

A REPORT FROM THE

**VIRGINIA** MATERNAL MORTALITY REVIEW TEAM

**PREGNANCY-ASSOCIATED  
MATERNAL DEATH IN VIRGINIA  
1999-2001**

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**VIRGINIA DEPARTMENT OF HEALTH  
OFFICE OF THE CHIEF MEDICAL EXAMINER**



VIRGINIA MATERNAL MORTALITY REVIEW TEAM

# 2007 REPORT

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## Mission Statement

Virginia's Maternal Mortality Review Team is dedicated to the identification of all maternal deaths in the Commonwealth and the development of interventions that reduce preventable deaths.

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# EXECUTIVE SUMMARY

This report presents findings and recommendations from the Virginia Maternal Mortality Review Team (MMRT). This Team reviews all cases of death occurring in the Commonwealth of Virginia to a Virginia resident who was either pregnant at the time of death or had a pregnancy in the year prior to death. The purpose of this review is to identify factors that contributed to death and develop public health strategies to prevent similar deaths in the future.

Through its review, the Team discovered that women who died within one year of pregnancy received services in settings where assessments, prevention efforts, treatments, referrals, and/or interventions might have changed the outcome. By describing these deaths and locating the systems in which women were already involved, public health initiatives can be identified to reduce morbidity and mortality.

With few exceptions, each of the women whose cases were reviewed by the MMRT had been seen in doctor's offices, hospitals, community service agencies, or by law enforcement agents during or soon after their pregnancies.

Maternal death review has a long history in Virginia. In 1928, the Medical Society of Virginia (MSV) began conducting systematic review of deaths that occurred during pregnancy and childbirth. MSV's efforts continued well into the 1990's. By that time, morbidity and mortality during pregnancy and childbirth had become issues of public health importance. During the 1990's the Virginia Department of Health (VDH) joined forces with the Medical Society of Virginia in their efforts to continue reviews of deaths to pregnant and postpartum women.

In 2001, with support from the Centers for Disease Control and Prevention (CDC), the VDH restructured maternal death review. The VDH Office of Family Health Services and the VDH Office of the Chief Medical Examiner partnered to establish the Virginia Maternal Mortality Review Team. This multidisciplinary Team chose to adopt the broad definition of maternal death, pregnancy-associated death, for its review. Pregnancy-associated death refers not only to those deaths that occurred as a direct result of a pregnancy but also to deaths that occurred within one year of a pregnancy irrespective of the cause of death. There are several important reasons for using the expanded definition. Review of these cases results in better identification of populations at risk for both natural and violent causes of morbidity and mortality. The relationship between violence and pregnancy is a newly recognized phenomenon requiring further study. Also, using the broad definition of pregnancy-associated

death allows for examination of the systems, agencies, and organizations that serve women during pregnancy and the postpartum period. Strengths, gaps, and the need for additional resources can be identified. The Team can then make suggestions for intervention and prevention strategies to reduce deaths that apply to a wide array of service providers - prenatal health care providers, social workers, psychiatrists, emergency care providers, dieticians, healthcare facility administrators, advocates, and law enforcement agents.

With few exceptions, each of the women whose cases were reviewed by the MMRT had been seen in doctor's offices, hospitals, community service agencies, or by law enforcement agents during or soon after their pregnancies. The Team asked several questions: Which

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agencies met this woman in the five years before her pregnancy? Who might have gathered more information, provided additional resources, and/or sought alternatives to address an identified need? Had someone known that violence or a serious mental illness or substance abuse was an ongoing problem, or known that once Medicaid insurance coverage for the pregnancy ended that no follow-up for chronic illness would be obtained, might they have attempted to steer her toward a resolution of these problems?

The Team chose to focus on five areas for this report: racial disparity, motor vehicle collisions, substance abuse, mental illness, and domestic violence.

The women whose cases were reviewed were young women whose deaths were premature. They were 14 to 46 years old with a median age of 29 years. Approximately one in five (22.3%) of the deaths were to women over the age of 35. Half (50.4%) of the women were White, 43.0% were Black, and 6.6% were of another race. The highest percentage (47.9%) had a high school education. Married women comprised 48.8% of all cases while 42.9% were never married. The majority (52.8%) of deaths were due to natural causes. Violent deaths accounted for 45.5% of all cases and included unintentional injury (25.7%), homicide (14.0%), and suicide (5.8%).

Fewer than half (42.1%) of the women began prenatal care in the first trimester of their pregnancies. Close to half (44.6%) had private insurance to cover the cost of care while one-third (33.1%) were covered by Medicaid. Roughly half of the women had vaginal deliveries (49.6%) followed by primary Cesarean sections (24.0%) and repeat Cesarean sections (9.1%). Three-fourths of the women (74.4%) delivered a live infant while fifteen women (12.4%) were pregnant when they died.

The Team found that nearly half (47.1%) of the women had died by 42 days (six weeks) after the end of the pregnancy. They noted the significance of this interval in so many cases because the postpartum visit typically takes place at six weeks. This visit reflects an important opportunity for assessment and referral. The Team's findings support the need for earlier follow-up by healthcare providers after delivery.

This report identifies contributors to pregnancy-associated mortality in Virginia as determined through review of 121 cases of pregnancy-associated deaths from the years 1999-2001. The Team chose to focus on five factors for this report: racial disparity, motor vehicle collisions, substance abuse, mental illness, and domestic violence. Major findings for each factor are discussed below. The Maternal Mortality Review Team offers recommendations to address these factors to reduce deaths in the Commonwealth.

## **Racial Disparity**

Virginia's Maternal Mortality Review Team confirmed that racial disparity in maternal death is a significant problem.<sup>1</sup> The overall maternal mortality ratio<sup>2</sup> in Virginia for the three year

<sup>1</sup> The population of Virginia was 7,078,515 in 2000. Roughly 72% of the population was White and 20% was Black. There were a total of 96,759 live births in Virginia during 2000. Births to White women totaled 67,232 and births to Black women totaled 22,302.

<sup>2</sup> The pregnancy-associated maternal mortality ratio is the number of pregnancy-associated maternal deaths divided by the number of live births then multiplied by 100,000.

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period of the review was 42.2. The ratio of deaths among Black women is more than double the ratio of deaths among White women—78.4 and 30.5 respectively.

Black women tended to enter prenatal care during the second trimester of pregnancy (14.1 weeks estimated gestational age) while White women entered care earlier (11.7 weeks estimated gestational age). Black women had fewer prenatal care visits (10 for Black women and 12 for White women) and delivered their babies earlier (37.6 weeks) than White women (38.1 weeks).

The leading types of death among White women were all violent: motor vehicle incidents, homicide, suicide, and accidental overdoses. For Black women, the leading death types were a combination of natural and violent types: homicide, cardiac disease, motor vehicle incidents, cardiomyopathy, and pulmonary embolism.

## **Motor Vehicle Collisions**

The Team reviewed 22 cases of motor vehicle collision deaths over the three year period. This death type represents the largest number of pregnancy-associated deaths. The women who died in a motor vehicle collision were primarily young (median age was 25 years old), single (72.7%), and had obtained at least a high school education. Just over one-quarter of these women (27.2%) were pregnant at the time of death. Over half (54.5%) were not using safety equipment at the time of the fatal incident. The driver of the vehicle had a blood alcohol content above the legal limit (at or over 0.08%) in 18.2% of cases of motor vehicle related deaths.

## **Substance Abuse, Mental Illness, and Domestic Violence**

Team members were surprised to discover the severity of problems associated with substance abuse, mental illness, and domestic violence and how often these factors contributed to maternal death. Often, there was no indication of the risks in the medical records reviewed by the Team even though almost all of the women had recent involvement with healthcare providers, usually obstetricians or a hospital, prior to their death. More commonly, these problems were revealed in records generated after they died. The median length of time between the end of pregnancy and death for women with mental health problems was 98 days, 105 days for women with domestic violence risk, and 116 days for those with substance abuse issues.

Team review of all records revealed that 38 women (31.4% of all cases) were at risk for problems related to substance use/abuse, and in 35 cases, the Team determined that substance use contributed to death.

More than one-third (36.8%) of women with a substance abuse risk were known to have used alcohol during pregnancy and over a quarter (28.9%) were known to have used other drugs during their pregnancy.

The majority of the women identified with a substance abuse risk died a violent death. Twenty-one percent were victims of homicide, 18.4% died from accidental overdoses, 13.2% committed suicide, and 10.5% died in motor vehicle incidents.

The ratio of deaths among Black women is more than double the ratio of deaths among White women—78.4 and 30.5 respectively.

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Of the 27 women identified with a risk for mental illness, slightly more than half died a violent death. Twenty-two percent of these women committed suicide, 11.1% died in motor vehicle collisions, 11.1% died from accidental overdoses, and 7.4% were homicide victims. Forty-three percent of the suicides occurred between two and four months after the end of the pregnancy while the remaining 57.0% occurred five to eight months after the pregnancy. In three of the seven cases of suicide, the Team determined that the suicide was directly related to the pregnancy.

The Team determined that 46.3% of pregnancy-associated deaths were preventable.

Twenty women were identified with a risk for domestic violence and in 17 cases, the Team determined that domestic violence was a direct contributing factor in the death. Forty-five percent of women with a risk for domestic violence died from homicide, 15.0% in motor vehicle collisions, and 15.0% from accidental overdoses. Five percent died from suicide and an additional 5.0% were undetermined in cause and manner. In 13 cases, the homicide perpetrator was an ex-boyfriend, boyfriend, husband, acquaintance, or family member. In over three-fourths of those cases, there was known conflict between the decedent and perpetrator at the time of death.

As each case was reviewed, the MMRT determined whether a reasonable change in one or more factors may have altered the outcome. Overall, the Team determined that 46.3% of pregnancy-associated maternal deaths were preventable. Nearly one-third (32.8%) of natural deaths and well over one-half (63.7%) of violent deaths were determined to be preventable.

