Arizona Maternal Mortality Review Program Brief

Inaugural Report
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Arizona Department of Health Services
Office of Injury Prevention
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Arizona Department of Health Services

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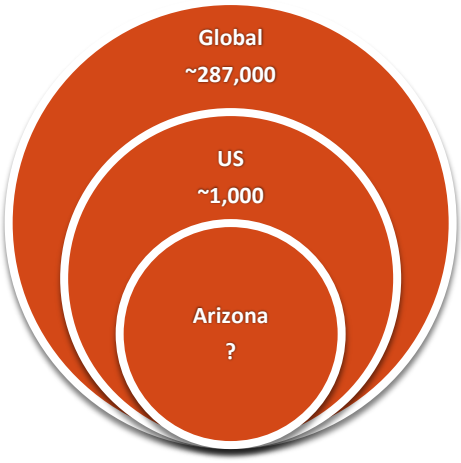
INTRODUCTION

Globally, it is estimated that there were 287,000 maternal deaths in 2010. The global maternal mortality rate has declined from 1990 to 2010 by over 47%. Of all maternal deaths, 85% occurred in Sub-Sarahan Africa and Southern Asia. (WHO, INICEF, UNFPA and The World Bank Estimates, 2012)[1]. Every year, an estimated 1,000 American women die of pregnancy related causes. Although maternal mortality in Arizona is relatively rare, it is a tragic event and in some cases preventable.

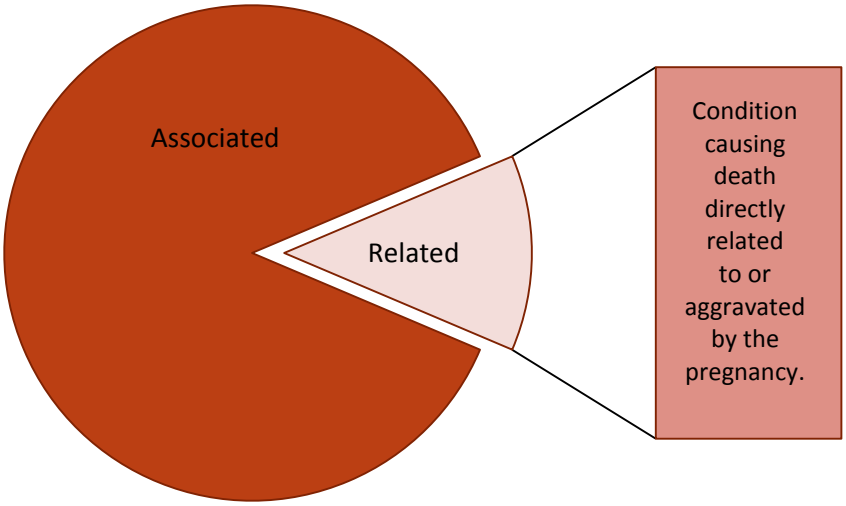
In April of 2011, Arizona passed Senate Bill 1121[2] amending the child fatality review statute by adding reviews of maternal deaths. This change allowed the Child Fatality State Team, which oversees the review of all child deaths in Arizona, the authority to create a subcommittee dedicated to reviewing the causes of maternal deaths. The changes to this bill went into effect in July, 2011, establishing a Maternal Mortality Review Subcommittee (referred to as the MMR Subcommittee for the remainder of the report) to begin reviewing all pregnancy associated deaths. The purpose of the MMR Subcommittee is to identify preventive factors and make recommendations for systems change.



It is unknown at this time the number of pregnancy associated deaths that occur in Arizona during a year's time. As maternal deaths are identified and reviewed, an annual report will be disseminated to educate the public about this important health concern in our State.

A pregnancy associated death is defined as "the death of a woman while pregnant or within 1 year of pregnancy, irrespective of cause." While many states only review pregnancy related deaths, which is defined as "the death of a woman while pregnant or within 1 year of termination 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" (Bacak, 2003)[3].

