the preconception and prenatal visits and recorded in the medical chart. Because cardiovascular disease continues to be the most common cause of maternal death, a systematic review of these deaths should be completed regularly and trends noted. In addition, maternal body-mass index (BMIs) should be tracked to see how it correlates with heart disease and other chronic disorders.

Problem: Lack of general knowledge about maternal mortality in Maryland, with most health care providers being unaware of the magnitude and scope of maternal deaths in the State.

Recommendation #2: Inclusion of maternal mortality data by age, race and cause of death for the most recent year and the most recent five-year interval in *The Maryland Vital Statistics Annual Report* would increase awareness of maternal mortality. In addition, a comprehensive report of pregnancy-associated deaths should be completed jointly by the Department and the MMR Committee every 10 years. The increased awareness of the incidence and contributing factors among health care providers can enable them to take steps for maternal mortality prevention, especially during the preconception and interconception periods.

Problem: Missing or incomplete information in medical charts, records and certificates. This lack of important medical record data hinders the review process and evaluation of the preventability of death.

Recommendation #3: Integration of the data from the Office of the Medical Examiner, Vital Records, Prenatal Visit Record, and Hospital Medical Records should be completed prior to formal case presentations. Representatives from the Vital Statistics Administration, Center for Maternal and Child Health, MMR Committee and the medical record chart abstractor should meet regularly (at least every four months) to fill in gaps that would be important for case presentation. The shared information will improve the classification of deaths into more accurate diagnostic categories, provide more detailed information of the pregnancy course and outcome, and guide the selection of cases for intensive review by the larger MMR committee. Additionally, a unified database that includes data from the live birth, fetal death, and maternal death certificates, as well medical record data from the Office of the Medical Examiner, hospitalizations and prenatal care visits would greatly consolidate the data needed for MMR. (See enclosure for fiscal note). It is hopeful that the meetings to integrate data will result in the creation of a database to store all the various information collected. This can be updated as information is gathered or revised.

VI. Activities of Maternal Mortality Review Program, 2006

Presentation at American College of Obstetricians and Gynecologists (ACOG) Annual Meeting
Dr. Maureen Edwards, Medical Director, Center for Maternal and Child Health, delivered a presentation about Maternal Mortality Review in Maryland during the CDC and ACOG Special Study Group Session at the ACOG Annual Meeting held in May 2006 in Washington, D.C. Her

presentation served as an overview of the review process in Maryland and was attended by many other State Maternal Mortality Review Programs in the U.S. as well as interested national and local organizations.

Addressing Patient Safety in Perinatal Hospitals

The need for interdisciplinary team communication was one of the main recommendations for improved patient safety from maternal mortality review last year. Dr. Harold Fox, Gynecologist & Obstetrician in Chief at Hopkins (and member of the State MMR) has given many lectures on this topic at national and State meetings, including the Annual Maryland Medical Society Conference and Annual ACOG Meeting. As one component of the Department's Babies Born Healthy Initiative, the Maryland Patient Safety Center is conducting a Perinatal Collaborative. The Collaborative's goal is to create a perinatal system that delivers appropriate care reliably without adverse fetal and maternal outcomes. This approach utilizes the Breakthrough Series Collaborative (Plan, Do, Study, Act) developed by the Institute for Healthcare Quality Improvement. In October 2006, the first meeting was held to specifically work on increasing patient safety in labor and delivery. One of the priority areas was to improve teamwork and communication among the interdisciplinary group that is responsible for maternal care. Additionally, the 2006 Annual Symposium of the Obstetrical & Gynecological Society of Maryland will also feature a keynote presentation, "Team Training: Improving Patient Safety in Obstetrics and Gynecology."

Maryland Maternal Depression Program

Depression during pregnancy and postpartum has been one of the program initiatives resulting from the MMR review of pregnancy-associated suicides, 1993-2003. The Department has been collaborating with the Mental Health Association of Maryland on a federal grant, 2005-2006, to increase provider screening and treatment or referral for maternal depression. Dr. Diana Cheng, Medical Director of Women's Health at the Department, has given numerous hospital grand rounds presentations to obstetricians, pediatricians and family practitioners in Maryland, as well as to other State and national organizations. She also wrote and edited patient and provider educational materials that can be accessed at www.healthynewmoms.org (the Website of the Maryland perinatal depression campaign). The Maryland PRAMS (Pregnancy Risk Assessment Monitoring System) Project analyzed survey data of new mothers and released a Focus Brief on Postpartum Depression in May 2006. This report (www.fha.state.md.us/mch/html/prams_fs.html) revealed that approximately 20 percent of new mothers felt they were at least moderately depressed during the postpartum period. A cover article about these PRAMS results appeared in the Fall 2006 "Perinatal Network" newsletter which is delivered to more than 500 private and public health providers in Maryland. Dr. Cheng was interviewed about this topic for radio programs in the Washington, D.C., Baltimore, and Annapolis areas that aired during National Depression Screening Day in October 2006. She currently is collaborating on a Washington Post feature article that will be released later this winter on perinatal depression.

Local Domestic Violence Fatality Reviews in Maryland

The finding that homicide is one of the leading causes of pregnancy-associated deaths has helped increase interest in intimate partner violence in Maryland. House Bill 741 was signed into law in 2005 and enables Maryland counties to establish domestic violence fatality review teams in accordance with Title 4, Subtitle 7 of the Family Law Article. Dr. Cheng is a member of the Baltimore City Team, which was just established in 2006. Her input has helped create a focus on deaths during the perinatal period.

VII. Summary

Maryland continues to experience high maternal mortality compared to the U.S. average and the Healthy People 2010 goal. The use of multiple sources for identifying pregnancy-associated deaths has resulted in a more complete detection of cases. Thirty-six pregnancy-associated deaths were reviewed in 2004. 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 to eliminate preventable maternal deaths. Activities will continue to focus on patient safety, maternal depression, and inter-disciplinary teamwork that include mental health, domestic violence, substance abuse, nutrition, and chronic disease. New initiatives will seek to integrate maternal records data and annual publication of Maryland maternal mortality rates.