STATE OF WEST VIRGINIA
DEPARTMENT OF HEALTH AND HUMAN RESOURCES
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Jim Justice
Governor

Bill J. Crouch
Cabinet Secretary

March 3, 2017

The Honorable Mitch Carmichael, President
West Virginia Senate
Room 229M, Building 1
State Capitol Complex
Charleston, West Virginia 25305

The Honorable Tim Armstead, Speaker
West Virginia House of Delegates
Room 228M, Building 1
State Capitol Complex
Charleston, West Virginia 25305

Dear President Carmichael and Speaker Armstead:

As required by West Virginia Code §61-12A-2, regarding infant and maternal mortality, please find enclosed the report on infant and maternal deaths. This report is provided by the West Virginia Department of Health and Human Resources through the Office of Maternal, Child and Family Health, Infant and Maternal Mortality Review Panel.

If additional information is needed, you may contact Christina Mullins, Director, Office of Maternal, Child and Family Health, via telephone at (304) 356-4392 or e-mail at christina.r.mullins@wv.gov.

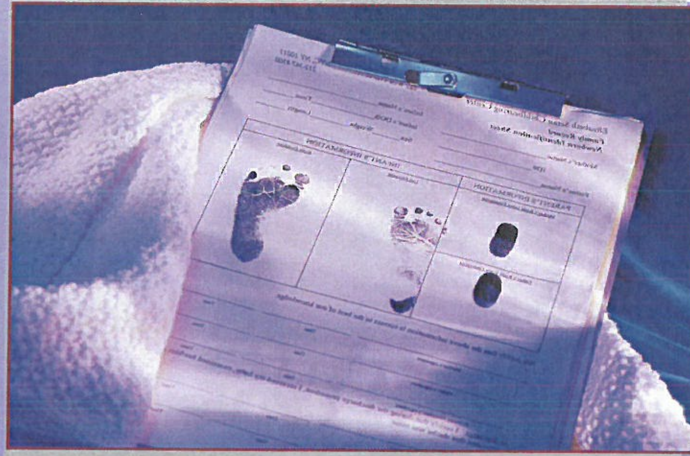
Sincerely,

Bill J. Crouch
Cabinet Secretary

BJC/vc

Enclosure

cc: Rahul Gupta, MD, MPH, FACP
Anne Williams
Christina Mullins
Steve Harrison
Clark Barnes
Legislative Library



West Virginia
Infant and Maternal Mortality Review

WEST VIRGINIA
Department of
Health & Human Resources
BUREAU FOR PUBLIC HEALTH

Office of Maternal, Child and Family Health
350 Capitol Street, Room 427
Charleston, WV 25301
Melissa Baker, MCH Epidemiologist
Division of Research, Evaluation and Planning

Interim Update

It is important to note that due to a vacancy in the Nurse Abstractor position, the Infant and Maternal Mortality Review Panel did not meet during calendar year 2016. There were no new cases reviewed for either infant or maternal deaths. This report contains a brief summary of the 2014 maternal deaths and the 2013 infant deaths along with the previous report containing 2013 maternal deaths and 2012 infant deaths. Since data have not been reviewed by the Panel, it is subject to change. Once cases are reviewed, more detailed data will be included in the next annual report.

Legislative History

The West Virginia Legislature passed Senate Bill 234 on March 6, 2008. In effect 90 days from passage, a new article, designated §48-25A-1, §48-25A-2 and §48-25A-3, all relating to the creation of a Maternal Mortality Review Team, established its members and responsibilities and gave the Bureau for Public Health rule-making authority for the team.

The passage of West Virginia House Bill 3028 in March 2011 expanded responsibilities of the Maternal Mortality Review Team to include infant mortality reviews and renamed the team the Infant and Maternal Mortality Review Team (IMMRT).