Reviewing all deaths of women within one year of their pregnancy, including those with accidental and incidental causes, allows a closer look at the different variables that may be related to a woman's death and not just those that are directly related to a complication of pregnancy. For instance, if a woman dies by suicide 6 months after the birth of her child, this would typically not be included in the review by those committees who only review pregnancy-related deaths. After a careful review of her medical records and



psychosocial history, it may be determined that she sufferred from post partum depression, was never treated, and took her own life. This would make her death pregnancy related instead of only pregnancy associated.

Regardless of the circumstances of the death, the woman's past medical history or her behavioral health status, it is best to describe pregnancy related deaths by asking the question: Had she not been pregnant, would she have died? Figure 2 shows the connection between pregnancy associated and pregnancy related deaths.

Arizona's statute requires the review of all maternal deaths if the woman was pregnant within one year of her death. This allows the review teams to identify cases that may have been missed or otherwise misclassified as not pregnancy related.

During the death certification process, reviewers such as funeral directors, physicians and medical examiners enter information into VSIMS. Part of the information that is collected in this system involves checking one of three pregnancy-related checkboxes: Pregnant at the time of death; not pregnant, but pregnant within 42 days; or not pregnant, but pregnant 43 days to one year.

Identification of cases for review by the MMR Subcommittee is done so by locating death certificates of women where a version of the pregnancy checkbox is marked. When a person dies, information is entered into the Arizona Department of Health Services, Office of Vital Records, Vital Statistics Information Management System (VSIMS)[4]. All birth and death events that occur in Arizona are registered through VSIMS. VSIMS provides the ability to record birth and death events completely, accurately and in a timely manner, thereby enhancing the birth and death certification process. (Arizona Vital Statistics Information Management System, 2012).

Approximately every other month, an epidemiologist from the Arizona Department of Health Services, accesses VSIMS data and ascertains a list of women who have died where a version of the pregnancy checkbox is marked during a particular calendar year. That list is narrowed by reproductive age (for Arizona this criteria is any woman less than 50 years). For 2011, the woman must have died between July1 and December 31. The law allowing maternal deaths did not go into effect until July 1.

Using the list of women pulled from VSIMS, requests for records are sent to medical facilities, behavioral health agencies, law enforcement and obstetrical care facilities as. A.R.S. § 36-3503 requires these facilities to release information to the MMR Subcommittee so the information is available at the review. This statute reads: "Upon request of the chairperson of a state or local team and as necessary to carry out the team's duties, the chairperson shall be provided within five days excluding weekends and holidays with access to information and records regarding a maternal death is being reviewed by the team, or information and records regarding the woman's family".

Once the records are received by the Arizona Department of Health Services, Maternal Mortality Review Program, they are reviewed and it is determined if records from other facilities are needed. This is important because reviews are not necessarily centered on the death event but also on the woman's family, social, psychological and medical factors. When that information has been received, the MMR Program Manager abstracts the case using the Arizona MMR Abstraction Tool (Appendix 2). For those cases where records may not be available (e.g., suspected homicide cases or other cases that may be in litigation), a summary is taken from the investigator, either in person or telephonically, and summarized for the review committee.

A pre-review is then scheduled with committee members to review the records and abstraction prior to the actual case review.

Although rare, there are instances where no information is received from medical facilities, social services agencies, law enforcement or medical examiners. This typically occurs when a woman dies while on an Indian Reservation within Arizona. The reservations are sovereign nations that are not subject to the rules regarding the MMR team's access to information as stated in A.R.S. § 36-3503. When this happens, the MMR team may review a case only with limited information and sometimes the review is completed only with information indicated on the woman's death certificate.

FINDINGS

The law allowing the review of maternal deaths went into effect in July 2011; leaving the MMR Subcommittee with only six months of deaths to review for 2011. The number of deaths is too small to draw meaningful conclusions about the data. Additionally, the counts are too low to calculate rates and therefore it is impossible to assess population differences relating to maternal deaths.

