MSAR # 2181

State of Maryland

Maternal Mortality Review Program

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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 policy makers, health care providers, health care facilities, and the public. The three-year sunset provision was removed during the 2003 legislative session. Maternal mortality review is conducted by the Maryland Department of Health and Mental Hygiene in consultation with MedChi, The Maryland State Medical Society. Funding has been made available from the Center for Maternal and Child Health (MCH), Maryland Department of Health and Mental Hygiene 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 to maternal mortality review activities, conducts case reviews and develops recommendations for the Department.

II. Background

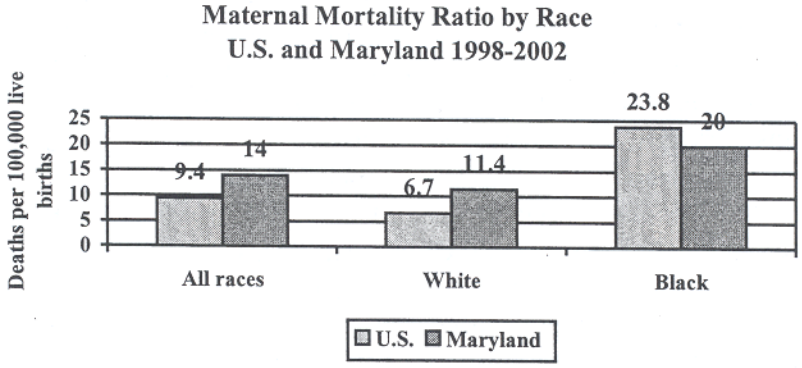
A maternal death is defined by the World Health Organization's (WHO) International Classification of Diseases Ninth Revision (ICD-9) and Tenth Revision (ICD-10) to be "the death of a woman while pregnant or within 42 days of conclusion of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes."[1] This definition is used by the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) in calculating maternal mortality in the United States.

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 and approach to identify more accurately deaths among women in which pregnancy was a contributing factor. This group also defined a pregnancy-associated death as the death of a woman while pregnant or within 1 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 National Center for Health Statistics uses strict criteria to define deaths included in the maternal mortality ratio 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 are believed to meet the WHO definition. It is expected that as Maryland and other states enhance surveillance the MMR will be influenced by this improved case finding.

The Healthy People 2010 maternal mortality ratio (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 1930's 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 has risen in the 1990s. The national MMR for 1998-2002 was 9.4 maternal deaths per 100,000 live births.

At least part of the increase is attributed to increased ascertainment of maternal deaths. 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.



The maternal mortality ratio for Maryland has also shown no improvement in recent years. For 1998-2002 the average Maryland MMR was 14.0 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.

In the United States, black women have a maternal mortality ratio three-to-four times greater than that for white women; a disparity that has persisted since the 1940s. The US MMR for black women was 23.8 maternal deaths per 100,000 live births while the MMR for white women was 6.7 per 100,000 live births over the period 1998-2002. In the same period, Maryland's MMR averaged 20.0 per 100,000 live births for black women compared to 11.4 among white women. The difference between black and white women is smaller in Maryland because black women have a lower mortality than the US average and white women have a higher rate of death than in the United States overall.

III. Maternal Mortality Review Process in Maryland

Case Identification

Cases for review were 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 were identified in one of three ways. 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. Second, death certificates for women were linked with birth certificates and fetal death certificates to identify cases that were not identified from examining the death certificate alone. Third, cases were identified through a manual review of files from deaths reported to the Office of the Chief Medical Examiner, also looking for evidence

of pregnancy in deceased women. All deaths occurring during pregnancy or within 365 days of pregnancy conclusion were subsequently designated as pregnancy-associated and further investigated.

Case Classification

Following case identification and records abstraction, case summaries were prepared using available information from death certificates, medical records and Medical Examiner files by a physician consultant. Cases were classified into broad categories by examining manner and cause of death, and contributing cause(s). Manner of death is designated as homicide, suicide, accidental, natural or undetermined. Categories utilized for classification of pregnancy-associated deaths in this review include: homicide, suicide, substance abuse, injury, cardiac disease, cancer, pregnancy-induced hypertension, amniotic fluid embolism, pulmonary embolism and infection. These categories have been utilized previously by the Maternal Mortality Review Program. Cases were classified as substance abuse if the manner of death was undetermined and drug or alcohol intoxication was listed as the cause of death or contributing condition on the death certificate. The injury category included accidental deaths from motor vehicle, bicycle and pedestrian injury, and injuries from fire and unintentional poisoning.