Based on these findings, the Maternal Mortality Review Team offers the following recommendations for reducing pregnancy-associated maternal deaths in the Commonwealth of Virginia. These recommendations are offered in the spirit of public health to the Governor, Members of the General Assembly, healthcare professionals, community services providers, law enforcement officers, and citizens of the Commonwealth.

## Team Recommendations

### Funding

1. The General Assembly should provide additional funds to support domestic violence prevention and intervention efforts in the Commonwealth.
2. The General Assembly should provide funding to treat substance abuse among pregnant and postpartum women. This should include expansion of intensive outpatient and home visitation services.
3. The General Assembly should provide funds to the Virginia Department of Health for prenatal services, including case management and home visitation services.
4. The General Assembly should provide funding to expand the Department of Medical Assistance Services' Family Planning Waiver to include assessment and treatment for mental health and substance abuse as needed.

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## Legislation

The Maternal Mortality Review Team supports strengthening laws related to medical history screening and the care and well-being of pregnant and postpartum women. Where there are recommended additions to the *Code of Virginia*, they are indicated by italicized text. Recommended subtractions are noted with strike-through text.

1. The General Assembly should enact legislation requiring the Department of Medical Assistance Services and all other third-party payers to provide payment for screening and management of substance abuse, domestic violence, and mental health problems including perinatal depression.
2. The General Assembly should amend and reenact §37.2-407 of the *Code of Virginia* referring to treatment of pregnant women with substance abuse with the following amendment:

The Board shall adopt regulations that ensure that providers licensed to offer *mental health and/or* substance abuse services develop policies and procedures for the timely and appropriate treatment of pregnant *and/or postpartum* women with *mental health conditions and/or* substance abuse. *These policies shall reflect a provision that services shall be initiated within 48 hours of a request for service for a pregnant and/or postpartum woman.*

3. The Commonwealth of Virginia should enact a primary seat belt law.
4. The General Assembly is encouraged to amend and re-enact §46.2-1094 of the *Code of Virginia* referring to occupants of front seats of motor vehicles to use safety lap belts and shoulder harnesses. The Team recommends specific statute changes as follows:
  - A. Each person at least sixteen years of age and occupying ~~the front seat~~ *any seat* of a motor vehicle equipped or required by the provisions of this title to be equipped with a safety belt system, consisting of lap belts, shoulder harnesses, combinations thereof or similar devices, shall wear the appropriate safety belt system at all times while the motor vehicle is in motion on any public highway. A child under the age of sixteen years, however, shall be protected as required by the provisions of this chapter.
  - B. This section shall not apply to:
    1. Any person for whom a licensed physician determines that the use of such safety belt system would be impractical by reason of such person's physical condition or other medical reason, provided the person so exempted carries on his person or in the vehicle a signed written statement of the physician identifying the exempted person and stating the grounds for the exemption; or
    2. Any law-enforcement officer transporting persons in custody or traveling in circumstances which render the wearing of such safety belt system impractical; or
    3. Any person while driving a motor vehicle and performing the duties of a rural mail carrier for the United States Postal Service; or

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4. Any person driving a motor vehicle and performing the duties of a rural newspaper route carrier, newspaper bundle hauler or newspaper rack carrier; or
  5. Drivers of taxicabs; or
  6. Personnel of commercial or municipal vehicles while actually engaged in the collection or delivery of goods or services, including but not limited to solid waste, where such collection or delivery requires the personnel to exit and enter the cab of the vehicle with such frequency and regularity so as to render the use of safety belt systems impractical and the safety benefits derived there from insignificant. Such personnel shall resume the use of safety belt systems when actual collection or delivery has ceased or when the vehicle is in transit to or from a point of final disposition or disposal, including but not limited to solid waste facilities, terminals, or other location where the vehicle may be principally garaged; or
  7. Any person driving a motor vehicle and performing the duties of a utility meter reader; or
  8. Law-enforcement agency personnel driving motor vehicles to enforce laws governing motor vehicle parking.
- C. Any person who violates this section shall be subject to a civil penalty of ~~twenty-five~~ fifty dollars to be paid into the state treasury. *Twenty-five dollars shall be credited to the Literary Fund and twenty-five dollars credited to the Virginia Department of Health, Office of Family Health Services to be used for public health education on seat belt usage.* No assignment of demerit points shall be made under Article 19 of chapter 3 of this title and no court costs shall be assessed for violations of this section.
- D. A violation of this section shall not constitute negligence, be considered in mitigation of damages of whatever nature, be admissible in evidence or be the subject of comment by counsel in any action for the recovery of damages arising out of the operation, ownership, or maintenance of a motor vehicle, nor shall anything in this section change any existing law, rule, or procedure pertaining to any such civil action.
- E. A violation of this section may be charged on the uniform traffic summons form.
- ~~F. No citation for a violation of this section shall be issued unless the officer issuing such citation has cause to stop or arrest the driver of such motor vehicle for the violation of some other provision of this code or local ordinance relating to the operation, ownership, or maintenance of a motor vehicle or any criminal statute.~~
- G. The governing body of any city having a population of at least 66,000 but no more than 67,000 may adopt an ordinance not consistent with the provisions of this section, requiring the use of safety belt systems. The penalty for violating any such ordinance shall not exceed a fine or civil penalty of ~~twenty-five~~ fifty dollars.

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## **Enforcement**

1. Law enforcement agencies should enforce domestic violence laws and hold abusers accountable.

## **Virginia Department of Health**

1. The Office of Family Health Services should provide a culturally competent public health education campaign on the use of seat belts by pregnant women.

## **Virginia Department of Mental Health, Mental Retardation and Substance Abuse Services**

1. The Department of Mental Health, Mental Retardation and Substance Abuse Services should take the lead in working with appropriate agencies to propose a statewide substance abuse and mental health screening program protocol for all pregnant women as provided in §54.1-2403.1 of the *Code of Virginia*.

## **Healthcare Providers and their Professional Organizations**

1. The Virginia Section of the American College of Obstetricians and Gynecologists and the Virginia Chapter of the American College of Nurse-Midwives should encourage its members to provide a two week postpartum follow-up visit.
2. The Virginia Board of Pharmacy should alert and train all licensed prescribers in the utilization of the Virginia Prescription Monitoring Program.

## **Education for Healthcare Providers**

1. The Virginia Department of Health, Office of Minority Health should create cultural competency training programs for all personnel involved in the care of pregnant and postpartum women.
2. The Department of Health Professions should require four hours of continuing learning activities on domestic violence and substance abuse for all license renewal.

## **Third Party Payers**

1. All public and private third party payers should expand Maternity Management Programs to include mental health, substance abuse, and domestic violence.

## **Community Initiatives**

1. Community health centers should apply for changes in scope of services and seek funding to include perinatal care and care of women with mental illnesses and substance abuse.
2. The Virginia Department of Health and the Virginia Sexual and Domestic Violence Action Alliance should provide written resources on domestic violence for dissemination to patients in every healthcare provider's office.
3. Working with the Virginia Sexual and Domestic Violence Action Alliance, all local school divisions should strengthen domestic violence primary prevention (including dating violence prevention) in their Family Life curriculum.

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## Virginia Department of Health, Division of Vital Records

The Division of Vital Records should adopt the Centers for Disease Control and Prevention's proposed revision of Section 28b of the Certificate of Death as follows:

IF FEMALE:

- ❑ Not pregnant within past year
- ❑ Not pregnant, but pregnant within 42 days of death
- ❑ Not pregnant, but pregnant 43 days to 1 year before death
- ❑ Pregnant at the time of death
- ❑ Unknown if pregnant within the past year

## Introduction

The Commonwealth of Virginia Maternal Mortality Review Team (MMRT) reviews all deaths to women that occur during a pregnancy or within one year of the end of a pregnancy. The review is conducted to understand the causes of maternal death within the context of women's lives and the circumstances surrounding injury and disease patterns. Results of these reviews are used to educate colleagues and policymakers about these deaths, to identify needed changes in law and/or practice, and to recommend other improvements and interventions to reduce maternal death in Virginia. This report presents the Team's findings and recommendations from the review of maternal deaths in the Commonwealth of Virginia for the years 1999-2001.

Definition of Key Terms. *Fatality review* is a theory and method grounded in public health and designed to identify and understand risk factors with a focus on prevention. The purpose is to improve understanding of how and why people die. Findings generated through these reviews are used to take action to prevent other deaths.

*Maternal mortality* is defined using the International Classification of Diseases (ICD) as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes."<sup>1</sup> This definition is currently used by the Centers for Disease Control and Prevention's (CDC's) National Center for Health Statistics in its publications of maternal mortality statistics in the United States.

The American College of Obstetricians and Gynecologists (ACOG) and CDC's Maternal Mortality Study Group developed new terms in 1986 to broaden the definition of maternal mortality. These terms are: *pregnancy-associated death* and *pregnancy-related death*. A *pregnancy-associated death* is defined as the death of a woman while pregnant or within one year of the termination of a pregnancy irrespective of the cause of death or the outcome of the pregnancy.<sup>2</sup> This term refers to the temporal relationship between the pregnancy and the death. A *pregnancy-related death* is any pregnancy-associated death resulting from one or more of the following: complications of the pregnancy itself; the chain of events initiated by the pregnancy that led to death; or aggravation of an unrelated condition by physiological effects of the pregnancy that subsequently caused death.<sup>3</sup> Virginia's MMRT reviews all pregnancy-associated deaths where the death occurred in Virginia to a Virginia resident. The Team then determines if the death was pregnancy-related through its review of the circumstances surrounding each death.

A *preventable death* is defined as a death that may have been averted by one or more reasonable changes in clinical care, facility infrastructure, community, and/or patient factors. The preventability of a death is determined through multidisciplinary case review and Team decision.

Fatality review is a theory and method grounded in public health and designed to identify and understand risk factors with a focus on prevention.

<sup>1</sup> World Health Organization. (1992). International classification of diseases (ICD-10) (Tenth Revision).

<sup>2</sup> Berg C, Danel, I, Atrash H, Zane S, Bartlett L (Eds.). (2001) Strategies to reduce pregnancy-related deaths: From identification and review to action, (p.5). Atlanta: Centers for Disease Control and Prevention.