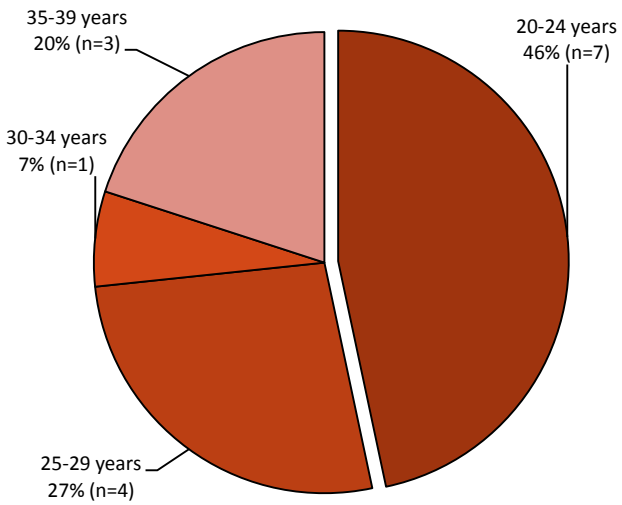
Based on the criteria listed above for ascertaining cases, 18 cases were identified for the period of July 1 through December 31, 2011. During the abstraction process, 3 cases were determined to have no indication of pregnancy even though a version of the pregnancy box was checked. It is possible that the checkbox was checked in error by one of the certifiers entering information into VSIMS. A thorough review of the clinical and medical history of these women was done and it was determined by either psychosocial information such as a statement in a report from a friend or family member that she was not pregnant and had not been pregnant during the past year, or by a pregnancy test that was completed at the hospital during the death event. Therefore, a total of 15 cases were reviewed by the MMR Subcommittee.

Age

Research has shown that age is a contributing factor to poor birth outcomes. According to the American College of Obstetrics and Gynecology (ACOG), the risk of poor birth outcomes, including chromosomal anomalies, congenital anomalies, miscarriage and stillbirth are greatly increased with advanced maternal age of 35 years or older. Women ages 40 and older have been associated with a significant increase of perinatal loss[5]. Although maternal age can be directly associated with poor birth outcome, there is no definitive research suggesting a relationship between maternal age and maternal mortality.

Although the statistics of a half a year's worth of data cannot be used for comparison, it should be noted that nearly half of the maternal deaths reviewed by the Subcommittee were between the ages of 20-24years. The youngest maternal death reviewed by the MMR Subcommittee was 20 years of age. The oldest maternal death was 39. The average age of pregnancy associated deaths was 26.8 years of age. Figure 3 shows pregnancy associated deaths by age group.

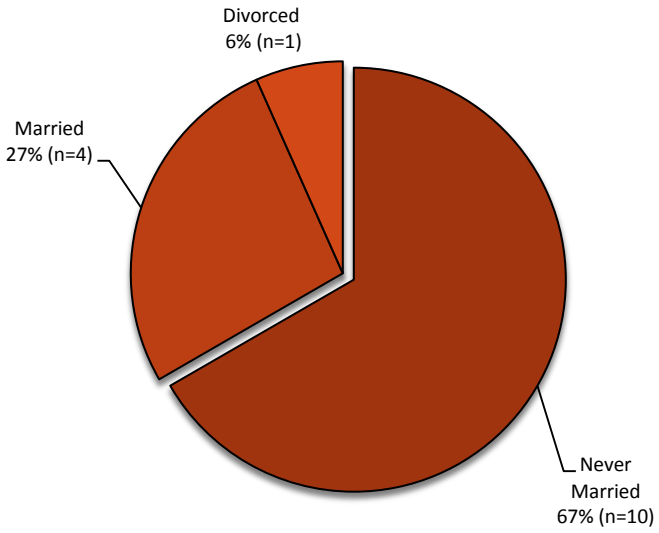
Figure 3. Pregnancy Associated Deaths by Age Group, Arizona, 2011



Marital Status

In 2011, 67% (n=10) of the women had never been married, 27 % (n= 4) were married at the time of death and 6% (n= 1) had been divorced prior to death. Figure 4 shows Pregnancy Associated Deaths by Marital Status.