During the 2013 Legislative Session, Senate Bill 108 was passed creating the Fatality and Mortality Review Team and establishing four advisory panels: Unintentional Pharmaceutical Drug Overdose Fatality Review Panel (UPDOFRP); Child Fatality Review Panel (CFRP); Domestic Violence Fatality Review Panel (DVFRP); and Infant and Maternal Mortality Review Panel (IMMRP), West Virginia Code §61-12A-2.

The Legislature found that there was a need for a process to study the causes of infant and maternal deaths. Comprehensive studies indicate that these mortalities are more extensive than they initially appear on death certificates. The Legislature believed that more extensive studies would enable development of a plan to reduce these deaths in the future.

The Infant and Maternal Mortality Review process is a method of understanding the diverse factors and issues that contribute to preventable deaths and identifying and implementing interventions to address these problems. The knowledge gained from the reviews will be used to enhance services, influence public health policy and direct planning efforts intended to lower mortality rates.

Responsibilities of the Infant and Maternal Mortality Review Panel

The IMMRP shall: (1) identify infant and maternal death cases; (2) review medical records and other relevant data; (3) determine preventability of deaths; (4) establish trends, patterns and risk factors and develop recommendations for the prevention of infant and maternal deaths; (5) provide statistical analysis regarding the causes of infant and maternal fatalities; (6) disseminate findings and make recommendations to policymakers, healthcare providers and facilities; and (7) promote public awareness of

the incidence and causes of infant and maternal fatalities, including recommendations for their reduction.

The IMMRP shall submit an annual report to the Governor and to the Legislature concerning its activities and the incidence of infant and maternal fatalities within the State. The report is to include statistics setting forth the number of infant and maternal fatalities, identifiable trends in infant and maternal fatalities in the State, including possible causes, if any, and recommendations to reduce the number of preventable infant and maternal fatalities in the State.

Definitions

Maternal Mortality: Death of a woman during pregnancy, at the time of birth or within one year of the birth of a child from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes.

Maternal Mortality Rate: Number of maternal deaths divided by the number of live births (rate reported per 100,000).

Infant Mortality: Death of a live born infant in the first year of life.

Infant Mortality Rate: Number of infant deaths divided by the number of live births (rate reported per 1,000).

Unexpected Death: The death of an infant who has died in the first year of life or a woman who has died during pregnancy, at the time of birth or within one year of the birth of a child, whose immediate death is not anticipated.

Unexplained Death: The cause and manner of death of an infant who has died in the first year of life or a woman who has died during pregnancy, at the time of birth or within one year of the birth of a child, that cannot be determined after an autopsy and thorough investigation of the circumstances surrounding the death.

Review: The process by which all facts and circumstances about a deceased infant who has died in the first year of life or a woman who has died during pregnancy, at the time of birth or within one year of the birth of a child are known and discussed among members of the Panel.

In 1986, the Centers for Disease Control and Prevention (CDC) and the American College of Obstetricians and Gynecologists (ACOG) collaborated to issue a statement recommending the use of two enhanced surveillance definitions as an approach to more accurately identify deaths among women in which pregnancy was a contributing factor.

Pregnancy-Associated Death: (ACOG/CDC) The death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause.

Pregnancy-Related Death: (ACOG/CDC) The death of a woman while pregnant or within one 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.

Pregnancy-related deaths are caused by:

- Complications of the pregnancy itself
- Chain of events initiated by the pregnancy
- Aggravation of an unrelated condition or event by the physiologic effects of pregnancy

Case Identification of Maternal Deaths

Maternal deaths are identified from linking death certificates for women aged 10-50 years with birth certificates and fetal death certificates. Additional maternal deaths are identified by ICD 9 diagnostic codes O630–O679 and ICD 10 diagnostic codes O00–O99 – pregnancy, childbirth and the puerperium. All maternal deaths occurring within 365 days of pregnancy conclusion are designated as pregnancy-associated and further investigated.