<sup>3</sup> Ibid.

## I. Process and Procedure for Team Review

Case Identification. Nationally, CDC reports of maternal mortality are identified through the International Classification of Diseases (ICD) cause of death codes and are limited to deaths directly attributable to a pregnancy, such as postpartum hemorrhage or amniotic fluid embolism. This system is used to classify causes of death as listed on the death certificate. These deaths would be defined as pregnancy-related deaths. Virginia's Maternal Mortality Review Team uses several methods to identify cases of pregnancy-associated death which include all deaths within one year of a pregnancy regardless of the cause. Virginia's Certificate of Death provides two items of information used to identify cases for review: (1) the certificate asks whether the decedent was pregnant within the past three months and (2) lists the causes of death. Since the Maternal Mortality Review Team reviews all deaths occurring either during a pregnancy or within one year of the end of pregnancy, the current certificate of death does not capture all cases that are reviewed by the Team. Therefore, one additional method is utilized to identify cases that meet the definition of pregnancy-associated death. This method consists of matching birth or fetal death certificates with pregnancy-associated death certificate information.

The Team identified 121 pregnancy-associated deaths between 1999-2001. Many of these deaths were identified by more than one mechanism described above. Eighty-four percent of cases were found by linking maternal death certificates with fetal death or live birth certificates; 40.5% had a death certificate check box indicating there was a pregnancy within the past three months; and, 18.2% had an ICD code indicating a pregnancy-related cause of death. Over half (52.0%) of the deaths were identified only by the correlation of certificates of maternal death with infant death/birth certificates, making this system the most effective method of case identification.

Record Collection. The Virginia Maternal Mortality Review Team is staffed by a Coordinator who is responsible for record collection and preparation of case summaries for Team review. The Coordinator receives copies of maternal death certificates and infant birth/death certificates from the Virginia Department of Health, Division of Health Statistics. The Coordinator assigns a unique case identification number to that case and begins the process of record collection.

In general, the Coordinator requests all medical records relevant to understanding the decedent's health, medical and social history leading up to and including the fatal injury, and illness or disease event. The following kinds of medical records are requested and, if available, reviewed in each maternal death:

- Birth
- Prenatal Care
- Mental Health

A pregnancy-associated death is defined as the death of a woman while pregnant or within one year of the termination of a pregnancy irrespective of the cause of death or the outcome of the pregnancy.

- Primary Healthcare
- Hospital
- Emergency Department
- Medical Specialists
- Medical Examiner

Where relevant, other public records such as court records and newspaper articles may also be collected.

Case Abstraction. Once all records have been collected, the Coordinator organizes the records and prepares case summaries for Team review. Two kinds of extractions are readied:

1. The Coordinator prepares a narrative case summary which provides an overview of (1) the decedent's background, medical and social history, and events leading up to the fatal event; and (2) reports and investigations of the death event.
2. The Coordinator completes a data abstraction tool which the Team adapted from the Pregnancy-Associated Mortality Review (PAMR) surveillance system developed by the Florida Department of Health.<sup>4</sup> This form presents information in the following categories: records collected in the case, demographics of the decedent, general health history, obstetrical history, psychosocial history, prenatal care, weight-related issues, labor and delivery, events of death, pathology results, and death certificate cause of death.

Case-specific medical records collected for maternal death review are housed and maintained by the Office of the Chief Medical Examiner (OCME) in Richmond, Virginia. This is a secure facility designed to support the confidentiality of decedent records.

Team Review. The Team meets six times per year in Richmond at the OCME. Team discussion and deliberation are governed by these values:

- Multidisciplinary review. Virginia's Team includes obstetricians; nurse midwives; social workers; forensic pathologists; psychiatrists; dieticians; domestic violence advocates; nurses; hospital and healthcare association advocates; and representatives from State programs and policy staff including the Virginia Department of Mental Health, Mental Retardation, and Substance Abuse Services; and the Virginia Department of Health's Division of Women's and Infants' Health and Division of Vital Records.
- Public health approach. This approach requires defining the problem through the systematic collection of information to describe populations at risk. The purpose is to improve the understanding of the totality of factors influencing the problem so that recommendations and interventions can be developed to reduce death.
- Retrospective review. The Team reviews deaths at least two years after the date of death. This facilitates time for the completion of death investigation.

<sup>4</sup> The Florida Department of Health, Documents of Special Interest. Florida's pregnancy-associated mortality review (PAMR) 1999-2002. Available at <http://www.doh.state.fl.us/Family/mch/docs/pdf/PAMR99-02.pdf> (accessed December, 2006).

- Consensus decision-making. Consensus decisions reflect general agreement and unity among Team members. The discussion and debate that ensues through consensus decision-making leads to the synthesis of ideas of all participants into a resolution acceptable to all.

Once a case has been reviewed, the Team collaboratively completes a *Contributors to Mortality* form. This discussion includes the Team's decision about the following dimensions of maternal deaths:

- The preventability of the maternal death;
- The degree to which the death was pregnancy related;
- Factors that contributed to the death;
- Ideas for prevention and intervention; and
- Agreement with cause and manner of death as described on the death certificate.

Confidentiality. The Coordinator is the only person who knows the identity of the decedent and takes several steps to insure the confidentiality of Team records and proceedings.

- All meeting attendees execute a sworn statement of confidentiality promising to maintain the confidentiality of information, records, discussions, and opinions disclosed during maternal mortality reviews.
- Summaries and abstractions of actual decedent cases are de-identified and are assigned a unique case identification number. Decedent's names do not appear on documents presented to Team members for review.
- Team members receive materials and review de-identified cases at meetings, and do not take these materials from the meeting. Review materials are collected and shredded at the end of each Team meeting.
- Team meetings are closed and confidential.
- Summaries and reports on Team findings and recommendations provide patterns and trends only and are presented in aggregate form.

### **II. Overview of Pregnancy-Associated Maternal Death in Virginia, 1999-2001**

The Virginia Maternal Mortality Review Team (MMRT) chose to adopt the broad definition of maternal death, pregnancy-associated death, for its review for the following reasons:

1. Review of all cases in which a death occurred either during a pregnancy or within one year of pregnancy results in the identification of populations at risk.
2. Trends and patterns related to psychosocial factors emerge that would be missed with a more narrow focus.
3. Deaths due to the pregnancy itself can be more clearly identified and a more thorough understanding of disease patterns and complications can be obtained.
4. Reviewing cases using the broader definition provides an opportunity to examine the

strengths, gaps, processes, and systems that serve women during pregnancy and the postpartum period.

5. The Team can develop strategies to reduce deaths that apply to prenatal care providers, social workers, psychiatrists, emergency care providers, dieticians, healthcare facility administrators, advocates, and law enforcement agencies.

With few exceptions, each of the women whose cases were reviewed had been seen in doctor's offices, hospitals, community service agencies, and/or by law enforcement during or soon after their pregnancies. The Team determined which agencies and organizations had been involved with each woman's case. They asked who might have gathered more information, provided additional resources, and/or sought alternatives to address an identified need. Had someone known that violence, or a serious mental illness, or substance abuse was an ongoing problem, or that once Medicaid insurance coverage for the pregnancy ended no follow-up for chronic illness would be obtained, might they have attempted to steer her toward a resolution of these problems?

This report will demonstrate that women who die within one year of pregnancy are already being seen in settings where prevention efforts, treatments, referrals, and/or interventions could be implemented. By identifying factors that contributed to these deaths and locating systems in which the women are involved, public health initiatives can be developed to prevent similar deaths in the future.

Demographic Characteristics. Table 1 provides an overview of selected characteristics for the 121 women whose cases were reviewed by the Maternal Mortality Review Team. Column one describes the characteristic being reported. Columns two and three provide the number and percent of cases of pregnancy-associated deaths for each characteristic. Columns four and five lay out information for those dying from natural causes and columns six and seven refer to cases of violent death.

Ages of women dying pregnancy-associated deaths ranged from 14 to 46 years old. The median age at time of death was 29 years old. Approximately one in five (22.3%) of the deaths were to women over the age of 35. In obstetrical terms, women over the age of 35 are classified with advanced maternal age and are considered at higher risk for problems during pregnancy.

In terms of race and ethnicity, half (50.4%) of the women were White, 43.0% were Black, 2.5% were Asian, and 4.1% were of another race. Eight of the women (6.6%) were of Hispanic origin. Nearly half (47.9%) of the women were high school graduates and an additional 32.2% had more than a high school education. Close to half of the women (48.8%) were married while 42.9% were never married.

By identifying factors that contributed to these deaths and locating systems in which the women are involved, public health initiatives can be developed to prevent similar deaths in the future.

# PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

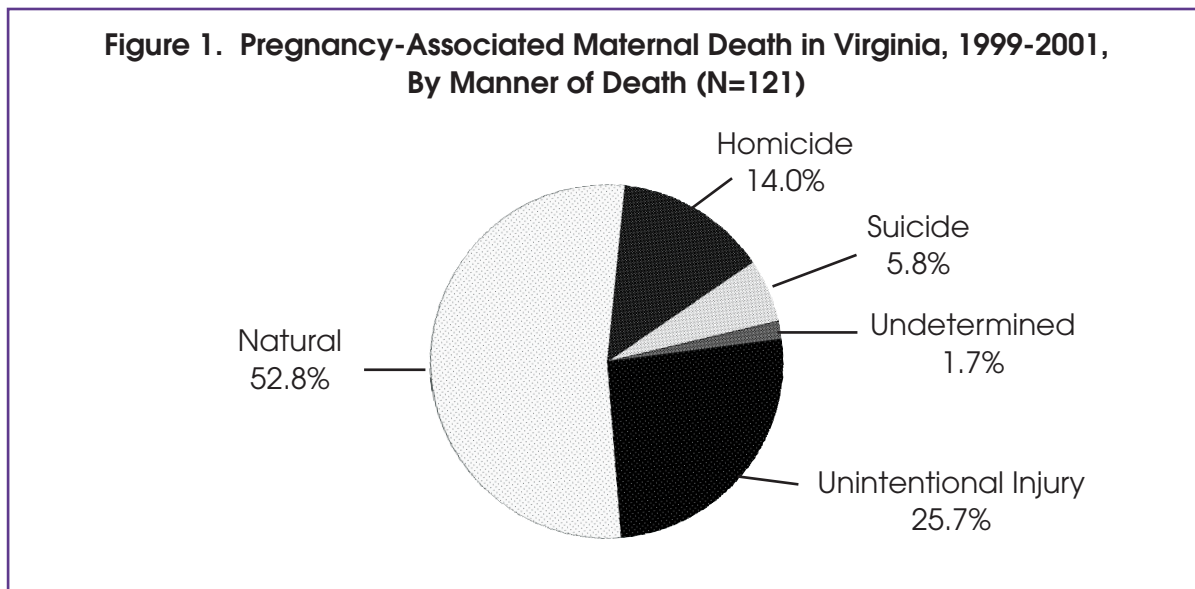
Table 1. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, Demographic Characteristics Overall and By Death Type (N=121)

1	Pregnancy-Associated Death (N=121)		Natural Death (n=64)		Violent Death (n=55)	
	2	3	4	5	6	7
	Number	Percent	Number	Percent	Number	Percent
<b>Age</b>						
<18	2	1.7	0	0.0	2	3.6
18-20	11	9.1	2	3.1	9	16.4
21-25	28	23.1	7	10.9	21	38.2
26-30	26	21.5	12	18.8	13	23.6
31-35	27	22.3	21	32.8	6	10.9
36-40	23	19.0	19	29.7	3	5.5
41 and over	4	3.3	3	4.7	1	1.8
<b>Median Age</b>						
Median Age	29		33		25	
<b>Race</b>						
White	61	50.4	25	39.1	34	61.8
Black	52	43.0	32	50.0	20	36.4
Asian	3	2.5	3	4.7	0	0.0
Other	5	4.1	4	6.2	1	1.8
<b>Education</b>						
Less than High School	23	19.0	9	14.1	13	23.6
Completed High School	58	47.9	26	40.6	32	58.2
More than High School	39	32.2	28	43.8	10	18.2
Unknown	1	0.8	1	1.5	0	0.0
<b>Marital Status</b>						
Never Married	52	42.9	20	31.2	32	58.2
Married	59	48.8	38	59.4	19	34.5
Widowed or Divorced	10	8.3	6	9.4	4	7.3
<b>Health Service Area</b>						
Northwest	13	10.7	6	9.4	7	12.7
Northern	22	18.2	12	18.8	10	18.2
Southwest	22	18.2	12	18.8	10	18.2
Central	28	23.1	13	20.3	14	25.4
Eastern	36	29.8	21	32.8	14	25.4

Virginia has five Health Service Areas (HSA) for the purposes of planning. The largest percentage of cases of pregnancy-associated death were from the Eastern Health Service Area (29.8%), with the Central Health Service Area reporting 23.1% of all cases. The Northern and Southwest Health Service Areas each had 18.2% of cases while the Northwest Health Service Area reported 10.7% of cases.

## PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

Cause and Manner of Death. The Team reviewed cases of both violent and natural deaths. Returning to Table 1, columns 5 and 7 reveal that women dying from violent causes tended to be young (median age 25), single (65.5%), White (61.8%), and to have had a high school education (58.2%). Women dying from natural causes tended to be older (median age 33), married (59.4%), Black (50.0%), and more highly educated with 43.8% having more than a high school education. Figure 1 portrays the manner of death for the 121 women who died a pregnancy-associated death.



The majority of pregnancy-associated death in Virginia (52.8%) was due to natural causes. Natural deaths are defined as those occurring as a result of a disease or illness process. Manners of death for violent deaths include unintentional injury (25.7%), homicide (14.0%), and suicide (5.8%). The cause and manner of death were not determined in two cases (1.7%).

Table 2 shows specific cause and/or manner of death for the 121 cases of pregnancy-associated death. Cardiac disease accounted for 15 deaths (12.3%), pulmonary embolism occurred in nine cases (7.4%), cancer claimed seven lives (5.7%), and hemorrhage accounted for six deaths (5.0%). Exacerbation of chronic conditions<sup>5</sup> and disorders of the central nervous system each accounted for five deaths (4.1%). Cardiomyopathies and amniotic fluid embolism were responsible for four deaths each (3.3%), followed by two cases of each of the following: pregnancy induced hypertension or eclampsia, ectopic pregnancies, infection, and AIDS related disorders.

Motor vehicle collisions were the cause of the largest number of pregnancy-associated deaths (22 or 18.2% of all cases). Homicide accounted for 17 deaths (14.0%). Suicide and accidental overdose claimed seven lives each (5.8%). There were two other accidents as well as two cases where the cause and/or manner of death were undetermined.

Prenatal Care Higher percentages of women dying a pregnancy-associated maternal death received no prenatal care and began prenatal care after the first trimester than women in the general population giving birth. Prenatal care is essential for the health of both the

<sup>5</sup> Chronic conditions included seizure disorders, asthma, diabetes, and advanced Amyotrophic Lateral Sclerosis.

# PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

Table 2. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, Cause/Manner of Death (N=121)

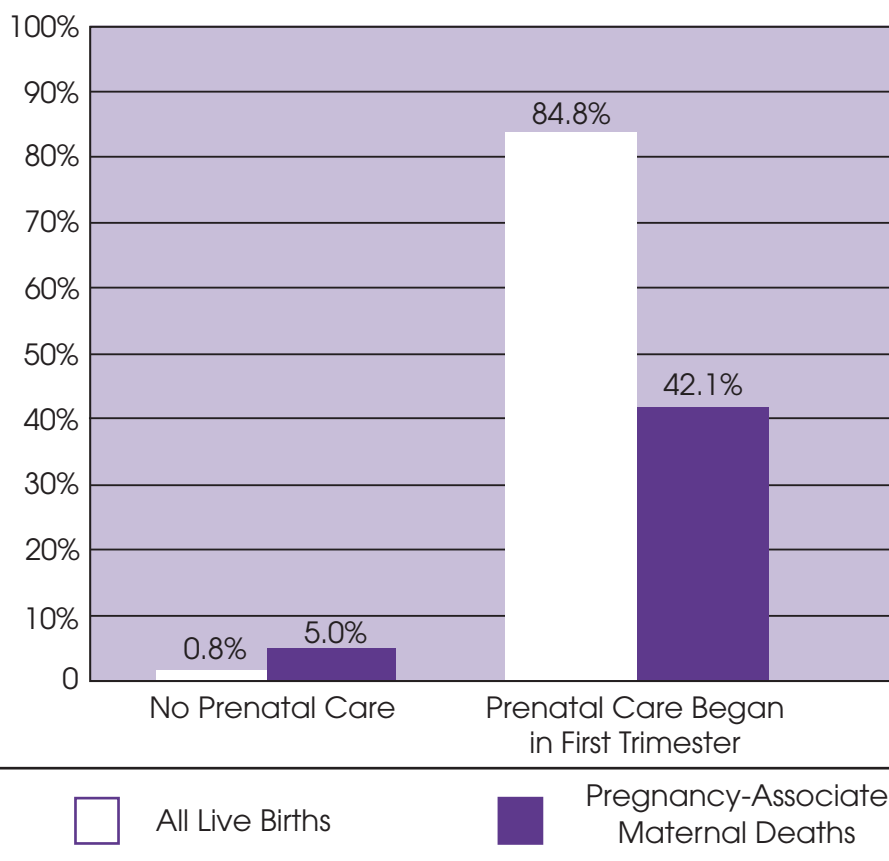
	Number	Percent
<b>Natural Death</b>		
Cardiac Disease	15	12.3
Pulmonary Embolism	9	7.4
Cancer	7	5.7
Hemorrhage	6	5.0
Exacerbation of Chronic Condition	5	4.1
Disorders of Central Nervous System (including stroke, arteriovenous malformation)	5	4.1
Cardiomyopathy	4	3.3
Amniotic Fluid Embolism	4	3.3
Pregnancy Induced Hypertension/Eclampsia	2	1.7
Ectopic Pregnancy	2	1.7
AIDs Related	2	1.7
Infection	2	1.7
Other	1	0.8
<b>Total Natural Death</b>	<b>(64)</b>	<b>(52.8)</b>
<b>Unintentional Injury</b>		
Motor Vehicle Collision	22	18.2
Accidental Overdose	7	5.8
Other Accident	2	1.7
<b>Homicide</b>		
Gunshot Wound	11	9.1
Blunt Force Trauma	2	1.6
Exsanguination	1	0.8
Asphyxia	3	2.5
<b>Suicide</b>		
Overdose	1	0.8
Gunshot Wound	3	2.5
Blunt Force Trauma	2	1.7
Stab Wound	1	0.8
<b>Total Violent Death</b>	<b>(55)</b>	<b>(45.5)</b>
Undetermined	2	1.7
<b>Grand Total</b>	<b>121</b>	<b>100</b>

mother and the developing fetus. Early screening for and detection of problems and/or potential complications with the pregnancy allow for prevention efforts, more effective treatment, and for referrals to specialized care when necessary.

Figure 2 compares characteristics of prenatal care for women dying pregnancy-associated deaths in Virginia to all women with a live birth in Virginia.

- No prenatal care was received by 5.0% of women dying pregnancy-associated deaths. This is in comparison to the overall 0.8% of women in Virginia who gave birth in 2001

Figure 2. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, and All Live Births in Virginia, 2001, By Initiation of Prenatal Care (N=121)



without receiving prenatal care.<sup>6</sup>

- Of the women who died while pregnant or within one year of pregnancy, 42.1% began prenatal care in the first trimester. This is considerably lower than the 84.8% of women who received prenatal care in the first trimester of their pregnancy in 2001.<sup>7</sup>
- Most women in both groups received prenatal care from a private physician rather than through a clinic or public healthcare provider.