Figure 4. Pregnancy Associated Deaths by Marital Status, Arizona, 2011

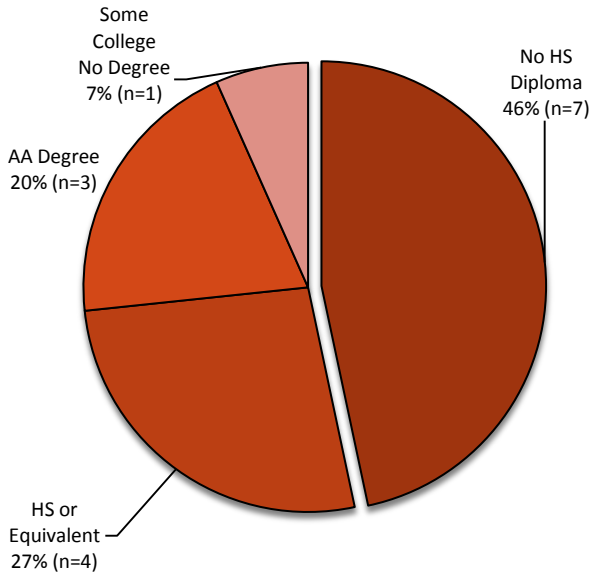


Education Level

There is statistical evidence about the association between maternal death and level of education. A study by the World Health Organization (2011) concluded that women who complete less than 12 years of education had more than twice the risk of maternal mortality. This remained true even when all other variables were controlled. (Karlsen, 2011)[6]. In guiding prevention initiatives in the future, this will be a very important point to consider.

The education level was distributed among most education levels with the exception of college level degree or higher. The 2011 maternal death data identified that 46% (n=7) of the women never finished high school nor obtained a General Equivalency Diploma. 27% (n=4) completed high school (or equivalent) and 20% (n=3) had received an Associate's degree. None of the women had an advanced degree. Figure 5 shows Pregnancy associated deaths by education level.

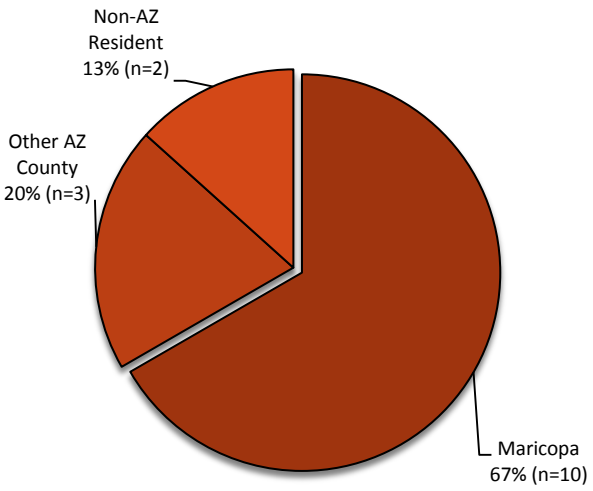
Figure 5. Pregnancy Associated Deaths by Education Level, Arizona, 2011



Residence County

The reviews by the MMR Subcommittee included women who lived throughout the state of Arizona. It is possible that there were maternal deaths that occurred in Arizona yet the woman was not an Arizona resident. If the death occurred in Arizona, it was reviewed by the MMR Subcommittee, regardless of the woman's state or country of residency. Conversely, motor vehicle crash, suicide attempt, etc., which occurred in Arizona but the woman was transported to and died at a hospital in another state, that death most likely would not be reviewed by Arizona's MMR Subcommittee. Sixty-seven percent (n=10) of the maternal deaths were residents of Maricopa County. Maricopa County accounts for 60% of Arizona's total population. Twenty percent of the women (n=3) lived in another county in Arizona and 13% (n=2) were non-Arizona residents. Figure 6 shows Pregnancy Associated Deaths by Residency County.