Classification of medical causes of death was done also in broad categories based on similarities of etiology and/or management. Cardiac disease included deaths from diseases of the heart and aorta. Cancer included deaths in which the underlying cause was malignancy. Deaths from pregnancy-induced hypertension were classified separately. Deaths from amniotic fluid embolism were differentiated from pulmonary embolism.

Case Review

Pregnancy-associated deaths for 2002 underwent several reviews 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 abstracted death certificates, hospital records and Medical Examiner records. All cases were then discussed with the Chair of the Maternal Mortality Workgroup, and twelve cases were selected for in-depth review. The Maternal Mortality Workgroup includes general obstetric, perinatology, family practice, pediatric and nurse-midwifery specialties. The Workgroup met three times to discuss these cases and identified a range of health systems issues.

The Maternal Mortality Workgroup discussion followed 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 causes of 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 and woman's adherence or non-adherence to medical recommendations." Quality and content of medical care includes factors such as "preventive services, community and patient education, nutrition, substance abuse services, social services, preconception services, prenatal care and labor and delivery services, postpartum care and follow-up, treatment and management, diagnostic procedures, medical interventions, and patient education and follow-up." Pregnancy-relatedness and preventability were determined through discussion.

The Maternal Mortality Workgroup is a subcommittee of the MedChi Maternal and Child Health (MCH) Committee. The MCH Committee membership includes the following specialties: obstetrics, pediatrics, family practice, nurse-midwifery, emergency medicine and public health. Additionally, a Maternal Mortality Policy Subcommittee met to review system issues identified through case review. This Subcommittee included representation from managed care, nursing and social work in addition to the Maternal Mortality Workgroup members. The Subcommittee met three times to discuss health systems issues and develop recommendations. 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

Case Identification

There were 41 pregnancy-associated cases identified for 2002. Pregnancy-related deaths are a subset of pregnancy-associated deaths. Following a review of available information on all the deaths, 11 cases (27%) were deemed pregnancy-related, 26 (63%) were deemed not related to pregnancy, and in four cases pregnancy-relatedness could not be determined. Examining deaths among women up to one year postpartum increased ascertainment of pregnancy-related cases by nine percent. Approximately the same number of cases have been identified for 2003. Case abstraction and review is under way for those deaths.

Cause of Death Classification

Among the 41 pregnancy-associated deaths in 2002, cardiac disease and homicide were the leading causes (20% each), followed by cancer and infection (10% each). There were three cases of substance abuse and two cases of suicide.

Among the 11 pregnancy-related deaths, the leading causes were cardiac disease (45%) and pulmonary embolism (18%). The "cardiac disease" category includes cases of cardio-myopathy, hypertensive cardiac disease, coronary artery disease, coronary artery dissection and aortic aneurysm rupture and cardiac arrhythmia.

Cases by Timing of Death

Sixty-one percent of pregnancy-associated and 36 percent of pregnancy-related deaths occurred postpartum in 2002. Women were pregnant at the time of death in 27 percent of the pregnancy-associated deaths and 36 percent of those that were pregnancy-related. Three women died in the intrapartum period.