The first prenatal care visit took place at a median of 13 weeks for women whose cases were under review. This is the beginning of the second trimester of pregnancy. Guidelines provided by the American College of Obstetricians and Gynecologists and recommended by the Virginia Department of Health<sup>8</sup> suggest that a total of 12-14 prenatal care visits should be made during an uncomplicated pregnancy. The median number of prenatal care visits received by women under review was 11 visits. Based on the Kotelchuck Adequacy of Prenatal Care Utilization Index, which is calculated using the expected number of prenatal care visits based on gestational age of the infant and the month prenatal care was initiated,<sup>9</sup>

<sup>6</sup> Virginia Department of Health. Center for Health Statistics. (2003). *Virginia health statistics annual report 2001*. (IV-46). Richmond, VA.

<sup>7</sup> Virginia Department of Health. Center for Health Statistics. (2003). *Virginia health statistics annual report 2001*. (IV-32). Richmond, VA.

<sup>8</sup> Virginia Department of Health. Clinical Standards available at <http://www.vahealth.org/wlh/Perinatal%20Guidelines/SECTION%202.pdf> (accessed December, 2006).

<sup>9</sup> Kotelchuck, M. (September, 1994). *Overview of adequacy of prenatal care utilization index*. Department of Maternal and Child Health, University of North Carolina at Chapel Hill.

## PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

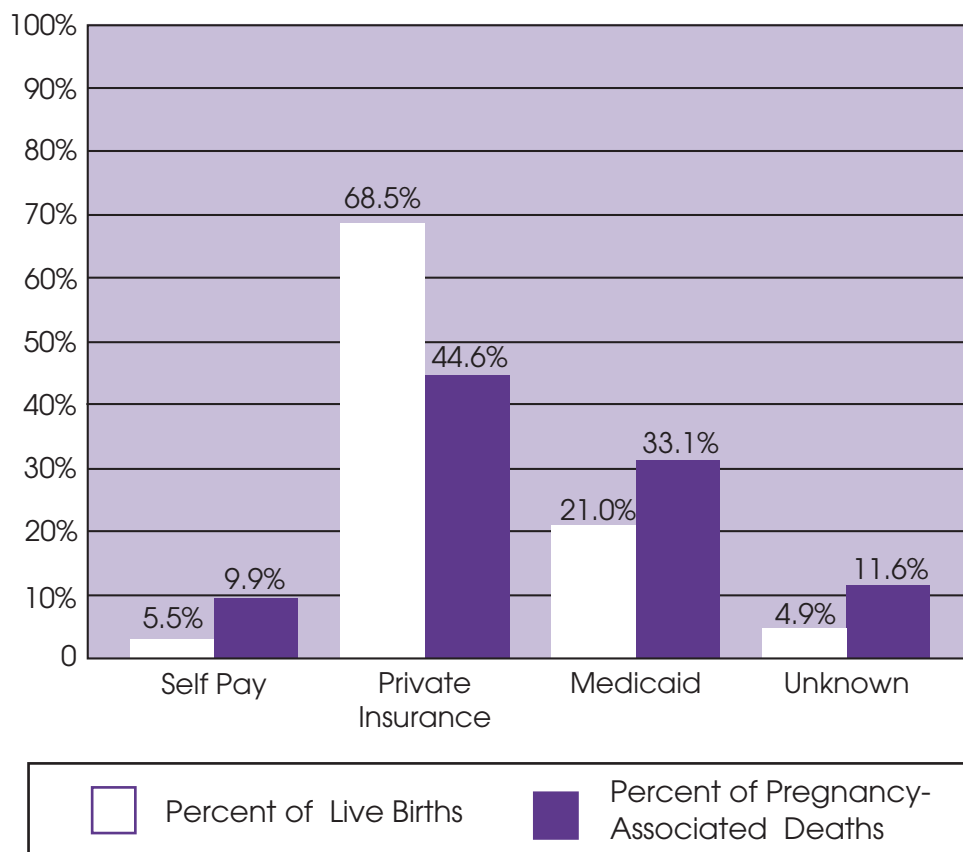
50.4% of women received at least adequate prenatal care. Nearly 29.0% received less than adequate care.

Sources of Payment for Healthcare During Pregnancy and/or Delivery. In general, payment for prenatal care is provided through all private health insurance plans. For those eligible women without private health insurance, Medicaid<sup>10</sup> will provide payment for prenatal care and delivery. However, higher percentages of women dying pregnancy-associated deaths were listed as self-pay for care (indicating they were uninsured) than all women giving birth in Virginia in general.

Figure 3 portrays methods of payment for healthcare during pregnancy and/or at delivery for women dying pregnancy-associated deaths and for all women in Virginia with a live birth in 2001.

Team findings show that higher percentages of women who died pregnancy-associated deaths were covered by Medicaid when compared with all women who gave birth. The percentage of women covered by private health insurance plans was lower for women

Figure 3. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, and All Live Births in Virginia, 2001, By Source of Payment for Prenatal Care and/or Delivery (N=121)



<sup>10</sup> Department of Medical Assistance Services. Information for Medicaid Clients. Eligibility for Children Under Age 19 and Pregnant Women. (Medicaid is an entitlement program authorized under Title XIX of the *Social Security Act* to provide medical services for low income individuals and particular groups such as pregnant women.) Available at [http://www.dmas.virginia.gov/downloads/pdfs/rcp-eligibility\\_for\\_children\\_under\\_age\\_19\\_and\\_pregnant\\_women.pdf](http://www.dmas.virginia.gov/downloads/pdfs/rcp-eligibility_for_children_under_age_19_and_pregnant_women.pdf) (Accessed December, 2006).

dying pregnancy-associated deaths than for women in the general population.

- Women whose cases were reviewed by the Team who were covered under Medicaid tended to be young, single women who died a violent death (60.0%). Demographically, they tended to be younger (median age 25.5 years) than women covered by private insurance (median age 33 years). Fewer women covered by Medicaid were married (25.0%) compared to 74.1% of women with private insurance.
- Women who died a pregnancy-associated death and were covered under Medicaid tended to enter prenatal care later than women covered by private health insurance (14.1 weeks and 10.0 weeks respectively).
- Deaths to women with Medicaid coverage occurred at a median of 93.5 days following the pregnancy. Women covered under private insurance tended to die closer (median of 57 days) to the end of their pregnancies.

Deliveries. Among cases reviewed by the Team, roughly half (49.6%) of the women had vaginal deliveries followed by primary Cesarean sections (24.0%) and repeat Cesarean sections (9.1%). In nine cases, death occurred the day of the Cesarean section. These include cases in which the Cesarean was performed following the fatal injury (motor vehicle incident, homicide) in an effort to save the fetus, as well as cases where death of the mother followed the Cesarean delivery. The Team noted that, in many cases, Cesarean sections were performed as a response to critical conditions that threatened the life of the mother and/or the infant.

Pregnancy Outcomes. The majority (74.4%) of the 121 pregnancies resulted in the birth of at least one live infant. One-fourth (25.6%) of the pregnancies were lost by either miscarriage or ectopic pregnancy, or the mother was pregnant at the time of death.

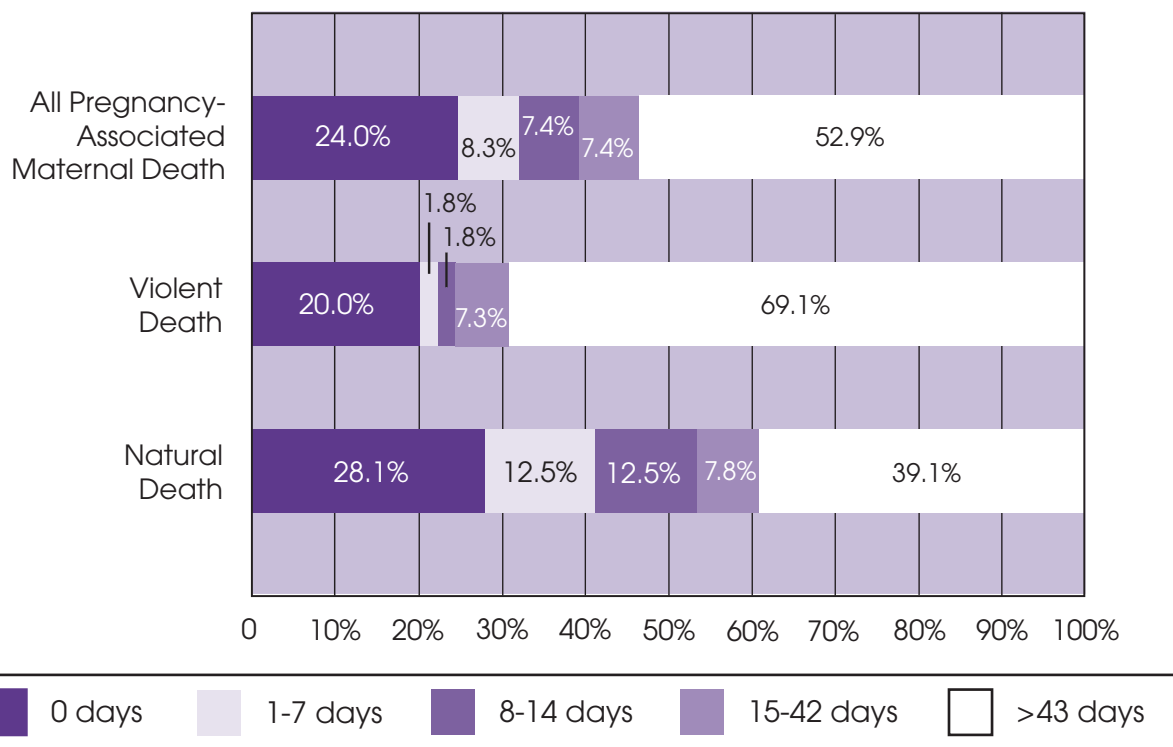
Intervals Between End of Pregnancy and Death. The Team found that nearly half (47.1%) of the women had died by 42 days (six weeks) after the end of the pregnancy. They noted the significance of this interval in so many cases as, historically, a postpartum visit takes place at six weeks. This visit reflects a last opportunity for assessment and referral. The Team's findings support the need for earlier follow-up by healthcare providers after delivery. Figure 4 portrays the interval between the end of pregnancy and death.