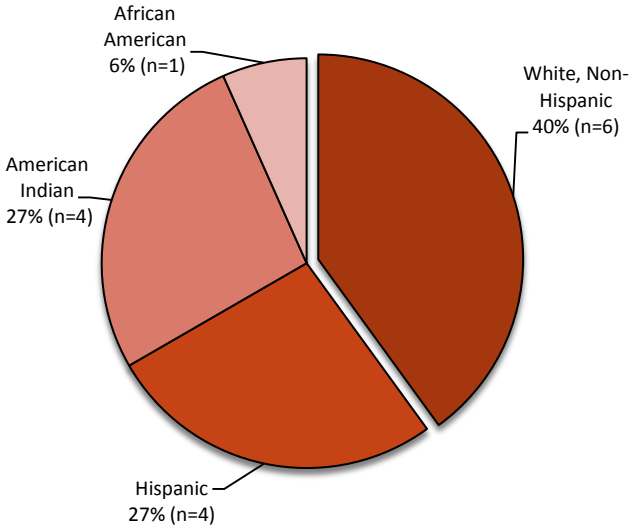
Figure 6. Pregnancy Associated Deaths by Residence County, Arizona, 2011



Race/Ethnicity

Forty percent (n=6) of maternal deaths were among women who were White, non-Hispanic. 27% (n=4) were Hispanic, 27% (n=4) were American Indian and 6% (n=1) were African American. Figure 7 shows pregnancy associated deaths by race/ethnicity.

Figure 7. Pregnancy Associated Deaths by Race/Ethnicity, Arizona, 2011

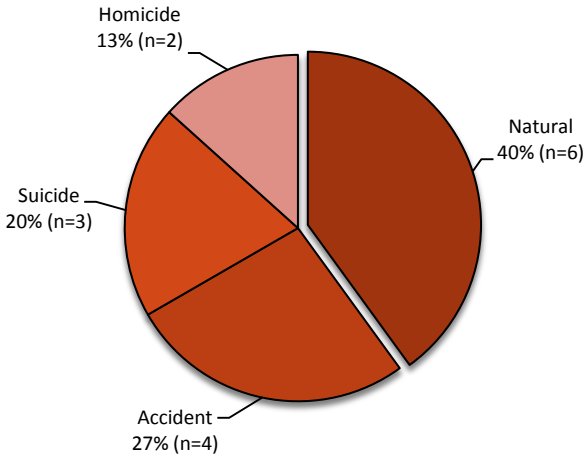


Manner

A medical examiner can certify a death using 5 categories: 1. Natural, 2. Accident, 3. Homicide, 4. Suicide, 5. Undetermined. After a careful review of the circumstances of death, receiving information from law enforcement if they were involved, and a careful examination of the decedent's body, the medical examiner assigns a manner of death.

A natural death would be a death where the woman died by a natural disease process such as cancer, pneumonia or heart failure. Most pregnancy related deaths are considered natural. An accidental death is what happens when a person's death was caused by an unintentional injury such as a fall or a motor vehicle crash. When the injury is inflicted upon someone with the intent of killing them or causing harm that led to his or her death, it is classified as homicide. If the injury is self-inflicted it is a suicide death. When a medical examiner is unable to determine whether an injury (intentional or not) caused the death versus a natural disease process it is classified as an undetermined death. In 2011, 40% (n=6) of the maternal deaths were natural. Figure 8 shows pregnancy associated deaths by manner.