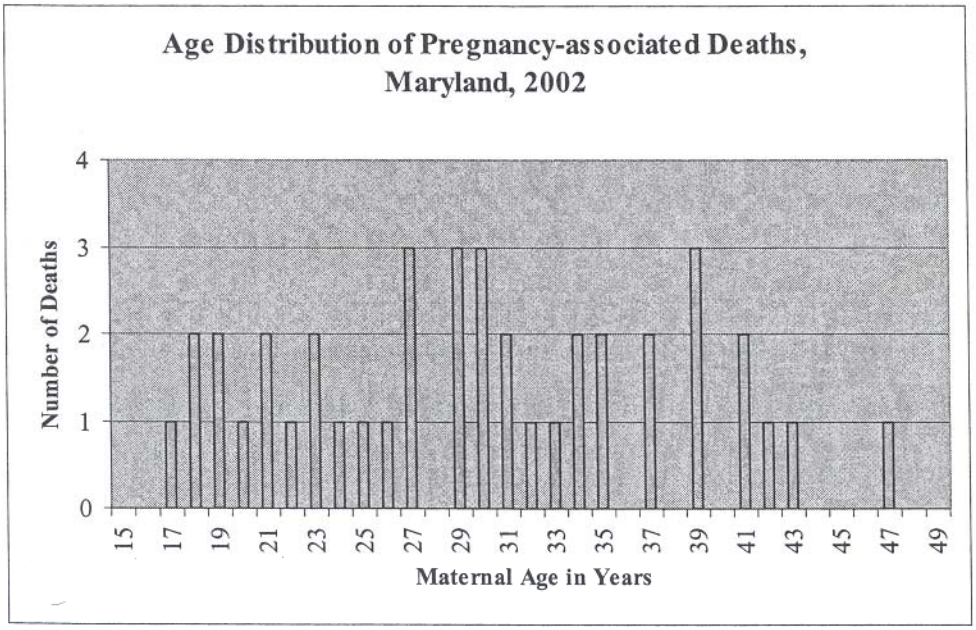
Cases by Maternal Race and Ethnicity

Among the 41 pregnancy-associated deaths, 61 percent occurred among non-Hispanic black women, 34 percent among non-Hispanic white women, and five percent among Hispanic women. Among the 11 pregnancy-related deaths, 73 percent (8) occurred among non-Hispanic black women, nine percent (1) among non-Hispanic white women, and 18 percent (2) among Hispanic women. Racial disparity is a persistent concern, particularly in pregnancy-related

deaths since non-Hispanic black women account for only 33 percent of births and Hispanic women seven percent of births while white women make up 52.9 percent of births in Maryland.

Cases by Maternal Age

The ages of the deceased ranged from 17 to 47 years as shown below. Twenty-nine percent of pregnancy-associated deaths were among women aged 35 years and older, although only 18.5 percent of births occurred in this age group. Women less than 20 years of age, account for 9.1 percent of births, and accounted for 12.2 percent of pregnancy-associated deaths in 2002.



Preventability

A case was classified as preventable if the death might have been avoided by a change in patient behavior, provider practice or institutional systems. Preventability was determined by two methods. First, the physician consultant and the Chair of the Maternal Mortality Workgroup reviewed the 41 pregnancy-associated deaths. Twelve cases (29%) were considered to have opportunities for prevention and were selected for in-depth discussion by the Maternal Mortality Workgroup. Injury and drug-related deaths were included if missed opportunities for intervention were identified during interactions with the health care system. Of these 12 cases, three were deemed preventable, six potentially preventable, and three undetermined. It is recognized that the determination of preventability does not follow rigid criteria and that this determination is open to interpretation. These considerations make comparisons in different venues impossible.

V. Findings and Recommendations

All cases thought to be preventable or potentially preventable were discussed in detail during the Maternal Mortality Workgroup meetings in order to identify the various factors that contributed to that death. Interactions between several factors may contribute to a death, particularly among the most vulnerable women with an underlying medical condition or mental illness. Factors examined include: individual, health care provider(s), health care system and policy.

The following factors were identified as potential contributors to death based on the available information for the twelve cases discussed. One or more factors were present in cases examined.

FACTOR	FREQUENCY
Individual	
Pre-pregnancy medical condition	67%
Pregnancy-complicating condition	42%
Non-adherence to medical advice	17%
Communication	
Communication between patient & providers	25%
Communication between healthcare professionals	33%
Patient education and follow-up	58%
Coordination of care	58%
Mental Health Care	33%
Pregnancy spacing	8%
Access to health care	17%

Findings regarding system of care issues and recommendations were organized into four domains: A) Discharge Planning and Care Coordination, B) Communication and Teamwork, C) Special Focus—Mental Health and Substance Abuse, and D) Review Process.

A. Discharge Planning and Care Coordination

Issues:

- For pregnant women with on-going medical illness:
  - Follow-up for co-morbid conditions during and after pregnancy is needed.
  - Coordination/ communication between medical providers (e.g. primary care provider managing chronic conditions and obstetrical care provider) is essential.
- Access to primary care is an issue when:
  - Women do not have a primary care provider.
  - Women do not have health insurance postpartum.
- Navigating the health care system and multiple providers appears difficult for women.
- Hospital discharge planning may be done by nursing, social worker or other personnel creating confusion in the locus of responsibility
  - Care for hypertension, asthma and other chronic conditions may not be clearly coordinated between the inpatient and outpatient care setting.
  - Postpartum discharge forms may not include follow-up plans for non-obstetrical conditions.
  - It is sometimes unclear whether medical problems are addressed.
- Women with complex health conditions requiring medication during pregnancy may choose not to breastfeed, or may breastfeed but not take their medications, due to concerns about the impact of the medications on their infant.