In 24.0% of cases, the woman was pregnant at the time of death, the woman died the day of delivery, or the infant was delivered immediately after the fatal event. In these cases the interval between the end of the pregnancy and death was zero days. Cumulatively, the death of the woman had occurred within seven days following the end of the pregnancy in 32.3% of cases, and within two weeks in 39.7% of cases. Overall, the average length of time between the end of pregnancy and death was 61 days.

The Team found that nearly half (47.1%) of the women had died by 42 days (six weeks) after the end of the pregnancy.

Violent deaths occurred at a median of 115 days after the pregnancy ended. Twenty-three point six percent had died by two weeks following the pregnancy, and 30.9% had died by six weeks postpartum.

Figure 4. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, By Interval Between End of Pregnancy and Death and Death Type (N=121)



Deaths due to natural causes tended to occur soon after the end of the pregnancy with a median interval of 12 days. Fifty-three point one percent of women dying from natural causes had died by two weeks postpartum and 60.9% had died by 42 days after the pregnancy. Most of these deaths (89.5%) were determined by the Team to be pregnancy-related deaths.

Table 3 summarizes information on payment for healthcare during pregnancy and/or delivery, adequacy of care, method of delivery, and outcome of the pregnancy.

**III. Risk Factors in Pregnancy-Associated Maternal Death in Virginia**

A primary function of case review within a public health framework is to utilize the information gathered to determine major risks to the group under review. The Team identified factors that may have contributed to each woman’s death as the case was reviewed. The factors had been determined by the Team a priori and were grouped within the categories of community, patient, healthcare facility, or healthcare professional. Examples of community factors included availability and accessibility of services, transportation, and community outreach. Patient factors included delay or failure to seek care, noncompliance, intimate partner violence, mental illness, and substance abuse. Healthcare facility factors included inadequately trained personnel, poor communications, and lack of continuity of care. Healthcare professional factors included misdiagnosis; failure to refer or seek consultation; inadequate patient education; and delay in or lack of diagnosis, treatment or follow-up.

# PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

Table 3. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, Characteristics of Prenatal Care and Delivery Overall and By Death Type (N=121)

	Pregnancy-Associated Death (N=121)		Natural Death (n=64)		Violent Death (n=55)	
	Number	Percent	Number	Percent	Number	Percent
<b>Source of Payment for Prenatal Care and/or Delivery</b>						
No Medical Care and No Delivery	1	0.8	0	0.0	1	1.8
Self pay	12	9.9	9	14.1	3	5.5
Private Insurance	54	44.6	34	53.1	18	32.7
Medicaid	40	33.1	16	25.0	24	43.6
Unknown	14	11.6	5	7.8	9	16.4
<b>Adequacy of Prenatal Care<sup>1</sup></b>						
Inadequate	29	24.0	14	21.8	14	25.4
Intermediate	6	4.9	3	4.7	3	5.5
Adequate	53	43.8	30	46.9	22	40.0
Adequate Plus	8	6.6	5	7.8	3	5.5
Unknown	25	20.7	12	18.8	13	23.6
<b>Type of Delivery</b>						
Vaginal Delivery	62	49.6	28	43.8	32	58.2
Primary Cesarean Section	29	24.0	19	29.7	10	18.2
Repeat Cesarean Section	11	9.1	8	12.5	3	5.5
Other	4	4.9	3	4.7	1	1.8
Pregnant at Time of Death	15	12.4	6	9.3	9	16.3
<b>Outcome of the Pregnancy</b>						
No Live Birth	31	25.6	16	25.0	15	27.3
Singleton	87	71.9	46	71.9	39	70.9
Multiple birth	3	2.5	2	3.1	1	1.8

<sup>1</sup> Based on Kotelchuck Adequacy of Prenatal Care Utilization, calculated using expected number of visits based on gestational age of infant and month prenatal care was begun.

Analyses of these factors, along with examination of the data reported herein, resulted in the identification of several risk factors for pregnancy-associated death in Virginia. The MMRT decided to focus attention on five areas for its recommendations. The factors that emerged were not necessarily those that individual Team members had believed would be the most relevant issues at the outset of their review. However, the weight of accumulated evidence led to agreement on issues requiring attention.

The risk factors include:

- the large disparity between Black women and White women in pregnancy-associated deaths;
- motor vehicle related collisions;
- the presence of substance use/abuse, and/or a mental illness, and/or domestic violence.

Each of these factors is discussed below.

## PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

Racial Disparity. The racial gap that exists in maternal mortality is described by the CDC as the largest disparity in all of women's and infant's health. This disparity has lasted for over 60 years.<sup>11</sup> The maternal mortality ratio is used to compare rates of death between groups.<sup>12</sup> A population based risk indicator, it describes the number of maternal deaths per 100,000 live births. The ratio allows for standardized comparison of risk between groups.<sup>13</sup>

The overall maternal mortality ratio for the three year period from 1999-2001 was 42.2. For White women, the ratio was 30.5. For Black women, the ratio was 78.4, indicating a significant racial disparity. Table 4 portrays maternal mortality ratios by Health Service Area.

Table 4. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, Maternal Mortality Ratios In Health Service Area By Race (N=121)

	Total		White		Black	
	No. of Deaths	Maternal Mortality Ratio	No. of Deaths	Maternal Mortality Ratio	No. of Deaths	Maternal Mortality Ratio
HSA I - Northwest	13	34.4	11	33.7	1	24.5
HSA II - Northern	22	25.9	13	20.2	4	36.5
HSA III - Southwest	22	51.7	15	42.0	7	117.4
HSA IV - Central	28	58.5	9	31.3	18	103.8
HSA V - Eastern	36	48.6	13	31.1	22	78.8
<b>Total</b>	<b>121</b>	<b>42.2</b>	<b>61</b>	<b>30.5</b>	<b>52</b>	<b>78.4</b>

Looking at these ratios by Health Service Area reveals differences in racial disparity across regions of Virginia. Ratios are highest overall for both White and Black women in the Southwest Health Service Area of Virginia. Notably, in the Southwest, for every 100,000 live births to Black women and 100,000 live births to White women, 75.4 more Black women die than White women. In the Central HSA, 72.5 more Black women die than White women for every 100,000 live births to each group.

Although maternal mortality is a relatively rare event for both Black and White women, the description of findings among the group of Black women and White women who died within one year of pregnancy reveals profound differences by race. Examination of the data showed differences in the types of death between Black women and White women (see Table 5).

The overall maternal mortality ratio for the three year period was 42.2. For White women, the ratio was 30.5. For Black women, the ratio was 78.4, indicating a significant racial disparity.

<sup>11</sup> Centers for Disease Control and Prevention. Press release: Pregnancy-Related Deaths Still Higher in Black Women than White Women. February 20, 2003. Available at <http://www.cdc.gov/od/oc/media/pressrel/r030220c.html> (accessed December, 2006).

<sup>12</sup> The pregnancy-associated maternal mortality ratio is the number of pregnancy-associated maternal deaths divided by the number of live births then multiplied by 100,000.

<sup>13</sup> The population of Virginia was 7,078,515 in 2000. Demographically, 72% of the population was White and 20% was Black. There were a total of 96,759 live births in Virginia during 2000. Births to White women totaled 67,232 and births to Black women totaled 22,302. Other races accounted for 7,225 births.

# PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

Table 5. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, Leading Death Types, Interval Between End of Pregnancy and Death, and Demographic Characteristics By Race (N=113)

	White (n=61)		Black (n=52)	
	Number	Percent	Number	Percent
<b>Leading Types of Death<sup>1</sup></b>				
Homicide	6	9.8	11	21.2
Suicide	6	9.8	1	1.9
Motor Vehicle Incident	14	23.0	8	15.4
Accidental Overdose	6	9.8	0	0.0
Pulmonary Embolism	5	8.2	4	7.7
Cardiac Disease	5	8.2	10	19.2
Cardiomyopathy	0	0.0	4	7.7
<b>Interval Between End of Pregnancy and Death in Days</b>				
	80.5		45.5	
<b>Age</b>				
<18	1	1.6	1	1.9
18-20	5	8.2	6	11.5
21-25	19	31.1	8	15.4
26-30	10	16.4	14	26.9
31-35	9	14.8	16	30.8
36-40	15	24.6	5	9.6
41 and over	2	3.3	2	3.8
<b>Median Age</b>				
	29		29.5	
<b>Education</b>				
Less than High School	11	18.0	11	21.2
Completed High School	28	45.9	28	53.8
More than High School	22	36.1	13	25.0
<b>Marital Status</b>				
Never Married	19	31.1	31	59.6
Married	36	59.0	17	32.7
Widowed or Divorced	6	9.8	4	7.7

<sup>1</sup>Will not equal 100%.

The four leading death types among White women were all violent: motor vehicle incidents (23.0%), homicide (9.8%), suicide (9.8%), and accidental overdose (9.8%). Among Black women, the leading causes of death were a combination of natural and violent types: homicide (21.2%), cardiac disease (19.2%), motor vehicle incidents (15.4%), cardiomyopathy (7.7%), and pulmonary embolism (7.7%). Notably, cardiac disease accounted for 19.2% of deaths of Black women and 8.2% of deaths among White women. Homicide accounted for 21.2% of deaths to Black women and 9.8% of White women.