Figure 8. Pregnancy Associated Deaths by Manner, Arizona, 2011



Associated vs. Related

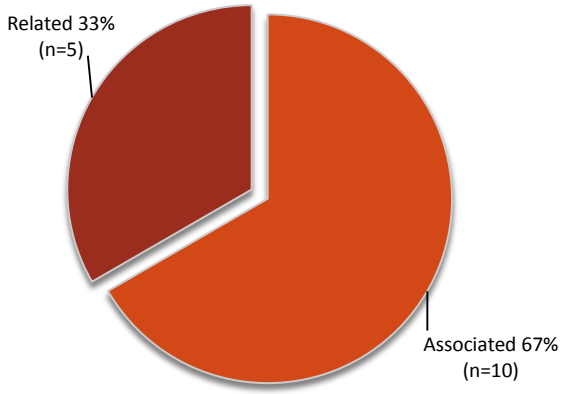
After a careful review of each maternal death, the MMR Subcommittee determined that 67% (n=10) of the deaths were associated with pregnancy, meaning that the woman died while pregnant or within one year of the end of her pregnancy but her pregnancy *did not* cause the death. In 33% (n=5) of the cases, the Subcommittee was able to determine that the pregnancy caused the death, or a disease process was aggravated by pregnancy which resulted in the woman's death.

Figure 9 shows pregnancy related versus pregnancy associated deaths.

This can be a difficult concept to understand. Historically, a suicide due to post-partum depression would not be considered a pregnancy related death. However, practice is evolving to the extent that if the death occurred within the first 42 days post-partum and the woman had made suicidal threats or ideations, the death should be considered pregnancy related.

Another example is one that is commonly stated by the Centers for Disease Control and Prevention when addressing the issue of pregnancy related vs. pregnancy associated deaths raises the question: ***If the woman was not or had not been pregnant, would she have died?***

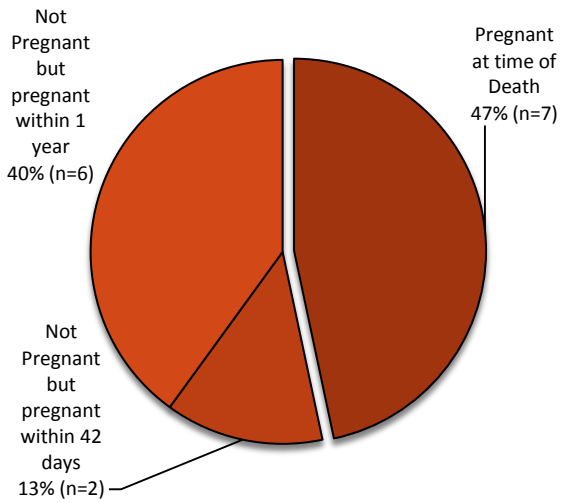
Figure 9. Pregnancy Related vs. Pregnancy Associated Deaths, Arizona, 2011



Pregnancy Status

There are three types of pregnancy associated deaths: 1. Pregnant at the time of death, 2. Not pregnant but pregnant within 42 days, and 3. Not pregnant but pregnant 43 days to one year prior to death. In 2011, 47% (n=7) of pregnancy associated deaths were pregnant at the time of death. Figure 10 shows pregnancy associated deaths by pregnancy status.

Figure 10. Pregnancy Associated Deaths by Pregnancy Status, Arizona, 2011

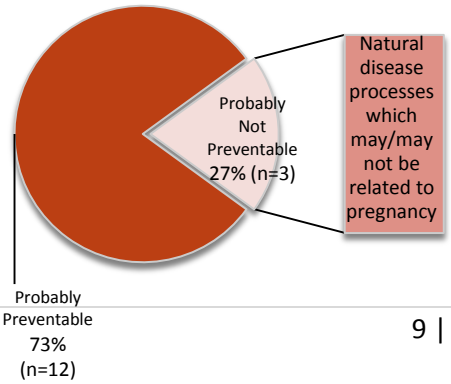


Preventability

The maternal mortality review process in Arizona is grounded in the principles of public health and is focused on the prevention of all maternal deaths. The MMR Subcommittee considers a woman's death preventable if something could have reasonably been done by an individual, or by the community as a whole to prevent the death. The determination of preventability for an individual case is a consensus decision by MMR Subcommittee after discussing and reviewing all available data regarding the circumstances of a woman's death. In some cases, there is insufficient information available to determine preventability or the team cannot reach consensus on preventability. In 2011 the Subcommittee determined that 73% (n=12) of maternal deaths were probably preventable and 27% (n=3) were probably not preventable.