Cases for review are limited to women of childbearing age who were residents of West Virginia at the time of their death. West Virginia residents who died in other jurisdictions are counted in the official Vital Statistics reports, but they are not included in the case reviews because of the difficulty in obtaining records across jurisdictions.

A Nurse Reviewer reviews death and birth certificates for all pregnancy-associated deaths. Once cases are identified as potentially pregnancy-related, medical records are obtained from all healthcare facilities providing care before, during and after the pregnancy conclusion. Hospital records at the time of death and autopsy reports are included when applicable. Medical records are de-identified and a summary of events is developed. These documents are sent to all members prior to the meeting.

The IMMRP reviews the potential pregnancy-related cases to determine whether the maternal death was preventable or potentially preventable. Pregnancy-relatedness and opportunities for prevention are determined through Panel discussion.

The IMMRP reviews pregnancy-associated deaths caused from medical complications. The Panel determines whether the maternal death was preventable, not preventable and/or pregnancy-related. Opportunities for prevention are determined through Panel discussion.

Case Identification of Infant Deaths

Infant deaths are identified from linking birth and death certificates for infants in the first year of life. Due to perinatal influences of the mother’s health and maternal risk factors, maternal medical information obtained during pregnancy is also reviewed.

Case reviews are limited to infants who were residents of West Virginia at the time of their death. Infants who died in other jurisdictions are counted in official Vital Statistics reports, but are not included in the case reviews because of the difficulty in obtaining records across jurisdictions. Infants who were residents of other states but died in West Virginia are not reviewed.

Interim Update – Maternal Deaths

In 2014, there were 11 maternal deaths. The preliminary manner of death was listed as: five accidental, three natural, two suicide and one undetermined. The accidental deaths included four drug overdoses and one fall, the natural deaths included two exsanguinations and one cardio-myopathy and the suicides were one self-inflicted gunshot wound and one asphyxia due to hanging.

The preliminary overall maternal mortality rate for West Virginia in 2014 was 54 per 100,000 (calculated as 11 maternal deaths by 20,303 residence births - 2014 Vital Statistics data).

2013 Maternal Deaths

In 2013, there were 14 pregnancy-associated maternal deaths. The manner of death was listed as: nine accidental, four natural deaths and one undetermined.

The overall maternal mortality rate for West Virginia in 2013 was 67 per 100,000 (calculated as 14 maternal deaths by 20,831 residence births - 2013 Vital Statistics data). Pregnancy-related maternal mortality in 2013 was 19.2 per 100,000 (calculated as 4 maternal deaths by 20,831 residence births - 2013 Vital Statistics data).

Maternal Age

Four mothers were in their teens, eight mothers were in their 20s, one mother was 34 years old and one mother was 41 years old.

Education

Six mothers had less than a high-school education, six mothers had at least a 12th grade education and the remaining two had college educations.

Prenatal Care

Prenatal visit information found on the birth and fetal death certificates, as well as the medical records, was used to determine entry into prenatal care.

Nine mothers (64%) began prenatal care in the first trimester. Four mothers (29%) began prenatal care during the second trimester. One mother (7%) had no prenatal care.

Cause

Drug abuse was the cause of four maternal deaths in 2013. Four deaths were natural with causes of hemolysis, elevated liver enzymes, and Low Platelet (HELLP) syndrome, cardiac arrest, bilateral pulmonary embolus and metastatic lung cancer. Four deaths

were the result of motor vehicle accidents and one death was contributed to being struck by a falling tree. The remaining death was undetermined.

Timing

Four maternal deaths in 2013 occurred less than 30 days postpartum, two deaths occurred between 30 and 90 days postpartum and eight deaths occurred greater than 90 days postpartum.

Medical Coverage

Medicaid was the primary insurance coverage in eight (57%) of the 14 cases, four deaths were either covered by other insurance or had no insurance and two deaths had unknown insurance coverage.

Marital Status

Ten of the 14 maternal deaths had never been married while four of the deaths were married.