The median age at the time of death is similar for both Black and White women (29.5 and 29 years old respectively). A closer examination of age groups shows that the highest

Table 6. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, Characteristics of Pregnancy By Race (N=113)

	White (n=61)		Black (n=52)	
	Number	Percent	Number	Percent
<b>Previous Pregnancy<sup>1</sup></b>				
Previous Complication in Pregnancy	14	28.0	22	48.9
History of Gestational Diabetes	5	10.0	5	11.1
<b>Adequacy of Prenatal Care<sup>2</sup></b>				
Inadequate	11	18.0	17	32.7
Intermediate	3	4.9	3	5.8
Adequate	27	44.3	21	40.4
Adequate Plus	6	9.8	2	3.8
Unknown	14	23.0	9	17.3
<b>Median estimated gestational age at first prenatal care visit in weeks</b>				
	11.7		14.1	
<b>Median number of visits to prenatal care provider</b>				
	12		10	
<b>Source of Payment for Prenatal Care and/or Delivery</b>				
No Prenatal Care or Delivery	0	0.0	1	1.9
Self pay	2	3.3	8	15.4
Private Insurance	29	47.5	21	40.4
Medicaid	19	31.1	20	38.5
Unknown	11	18.0	2	3.8

<sup>1</sup> Includes only those 50 White women and 45 Black women with a prior pregnancy.

<sup>2</sup> Based on Kotelchuck Adequacy of Prenatal Care Utilization, calculated using expected number of visits based on gestational age of infant and month prenatal care was initiated.

percentage of White women died between the ages of 21 and 25 years old (31.1%) followed by 36-40 years old (24.6%). Among Black women, the highest percentage died between 31 and 35 years old (30.8%) followed closely by 26-30 years old (26.9%). Of note, 27.9% of deaths to White women but only 13.4% of deaths to Black women occurred after the age of 35.

The Team determined that 44.2% of deaths to Black women were pregnancy-related compared to 37.7% of deaths to White women. Black women tended to die temporally closer to the end of the pregnancy at approximately 45 days while White women died approximately 80 days after the pregnancy.

Table 6 shows various aspects of care for White women and for Black women.

Of the 45 Black women known to have had a previous pregnancy, 48.9% had a prior maternal complication such as postpartum hemorrhage, pregnancy induced hypertension, anemia,

and hyperemesis gravidarum<sup>14</sup> compared to 28.0% of the 50 White women with a prior pregnancy. Black and White women had a history of gestational diabetes in nearly equal proportions (11.1% and 10.0% respectively).

Black women less frequently received prenatal care that was at least adequate (44.2%) based on the Kotelchuck Index compared to White women (54.1%). Black women tended to enter prenatal care later (14.1 weeks estimated gestational age) than White women (11.7 weeks), to have had fewer prenatal visits (10 for Black women and 12 for White women), and to deliver their babies earlier (37.6 weeks) than White women (38.1 weeks).

The percentage of Black women listed as self-pay was 15.4% while only 3.3% of White women were self-pay for care. Forty-seven and one half percent of White women were covered by private health insurance plans and 31.1% were covered under Medicaid while 40.4% of Black women were covered under private health insurance and 38.5% were covered by Medicaid.

In case after case, Team discussion focused on the importance of early postpartum checkups, improvements in the management of identified medical risk factors, and the availability of home visiting services as necessary components for amelioration of these complex problems that ultimately led to death. Identification of women at high risk for maternal complications and planning for interventions and referrals were noted to be vital components of comprehensive care for these women.

Motor Vehicle Incidents. Motor vehicle collisions were responsible for the largest number of deaths (22 deaths, 18.2% of all cases).

- Nearly all of the 22 deaths involved passenger vehicles with one motorcycle incident and one pedestrian death. In 54.5% of the cases the decedent was the driver of the vehicle, and in 40.9%, she was the passenger. In 6 cases, the position of the passenger was known; 4 in front seats and 2 in back seats.
- At the time of the fatal event, 54.5% of the women were not using safety equipment.
- Women dying in motor vehicle incidents were primarily young (median age was 25 years old), single (72.7%), and had obtained at least a high school education.
- Of the women dying in motor vehicle incidents, 27.3% were pregnant at the time of death.
- Alcohol use by four decedents (18.0%; 2 drivers, 2 passengers) exceeded the legal limit (at or over 0.08%) based on toxicological analysis performed immediately after the accident. In another two out of 22 cases, the driver of a vehicle involved in the fatal incident but who was not the decedent under Team review had a blood alcohol content at or above 0.08%.

**Of the women who died in a motor vehicle incident, 54.5% were not using safety equipment at the time of the fatal event.**

It was apparent to the Team that pregnant women would benefit from both written and verbal reinforcement of the need to wear seatbelts and instruction on how to correctly use

<sup>14</sup> Hyperemesis gravidarum is extreme, persistent nausea and vomiting during pregnancy that may lead to dehydration.

seatbelts during pregnancy. It was also clear to the Team that further work to curb driving under the influence of alcohol and/or drugs was needed to save lives.

Substance Use/Abuse, Mental Illness, and Domestic Violence. The psychosocial risk factors of substance use, mental illness, and domestic violence played a far greater role in contributing to the death of the women under review than Team members had anticipated when they began their work. Women were considered to be at risk for problems related to substance abuse, mental illness, and/or domestic violence if either the prenatal care provider or a hospital or urgent care center noted the problem in the record or the Maternal Mortality Review Team determined that the factor contributed to death. Thus, 38 women were identified with a substance abuse risk, 27 women had a mental health risk, and 20 women were at risk for domestic violence. When looking at the aggregated data, Team members were astounded by the prevalence of these psychosocial risk factors. They had not envisioned these factors being major contributors to maternal mortality when they joined the Team.

As individual cases were discussed Team members characterized the lives of women with substance abuse, mental illness, and domestic violence risk as “tumultuous” and “chaotic.” They spoke often of the lack of societal support systems necessary to protect their lives. Lack of individual responsibility was also discussed as contributing to continuing problems. Team members recognized the enormous barriers to care many women face: lack of child care, inadequate insurance coverage, and inaccessibility of services and with the responsibility one has for one’s own health.

Women with risks for substance abuse, mental illness, and/or domestic violence tended to die between three and four months after the end of their pregnancies. Often, there was no indication of the presence of these risks in medical records reviewed by the Team. More commonly, these problems were revealed in records generated during the course of death investigation. Prenatal care providers and hospitals screened for substance use more often than they screened for either mental illness or domestic violence. Table 7 describes screening and identification of risks by healthcare providers and MMRT.

Table 7. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, Screening for and Identification of Risk Factors By Health Care Providers and Maternal Mortality Review Team (N=121)

	Substance Abuse Risk		Mental Health Risk		Domestic Violence Risk	
	Number	Percent	Number	Percent	Number	Percent
<b>Records With Completed Risk Screen</b>						
Prenatal Record (n=85 Records Received)	59	69.4	33	38.8	17	20.0
Hospital Record (n=103 Records Received)	51	49.5	26	25.2	20	19.4
<b>Risk Noted in Record</b>						
Prenatal Record (n=85 Records Received)	10	11.8	14	16.5	4	4.7
Hospital Record (n=103 Records Received)	13	12.6	10	9.7	5	3.9
<b>Risk Noted by MMRT</b>						
Risk Identified by MMRT as a Contributor to Death (n=121)	35	28.9	20	16.5	17	14.0

# PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

Table 8. Pregnancy-Associated Maternal Death in Virginia, 1999-2001, Cause/Manner of Death By Risk for Substance Abuse, Mental Illness, and Domestic Violence

	Substance Abuse Risk (n=38)		Mental Health Risk (n=27)		Domestic Violence Risk (n=20)	
	Number	Percent	Number	Percent	Number	Percent
<b>Natural Death</b>						
Cardiac Disease	5	13.2	2	7.4	1	5.0
Pulmonary Embolism	1	2.6	2	7.4	0	0.0
Cancer	0	0.0	2	7.4	0	0.0
Exacerbation of Chronic Condition	2	5.3	3	11.1	1	5.0
Cardiomyopathy	2	5.3	1	3.7	0	0.0
Other	3	7.8	2	7.4	1	5.0
<b>Total Natural Death</b>	<b>(13)</b>		<b>(12)</b>		<b>(3)</b>	
<b>Unintentional Injury</b>						
Motor Vehicle Collision	4	10.5	3	11.1	3	15.0
Accidental Overdose	7	18.4	3	11.1	3	15.0
<b>Homicide</b>						
	8	21.1	2	7.4	9	45.0
<b>Suicide</b>						
	5	13.2	6	22.2	1	5.0
<b>Total Violent Death</b>	<b>(24)</b>		<b>(14)</b>		<b>(16)</b>	
<b>Undetermined</b>						
	1	2.6	1	3.7	1	5.0
<b>Grand Total</b>	<b>38</b>	<b>100</b>	<b>27</b>	<b>100</b>	<b>20</b>	<b>100</b>
<b>Interval Between End of Pregnancy and Death in Days</b>						
	116.5		98		105	

Table 8 shows selected cause/manner of death for women at risk for substance abuse, mental illness, and domestic violence. Most women (63.2%) with a substance abuse problem died a violent death which occurred approximately four months following the end of the pregnancy. Twenty-one point one percent were victims of homicide, 18.4% died from accidental overdoses, 13.2% committed suicide, and 10.5% died in motor vehicle incidents. The remaining women died from natural causes such as cardiac disease (13.2%), cardiomyopathy (5.3%), and exacerbation of a chronic illness (5.3%).

Slightly more than half of the women with a mental health risk died a violent death. Twenty-two percent of these women committed suicide, 11.1% died in motor vehicle collisions, and 11.1% by accidental overdoses, while 7.4% were homicide victims. One death was undetermined in manner and the remaining 44% of women died from natural causes such as exacerbation of a chronic illness (11.1%), cancer (7.4%), and pulmonary embolism (7.4%). The deaths tended to occur at approximately three and one-half months after the pregnancy.

Forty-five percent of women with a risk for domestic violence died from homicide, 15.0% in motor vehicle collisions, and 15.0% from accidental overdoses. Five percent died from

## PREGNANCY-ASSOCIATED MATERNAL DEATH IN VIRGINIA, 1999 - 2001

suicide and 5.0% were undetermined in cause and manner. The remaining 15.0% were due to natural causes such as infection, cardiac disease, and exacerbation of a chronic illness.