During the review of each death, teams identify factors believed to have contributed to the death. Although the presence of a contributing factor typically led to the determination that a death was probably preventable, this was not always the case. For example, the team may have concluded that substance use was a contributing factor in a suicide death. However, the MMR Subcommittee may not have had sufficient information (e.g., the woman's autopsy report or an adequate death scene investigation) to determine that the death could have been prevented. Figure 11 shows maternal deaths in Arizona by preventability.

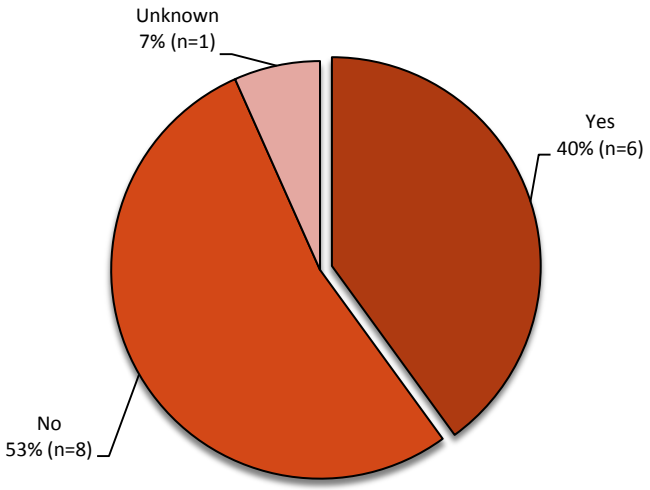
Figure 11. Pregnancy Associated Deaths by Preventability, Arizona, 2011



Substance Use

Obesity and substance abuse were among the most common risk factors for pregnancy associated deaths. In 40% (n=6) of maternal deaths, the woman tested positive for illicit drugs and/or alcohol at the time of autopsy. Figure 12 shows pregnancy associated deaths with substance use/abuse.

Figure 12. Pregnancy Associated Deaths with Substance Use, Arizona, 2011

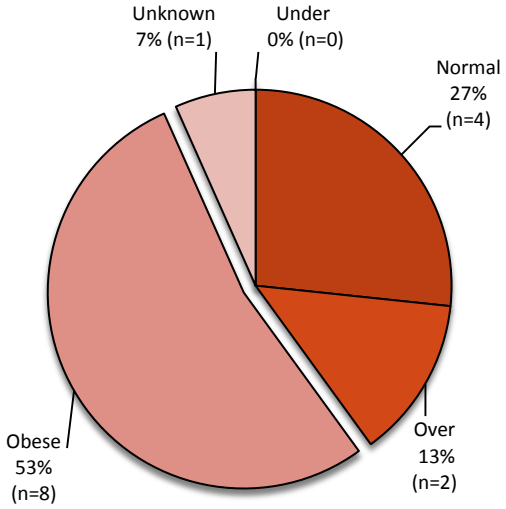


Body Mass Index

Using the US Department of Health and Human Services Body Mass Index (BMI) scale, 53% (n=8) of the women were obese. In order to calculate the BMI for a particular woman, her pre-pregnancy weight was used unless she was more than 42 days post termination of pregnancy.

Poor pregnancy outcomes, including death, are influenced by a woman's pre-pregnancy body mass index. According to the Mayo Clinic[vii], obesity during pregnancy can cause gestational diabetes, preeclampsia, increase a woman's risk of infection, thrombosis, obstructive sleep apnea, prolonged pregnancy, labor problems and pregnancy loss. The higher the body mass index on a pre-pregnant woman, the more likely she is to have a negative outcome. Figure 13 shows pregnancy associated deaths and body mass index.