Maternal Deaths 2007- 2013

Maternal Death Case Findings in WV 2007-2013				
Year	**All deaths**	**Deaths related to medical conditions**	**Pregnancy-related deaths**	**Resident births**
2007	**13**	**5***	**2**	**22,017**
2008	**10**	**5****	**2**	**21,493**
2009	**6**	**2**	**1**	**21,275**
2010	**11**	**8**	**4**	**20,471**
2011	**12**	**1**	**1**	**20,705**
2012	**11**	**3**	**1**	**20,813**
2013	**14**	**4**	**3**	**20,831**
Total	**77**	**28**	**14**	**147,605**

*1 additional death received out-of-state care; medical records unavailable.
**1 additional death occurred out-of-state; medical records unavailable.

During 2007-2013, there were 77 pregnancy-associated maternal deaths. The estimated overall maternal mortality rate for this time period was 52.2 per 100,000 (calculated as 77 maternal deaths by 147,605 residence births - Vital Statistics data). Pregnancy-related maternal mortality for 2007-2013 was 9.5 per 100,000 (calculated as 14 maternal deaths by 147,605 residence births – Vital Statistics data). Researchers for the Institute for Health Metrics and Evaluation at the University of Washington published a study in The Lancet, a weekly medical journal, estimating the U.S. pregnancy-related maternal mortality rate to be 18.5 maternal deaths per 100,000 births in 2013.

Findings 2007-2013

West Virginia's 2007-2013 pregnancy-related maternal mortality rate of 9.5 maternal deaths per 100,000 births is lower than the estimated 2013 U.S. pregnancy-related maternal mortality rate of 18.5 deaths per 100,000 births.

Sixty-two percent of the maternal deaths during 2007-2013 began prenatal care in the first trimester. This is much lower in comparison to 81.5% of all mothers with known prenatal care that began care in the first trimester in West Virginia in 2013.

Eighty-three percent of the maternal deaths during 2007-2013 had Medicaid as the primary medical coverage during delivery. This is significantly higher when compared to 49.6% of mothers with known coverage having Medicaid as the primary coverage in West Virginia in 2013.

Thirty-nine percent of the maternal deaths during 2007-2013 were due to medical conditions. Drug abuse was the cause for more than a quarter (27%) of the maternal deaths for 2007-2013. Seventeen percent of maternal deaths were motor vehicle accidents (MVA), 5% were homicides and 4% were suicides for this time period.

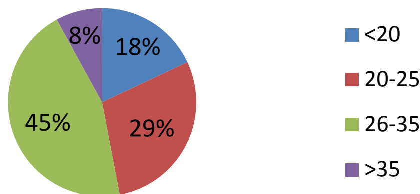
Maternal Age

Fourteen (18%) of the 77 deaths were less than 20 years old, 22 deaths (29%) were 20 to 25 years of age, 35 deaths (45%) were 26-35 years of age and six deaths (8%) were greater than 35 years old.

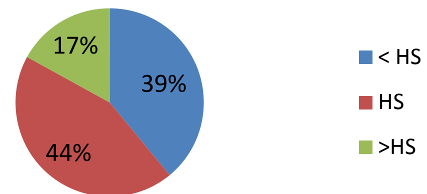
Education

Thirty (39%) of the 77 deaths had less than a 12th grade education, 34 (44%) had a high school education and 13 deaths (17%) had some college or a college degree.