Substance abuse, mental illness, and domestic violence were also found to co-occur as reflected by the following data:

- Six women were identified with all three risks. Four of these six women lived in the Southwest Health Service Area. Five of the six had less than a high school education. All six women were covered by Medicaid during their pregnancies and/or at delivery.
- Seven women experienced both mental illness and domestic violence. Only two of these women began prenatal care in the first trimester. Six of the seven were covered by Medicaid.
- In 12 cases, both substance abuse and domestic violence were found to be contributors to mortality. Ten of the 12 died violent deaths.
- Substance abuse and mental illness were found to co-occur in 15 cases. Ten of these women died violent deaths. Forty-seven percent had their first prenatal care visit during the first trimester. Eleven of the 15 were recipients of Medicaid.

Table 9 provides selected characteristics for cases identified with a risk for substance abuse, mental illness, or domestic violence.

Table 9. Pregnancy-Associated Maternal Death in Virginia, 1999-2001,  
Characteristics of Pregnancy By Risk Factor

	Substance Abuse Risk (n=38)		Mental Health Risk (n=27)		Domestic Violence Risk (n=20)	
	Number	Percent	Number	Percent	Number	Percent
<b>Source of Payment for Prenatal Care/Delivery</b>						
No Prenatal Care or Delivery	1	2.6	0	0.0	0	0.0
Self pay	7	18.4	2	7.4	0	0.0
Private Insurance	8	21.1	8	29.6	7	35.0
Medicaid	18	47.4	15	55.6	11	55.0
Unknown	4	10.5	2	7.4	2	10.0
<b>Adequacy of Prenatal Care<sup>1</sup></b>						
Inadequate	14	36.8	5	18.5	7	35.0
Intermediate	2	5.3	0	0.0	1	5.0
Adequate	14	36.8	13	48.1	8	40.0
Adequate Plus	1	2.6	2	7.4	0	0.0
Unknown	7	18.4	7	25.9	4	20.0
<b>Median estimated gestational age at first prenatal visit (in weeks)</b>						
	12.6		11		12.6	
<b>Median number of prenatal care visits</b>						
	9		13		12	

<sup>1</sup> Based on Kotelchuck Adequacy of Prenatal Care Utilization, calculated using expected number of visits based on gestational age of infant and month prenatal care was begun.

Examination of each risk factor reveals some of the unique difficulties associated with each:

Substance Abuse. Review of all records revealed that thirty-eight women (31.4% of all cases) were at risk for substance use and abuse. The Maternal Mortality Review Team determined that substance use contributed to death in 35 cases.

- The highest percentage of women identified with a substance use problem resided in the Southwest Health Service Area (31.6%) followed by the Central Health Service Area with 28.9% of cases.
- Of the women identified with a risk for substance abuse, 60.5% were White and 36.8% were Black.
- The median age at death was 30 years old.
- Just over half (52.6%) had never married.
- Of those women identified as having a risk for substance use, close to half (47.4%) were recipients of Medicaid, 21.1% had private insurance, and 18.4% were self-pay.
- At least adequate prenatal care was obtained by 39.4% of these women.

In addition:

- More than one third (36.8%) of women with a substance abuse risk were known to have used alcohol during the pregnancy and 28.9% were known to have used other drugs during their pregnancy.
- Almost 29% of these women had a blood alcohol content greater than the legal limit (at or above 0.08%) when they died.
- Close to half (47.4%) had a positive toxicology for substances other than alcohol at the time of death. These women tested positive for substances such as cocaine, opiates, benzodiazepines, and amphetamines.

Major areas of concern identified by the Team through case review included inadequate screening by healthcare providers for substance abuse problems, lack of knowledge by providers of appropriate referrals for those identified as potentially having a problem, and inadequate monitoring of prescription drug abuse. Also noted was a lack of accessible substance abuse treatment throughout the State. The Team identified the need for a coordinated system of care for pregnant women with risk factors for substance abuse whereby screening, referral, and follow-up among various agencies serving the women is conducted. These women would benefit from home visitation services, personal support, transportation, and child care assistance. Project Link, an interagency project with eight sites serving 14 communities across the State, was identified as an example of service delivery and care coordination designed to meet the needs of women with substance abuse risks.

**The Team identified the need for a coordinated system of care for pregnant women with risk factors for substance abuse whereby screening, referral, and follow-up among various agencies serving the women is conducted.**

Mental Illness. Mental illness was identified as a risk for 27 women (22.3% of all cases). In 20 of those cases, the Team determined that mental illness was a contributing factor in the death.

- The median age at time of death was 29 years old.
- Sixty-three percent of the women identified with a mental illness were White.
- Almost half (48.1%) were never married, 40.7% were married at the time of death, and 11.1% were widowed or divorced.
- These women tended to begin prenatal care during the first trimester (51.9%) at approximately 11 weeks estimated gestational age, and had approximately 13 prenatal care visits. Slightly more than half had at least adequate prenatal care.
- More than half (55.6%) were covered under Medicaid with 29.6% covered under private health insurance.

In addition:

- Overall, 25.9% were known to have a mental illness other than depression. These illnesses included bipolar disorder, anxiety disorder, and schizophrenia.
- Of the twelve women who died from suicides or accidents, 75% had been diagnosed with depression at some point in the past.
- The median interval between the end of the pregnancy and death for women committing suicide was 127 days (4.2 months). Forty-three percent of suicides occurred between two and four months after the end of the pregnancy while the remaining 57% occurred more than four months following the pregnancy but within one year.
- In three of the seven cases of suicide, the Team determined that the suicide was directly related to the pregnancy.

The Team believed that information on perinatal depression should be made available to all pregnant women as well as family members and/or caretakers.

Team concerns centered on lack of screening for mental health problems including postpartum depression and a general lack of knowledge regarding obstetrical care of women with psychiatric illness. The Team believed that information on perinatal depression should be made available to all pregnant women as well as family members and/or caretakers. Healthcare providers need more education on the incidence of and importance of screening for perinatal depression. The need for third party payers to provide payment for screening and management of all identified mental health problems was also noted. Treatment of mental health conditions was noted to be a vital component of suicide prevention. Further education on recognition of the indicators of suicide and management of the suicidal person was identified as an area of need for the general public as well as healthcare providers.

Domestic Violence. Domestic violence was identified as a risk for 20 women (16.5% of all cases). Most of these women died a violent death: nine (45.0%) were victims of homicide in which the perpetrator was the husband or boyfriend of the victim, three (15.0%) died from accidental overdoses, and three in (15.0%) motor vehicle incidents. In 17 of the 20 cases, the Team determined that domestic violence was a direct contributing factor in the death.

- Of those 20 women identified with a risk for domestic violence, 60.0% were White and 30.0% were Black.
- Seventy percent of these women were under 30 years old and half of them were married.
- The median length of time between the end of the pregnancy and death was three and a half months for those at risk for domestic violence.

In addition:

- There were 13 cases in which death was by homicide perpetrated by an ex-boyfriend, boyfriend, husband, acquaintance, or family member. In over three-fourths (76.9%) of those cases, there was known conflict between the decedent and perpetrator at the time of death. In 61.5% of cases the victims were Black and in 38.5% of cases the victims were White. Nearly 85% were 30 years old or younger and most (61.5%) had never married.

The Team found existing domestic violence laws in Virginia were sufficiently strong, but that law enforcement agencies were inconsistent in enforcing these laws to hold abusers accountable for their actions. The Team identified a need for improved screening for domestic violence by healthcare providers and encouraged providers to update and implement standards for routine, universal screening to be used in the development of individual treatment plans with appropriate referrals. The Team believed that training of all medical office personnel on issues relevant to domestic violence was necessary because any contact within the medical office setting provides a potential opportunity for patient disclosure and intervention.

The Team concluded that domestic violence education and prevention programs should be strengthened and begin in childhood. The Team endorsed collaboration among colleges and universities in the Commonwealth to conduct research on societal attitudes about domestic violence and on methods to promote systems change by reducing community tolerance of domestic violence.

The Team identified a need for improved screening for domestic violence by healthcare providers and encouraged providers to update and implement standards for routine, universal screening to be used in the development of individual treatment plans with appropriate referrals.

#### **IV. Conclusion: Future Directions for Maternal Mortality Review**

Virginia's Maternal Mortality Review Team elected to address five major areas for recommendations in this report. At the same time, it identified other areas of concern for future review by the Team:

1. A concentrated focus by the Team on cases of pregnancy related deaths will be initiated. Forty-one point three percent of all cases reviewed to date were determined to be pregnancy related. Causes of these deaths included pulmonary embolism (18.0%), cardiac disease (14.0%), hemorrhage (12.0%), cardiomyopathy (8.0%), amniotic fluid embolism (8.0%), and homicide (8.0%).
2. The Team identified nutrition during pregnancy as an area of concern. Specifically, obesity will be examined as the median Body Mass Index (BMI) among women dying from pregnancy related causes was 29.3. This BMI represents the high end of the overweight category.
3. Over one-third of the women dying from natural causes were over the age of 35 years old. A concentrated study of the issues related to advanced maternal age may shed light on approaches to reduce mortality among this group of women.
4. Issues of access to care have often been discussed by Team members. Future study will examine how access to care has impacted the lives of women whose cases were reviewed.

As more cases are identified and reviewed by the Team, a greater understanding of maternal morbidity and mortality will be revealed along with strategies to reduce the impact on women's lives. Much more work is required. This Team looks forward to diligently pursuing its mission to reduce the incidence of pregnancy-associated maternal mortality in the Commonwealth of Virginia.

In conclusion, this report demonstrates that women who die within one year of pregnancy are being seen in settings where assessments, prevention efforts, treatments, referrals, and/or interventions might have changed the outcome. By identifying factors that contributed to these deaths and locating systems in which women are already involved, public health initiatives can be developed to reduce morbidity and mortality. Looking beyond those cases in which death was directly related to the pregnancy itself, we find that young women are dying in ways that can be prevented – from not wearing seatbelts, from treatable mental health and substance abuse problems, and from violence in their homes. These women are our daughters, sisters, wives, and the mothers of very young children. We, as citizens of the Commonwealth of Virginia, cannot afford to ignore the impact of this loss.



This report is available at the following website:  
<http://www.vdh.virginia.gov/medexam/maternalmortality.htm>

Or by calling:

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