Recommendations:

1) Utilize a multidisciplinary forum, such as the DHMH Perinatal Clinical Advisory Committee to address issues related to discharge planning and care coordination of pregnant and postpartum women. Develop approaches to address:
   a) Communication between obstetric and primary care providers regarding clinical management during and immediately after pregnancy,
   b) Follow-up with both obstetric and primary care providers as part of hospital discharge planning,
   c) Opportunities for health care coverage for one year postpartum for uninsured women to allow time for management of chronic conditions,
   d) Methods to identify primary case managers to assist women in navigating between and among providers, and
   e) A more standard method for discharge planning.
2) Identify venues and enhance education of providers and patients regarding complications of pregnancy including:
   a) The effect of chronic conditions on pregnancy,
   b) The effects of pregnancy on chronic conditions,
   c) The need to continue medications postpartum that were deemed safe during pregnancy when breastfeeding and to consult their provider before stopping medications, and
   d) The need for lactation consultation for women with chronic conditions before hospital discharge.

B. Communication and Teamwork

Issues:

- Non-obstetric and primary care physicians may need increased knowledge regarding management of pregnant, postpartum and breastfeeding patients.
- Pediatricians have an opportunity to identify maternal issues and encourage women to seek follow up because they have contact with postpartum women related to newborn care.
- Providers may minimize degree of risk for certain complaints by pregnant patients (e.g., dismissal of breathing problems by triage personnel).
- When staff do not agree regarding clinical issues (e.g. physician disagrees with nursing staff or another physician regarding status of patient), care may be compromised.
- A pregnant or postpartum patient may be placed in the Maternity Ward due to her pregnancy status when a critical care unit may be more appropriate given her medical condition.
- Case Management is tied to specific services and therefore, a patient may see several case managers.
- Obstetrical care providers may not have adequate time or other resources to offer a woman access to services that might be beneficial.

Recommendations:

1) Utilize multidisciplinary forum such as the Perinatal Clinical Advisory Committee to develop solutions to problems identified in case reviews including:
   a) Protocol for relaying medical complaints of pregnant women to appropriately trained clinician when utilizing phone or other triage mechanism.
   b) Follow-up protocol for patients whose symptoms do not resolve as expected.
   c) Resolution process when there is a difference in opinion between clinical team members.

d) Protocol for management of critically ill pregnant and postpartum women in each hospital, including location of care and communication between obstetrical and critical care units.
e) Communication channels to coordinate case management for pregnant and postpartum patients between various programs before and after delivery.
f) Case management for any pregnant or postpartum woman referred by their obstetrical care provider, not only those who qualify based on income or other criteria.

2) Educate physicians and other providers about the management of pregnant, postpartum and breastfeeding patients.
   a) Provide information and resources to postpartum women in the pediatric setting.
      i) Develop guidelines and brief set of questions for screening postpartum issues.
      ii) Recommend re-imbursement method for pediatricians to cover time and encourage them to screen mothers during newborn visits.
   b) Increase awareness of medical complaints in pregnancy through staff training.

C. Special Focus: Mental Health and Substance Abuse

Issues:

- Physicians may be unaware of treatment programs and enrollment mechanisms for women with mental health, domestic violence or substance abuse needs.
- Psychiatric and substance use support/follow up programs for pregnant and postpartum women are necessary.
- Programs established according to Senate Bill 512-1997 are not in place in all jurisdictions in the state.

Recommendations:

1) Develop mechanism for sharing of issues and solutions between maternal and child health and mental health and drug and alcohol abuse providers to:
   a) Educate primary and obstetrical care providers as well as other professional audiences regarding the basics of treatment programs, point of entry, and referral information for mental health, domestic violence and substance use.
   b) Educate providers that pregnant women should be considered as a high-risk group for substance use and domestic violence.
   c) Provide information about substance use and domestic violence each time a woman is seen so that it gives additional opportunities to seek assistance.
   d) Design methods of follow up for women with positive screens.
   e) Increase public awareness of substance use and domestic violence and its impact on women and their infants.
2) Investigate and support appropriate continuation of Senate Bill 512-1997 pilot programs approach to substance abuse in pregnancy with special attention to:
   a) Expansion of program to include outpatient treatment.
   b) Increased support of program to meet demand.

D. Review Process

Issues:

- Medical records may not contain prenatal care record.
- Medical Examiner records do not have the names of primary care nor obstetrical providers.

- Primary care, obstetrical and hospital providers are not notified of a death of a patient occurring while not under their care.
- Hospital-based Morbidity and Mortality Reviews offer an opportunity to identify system issues and implement actions to improve quality of care.