Maternal Age 2007-2013

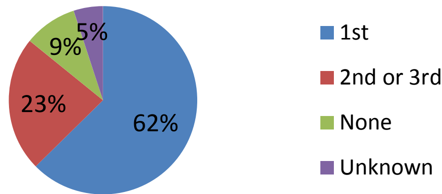


Maternal Education 2007-2013



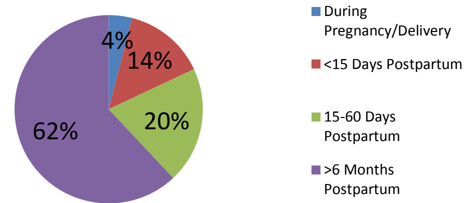
Prenatal Care
Forty-eight of the deaths (62%) began prenatal care in the first trimester and 18 deaths (23%) began prenatal care during the second or third trimester. Of the remaining 11 deaths, seven (9%) had no prenatal care and four (5%) had unknown prenatal care.

Trimester Prenatal Care
2007-2013



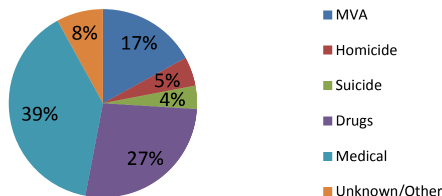
Timing
Three deaths (4%) occurred during pregnancy or delivery, 11 deaths (14%) occurred within 15 days postpartum, 15 deaths (20%) occurred 15-60 days postpartum and 48 deaths (62%) occurred after 60 days postpartum.

Timing of Death
2007-2013



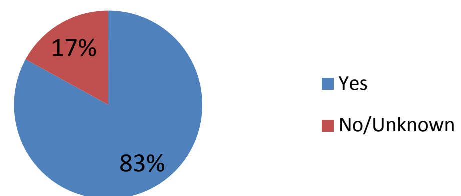
Cause
Thirteen deaths (17%) were MVA, four deaths (5%) were homicides and three deaths (4%) were suicides. Drug abuse was the cause for 21 (27%) of the 77 deaths. Six deaths (8%) were unknown or undetermined or other accident. The remaining 30 deaths (39%) were determined to be cardiovascular, respiratory, neurological, cancer, HELPP syndrome, uterine abruption or other medical.

Cause of Death
2007-2013



Insurance Coverage
Medicaid was the primary insurance coverage in 64 of the 77 deaths (83%) while 13 deaths (17%) did not list Medicaid as the primary medical coverage.

Medicaid Coverage
2007-2013



Recommendations to Date

During review of the 2007-2013 cases, medical personnel, especially emergency room (ER) medical personnel, were not recognizing possible causes and were not always performing correct diagnostic procedures to rule out conditions that may or may not be related to the pregnancy when women were presenting with symptoms of:

- Nausea, vomiting and other vague abdominal symptoms.
- Hypertension, whether chronic or pregnancy-induced.
- Post-partum symptoms that may be related to cardiomyopathy.

Women were misdiagnosed resulting in complications that caused or contributed to their deaths. These problems were addressed through creation of subcommittees for development of educational materials for medical professionals and patients. The IMMRP developed practitioner educational posters for Hypertension/Preeclampsia and Peripartum Cardiomyopathy. These posters were distributed to all West Virginia hospital emergency rooms (ERs), rural/community clinics and medical school curriculum across West Virginia. Once the educational materials are in place, available teaching moments such as Grand Rounds, Medical Journal articles, etc. will be used to ensure the ER protocols are being practiced. The Panel recommended that the woman's prenatal care medical practitioner should be notified immediately after she arrives to the healthcare facility.

The Panel has recommended maintaining collaborations with the WV Perinatal Partnership and other stakeholders in continued education to providers and women of reproductive age of the negative outcomes associated with drug use before and during pregnancy.

Interim Update - Infant Deaths

In 2013, there were 156 infant deaths according to the West Virginia Health Statistics Center. The preliminary cause of death was listed as: 13 deaths (8%) – medical conditions; 41 deaths (26%) – prematurity/extreme prematurity; 53 deaths (34%) – birth defects; 11 deaths (7%) – accidental; 25 deaths (16%) – SUID; 10 deaths (6%) – undetermined/unknown and three deaths (2%) - homicides.