Figure 13. Pregnancy Associated Deaths and BMI, Arizona, 2011



Limitations to the Maternal Mortality Review Process

Information relating to abortions in Arizona could be a potential limitation to the MMR process. In 2010, SB1304 was enacted that statutorily required the reporting of abortions, complications of abortions and treating those complications. During the passage of this statute, reporting of abortions was changed to a web-based system. This system was designed to meet the reporting requirements of the law while protecting the anonymity of the women. This system does not contain any identifying information. Although it can track adverse outcomes associated with abortion procedures, the information is protected and would not be available to the MMR Subcommittee.

The MMR Subcommittee would not have information on a woman if she was unaware of her pregnancy and did not have an autopsy. Most of the cases accepted by the Office of the Medical Examiner are those in which the person died under suspicious circumstances such as death due to homicide, suicide or accident. Patients who die of natural causes or a natural disease process, are not under the age of 18, typically do not undergo an autopsy. For this reason, a woman who died of natural causes and but who may have been unknowingly pregnant at the time of her death would not be captured in this data.

Another limitation to the review process is access to medical records. Arizona has 22 recognized federal Tribes who are not required to comply with this mandate. Many of the Tribes do, however, there are some deaths that occur where the only record to review is the death certificate. This lack of access to certain medical records, psychosocial records, past clinical history and obstetrical care is a barrier when reviewing the circumstances of a death, determining whether it was pregnancy-related and if it was preventable, which is the foundation of MMR.

Membership

The 2011 Maternal Mortality Review is made up of a multidisciplinary team with professional including; OB/GYNs, neonatologists, directors of nursing, maternal-fetal medicine specialists, public health professionals, domestic violence specialists, behavioral health specialists, and representatives from Arizona's tribal nations.

It is through the work of these Subcommittee members that maternal mortality review in Arizona is able to be accomplished.

- Teresa Buchta, RNC-OB, MS-NL: RN Director, Women and Infant Services, Banner Health.
- Deb Christian: Executive Director, Arizona Perinatal Trust.
- Dr. Kimberly Couch, DNP, CNM, FNP: Director of Midwifery Services, Phoenix Indian Medical Center, United States Public Health
- Dr. Dean Coonrod, MD-MPH: Chair, Department of OB and GYN, Maricopa Integrated Health System; Professor of OB and GYN, University of Arizona-College of Medicine, Phoenix.
- Mary Ellen Cunningham, MPA, RN: Chief, Bureau of Women's and Children's Health, Arizona Department of Health Services.
- Marla Dedrick, BSW, M.Ed., MA: Child Fatality and Maternal Mortality Program Manager, Arizona Department of Health Services (support staff).
- Dr. Tim Flood, MD: Bureau Medical Director, Arizona Department of Health Services.
- Dyanne Herrera, MPH: Maternal and Child Health Epidemiologist, Arizona Department of Health Services (support staff).
- Khaleel S. Hussaini, PhD: Bureau Chief, Public Health Statistics, Arizona Department of Health Services (support staff).
- Dr. Robert Johnson, MD – Chair: Director of Maternal-Fetal Medicine, Arizona Perinatal Care Centers.
- Dr. Michael McQueen, MD – Co Chair: NICU Director, Banner Thunderbird; Medical Director, Women and Infant Services, Banner Estrella; CEO, Goodnight Pediatrics; Medical Director, Women and Infant Services, Banner Del E. Webb.
- Kathleen Malkin, RN, MS: Division Manager-Community Health Services, Pima County Health Department
- Beth Mulcahy, MPH: State Director of Program Services and Public Affairs, March of Dimes-Arizona.
- Dr. Mary Rimsza, MD: State Team Chair-Arizona State Child Fatality Review Team; American Academy of Pediatrics-Arizona Chapter; University of Arizona College of Medicine.
- Robin Shepherd, RN, MSN: Director, Women's and Infants' Services, Arrowhead Hospital.
- Sheila Sjolander, MSW: Assistant Director of Public Health Prevention Services, Arizona Department of Health Services.
- Tomi St. Mars, RN, MSN, CEN, FAEN: Chief, Office of Injury Prevention, Arizona Department of Health Services (support staff).
- Dr. Ken Welch, MD: Chief Medical Officer, Banner Estrella Medical Center.

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