Recommendations:

1) Work with individual hospitals and Maryland Hospital Association to assure that the prenatal record is required as part of hospital medical record completion.
2) Investigate whether the Office of the Chief Medical Examiner (OCME) can develop a method to record the names of primary and obstetrical care providers in cases of a pregnancy-associated death.
3) Investigate possible mechanisms for OCME to communicate with primary and obstetrical care providers and hospitals of birth in cases of pregnancy-associated death as appropriate.
4) Consider additional mechanisms to inform physicians and hospital quality assurance departments of pregnancy-associated patient deaths so that reviews may occur contemporaneously.
5) Increase awareness of pregnancy-associated deaths among institutions and physician groups:
   a) Review deaths of all women who delivered or died at their institution.
   b) Develop a standard tool and elements to consider when conducting reviews of pregnancy-associated deaths, including when to perform a root cause analysis.
   c) Include representation from various disciplines or fields of expertise when conducting reviews in order to obtain the most complete understanding of areas for prevention.
   d) Include maternal mortality review as part of routine institutional quality assurance activities.

VI. Accomplishments of Maryland's Maternal Mortality Review Program

There has been significant progress in establishing the maternal mortality review process for the State. This has been achieved through a partnership between the Department and MedChi and its Maternal and Child Health Committee. A format for case review has been created including a guide for data abstraction and case summarization as well as a process for development of recommendations for improvement based on case evaluation.

DHMH, MedChi and other partners have utilized the findings and recommendations of the Maternal Mortality Review Program to guide their work as well as to broaden the Program. The Maternal Depression Project was developed following an earlier review of a series of maternal suicides in order to identify ways to improve diagnosis and treatment for depression during and after pregnancy. The Maternal Depression Team was formed by MedChi and includes the American College of Obstetrics and Gynecology (ACOG) and local, state and national participants representing public agencies, institutions, private organizations and the managed care sector. A survey of clinical practice identified a number of barriers to diagnosis and treatment of women with depression. A provider toolkit was developed with resources and information to assist in the diagnosis and referral or treatment of maternal depression and distributed to more than 200 obstetric, pediatric and family practice clinicians throughout Maryland. Grand Rounds lectures were conducted by MCH's Dr. Diana Cheng at several Maryland institutions throughout 2004. In addition, an updated Postpartum Depression brochure with patient information and resources was developed for inclusion in materials given to new parents at the time of hospital discharge.

DHMH sponsored the David A. Nagey Perinatal Partnership Conference in September 2004. Five hundred participants attended the Conference that addressed several issues that have been identified in cases of maternal mortality such as cardiovascular disease in pregnancy and postpartum depression. A "Special Day" for women and their friends was held the day preceding the clinical conference to inform women about important care issues during pregnancy. The Department also sponsored an annual Suicide Prevention conference.

In 2004, Maryland issued its first Pregnancy Risk Assessment and Monitoring System (PRAMS) report. PRAMS is a CDC sponsored program that allows the state to examine women's experiences with pregnancy and medical care in order to identify areas of intervention to improve outcome. In addition, Maryland was invited to examine perinatal disparities in a special project sponsored by the Association of Maternal and Child Health Programs. This project is considering disparities in maternal mortality as well as other poor perinatal outcomes. Maternal issues are being examined in a broader context during the development of the Title V (Maternal and Child Health Block Grant) needs assessment required by the Health Resources Services Administration every five years.

The DHMH Perinatal Clinical Advisory Committee reconvened in the spring of 2004, in order to update the Maryland Perinatal Systems Standards, guidelines for hospitals in providing risk-appropriate care. These Standards were finalized in October 2004.

Issues regarding preventive healthcare and chronic conditions in pregnancy are being addressed in a variety of venues. The "Women Enjoying Life Longer" (WELL) project is introducing additional preventive healthcare components to pilot family planning clinics in order to address problems in the pre-conception and inter-conception periods. Professional education regarding chronic disease in pregnancy was addressed in a special issue of "Focus on FIMR," a publication aimed at providing information and resources to local Fetal and Infant Mortality Review Teams and their partners. Asthma in pregnancy was reviewed in the quarterly newsletter of the Maryland Asthma Control Program.

VII. Summary and Future Plans

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 has resulted in more complete detection of cases. Forty-one pregnancy-associated deaths were reviewed for 2002. A series of key factors contributing to maternal mortality in Maryland have been identified and recommendations made for developing solutions.

In addition, 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.

VIII. Acknowledgements

The Maternal Mortality Review Program would like to offer sincere thanks to the volunteer members of MedChi's Maternal and Child Health Committee and those who joined in the Maternal Mortality Policy Subcommittee for the many hours and serious attention given to this important public health project. Special thanks are extended to Dr. Harold Fox, Director of Gynecology and Obstetrics at Johns Hopkins University for his leadership of the Maternal Mortality Workgroup. The Program is also grateful for the diligent work of Dr. Hanan Aboumatar, physician consultant, for her careful and thorough abstraction of the cases.