The preliminary infant mortality rate for West Virginia in 2013 was 7.48 infant deaths per 1,000 live births (calculated as 156 infant deaths by 20,829 residence births - 2013 Vital Statistics data). In 2013, the CDC reported the U.S. infant mortality rate as 5.90 infant deaths per 1,000 live births.

2012 Infant Deaths

In 2012, there were 152 infant deaths reviewed by the IMMRP. The manner of death was listed as: 111 (73%) – natural; 30 (20%) – undetermined; two (1%) – homicide; four (2%) – accidental; and the remaining six (4%) - out of state deaths with pending or little information available.

The infant mortality rate for West Virginia in 2012 was 7.3 infant deaths per 1,000 live births (calculated as 152 infant deaths by 20,813 residence births - 2012 Vital Statistics

data). In 2012, the CDC reported the U.S. infant mortality rate as 6.0 infant deaths per 1,000 live births.

2012 Infant Deaths	
Manner of Death	**Number/Percentage of Deaths**
Natural	111/73%
Undetermined	30/20%
Homicide	2/1%
Accidental	4/2%
No information (includes out of state, unknown and pending)	6/4%

Infant Age at Time of Death
Fifty-one of the 152 deaths were less than one day old, 44 deaths were 1 - 28 days old and 57 deaths were greater than 29 days old.

Cause of Infant Deaths
Of the 152 infant deaths, 58 deaths were due to prematurity, 38 deaths were due to birth defects, 26 deaths were Sudden Unexplained Infant Deaths (SUID), 16 deaths were medical related, six were accidents, one was homicide and the remaining seven deaths were either unknown, no information, undetermined or pending.

Prenatal Care of Infant Deaths
One hundred and five of the 152 infant deaths began prenatal care in the first trimester. Twenty-five deaths began prenatal care during the second trimester and four began prenatal care in the third trimester. Of the remaining 18 deaths, four had no prenatal care and 14 had unknown prenatal care.

Medical Coverage of Infant Deaths
Medicaid was the primary medical coverage in 93 of the 152 infant deaths while 30 deaths did not list Medicaid as the primary medical coverage and 23 deaths had unknown coverage.

Leading Risk Factors of SUID Deaths
Of those infant deaths with information available, there were identified risk factors associated with the SUID deaths that were most prevalent: co-sleeping/bed sharing, hazardous bedding and exposure to smoking – both maternal and others in the household. Twenty of the 26 SUID deaths indicated exposure to smoking – either maternal or others in household. Twelve of the 26 SUID deaths indicated the infant was co-sleeping/bed sharing and 21 were in hazardous sleep conditions.

Findings

West Virginia's infant mortality rate for 2012 was 7.3 infant deaths per 1,000 live births. The CDC reported the U.S. infant mortality rate as 6.0 infant deaths per 1,000 live births, making West Virginia's rate higher than the national rate.

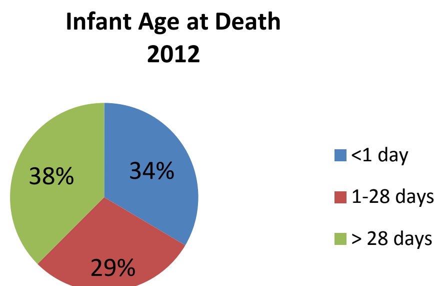
The three leading causes of infant death in West Virginia are in line with the leading causes of infant death in the U.S.: prematurity, birth defects and sudden unexplained infant death. These leading causes account for 80% of the infant deaths in West Virginia in 2012. Leading risk factors of the SUID deaths indicated infants were exposed to smoking and infants were co-sleeping/bed sharing or in hazardous sleeping environments. These risk factors are modifiable and would have an impact on infant mortality in West Virginia.

Only 69% of the infant deaths had mothers who began prenatal care in the first trimester. This is significantly lower than the overall percentage (84%) of pregnant women with known prenatal care who began care in the first trimester in West Virginia in 2012.

Medicaid was the primary medical coverage in 61% of the infant deaths in West Virginia in 2012. According to West Virginia Vital Statistics for 2012, the infant mortality rate for non-Medicaid infant deaths was 6.2 per 1,000 live births but the infant mortality rate for Medicaid infant deaths was higher at 8.3 per 1,000 live births.

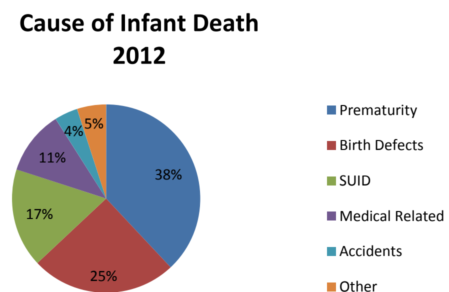
Infant Age at Death

Fifty-one (33.5%) of the 152 deaths were less than one day old, 44 deaths (29%) were 1 - 28 days old and 57 deaths (37.5%) were greater than 29 days old.



Causes of Infant Deaths

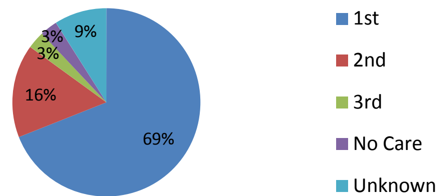
Of the 152 infant deaths, 58 deaths (38%) were due to prematurity, 38 deaths (25%) were due to birth defects, 26 deaths (17%) were SUID, 16 deaths (11%) were medical related, six (4%) were accidents and the remaining eight deaths (5%) included one homicide and seven either unknown, no information, undetermined or pending.



Prenatal Care of Infant Deaths

One hundred and five (69%) of the 152 infant deaths began prenatal care in the first trimester and 25 deaths (16%) began prenatal care during the second trimester and four (3%) began prenatal care in the third trimester. Of the remaining 18 deaths, four (3%) had no prenatal care and 14 (9%) had unknown prenatal care.

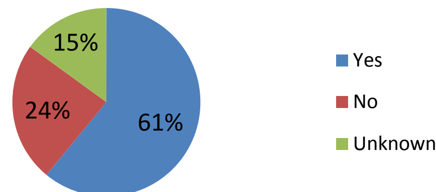
Trimester Prenatal Care Infant Death 2012



Medical Coverage of Infant Deaths

Medicaid was the primary medical coverage in 93 (61%) of the 152 infant deaths while 36 deaths (24%) did not list Medicaid as the primary medical coverage and 23 deaths (15%) had unknown coverage.

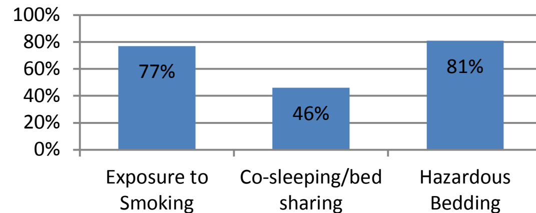
Medicaid Coverage of Infant Death 2012



Leading Risk Factors of Undetermined Infant Deaths

Twenty (77%) of the 26 SUID deaths indicated exposure to smoking – either maternal or others in household. Twelve (46%) of the 26 SUID deaths indicated the infant was co-sleeping/bed sharing and 21 (81%) were in hazardous sleep environments.

Leading Risk Factors of Undetermined Infant Death 2012



The Panel recommends continued participation of collaborative efforts to address smoking among pregnant women. The Panel also recommends continued exploration of initiatives that will reduce sudden unexplained infant deaths, as these are deaths with modifiable risks factors that have an impact on preventable deaths. Additionally, the Panel recommends maintaining partnerships with the Bureau for Children and Families and the Office of the Chief Medical Examiner in identifying infants that may be exposed to these risk factors before death and other infants in the household after an infant death has occurred as a preventative measure.