

# Florida's Pregnancy-Associated Mortality Review 2009 Update



**Prepared by:**

**Leticia Hernandez, Ph.D.**

Training and Research Consultant  
Maternal and Child Health Practice and Analysis Unit  
Florida Department of Health

**William M. Sappenfield, M.D., M.P.H.**

Director  
Maternal and Child Health Practice and Analysis Unit  
Florida Department of Health

**Deborah Burch, R.N., M.S.N., C.P.C.E.**

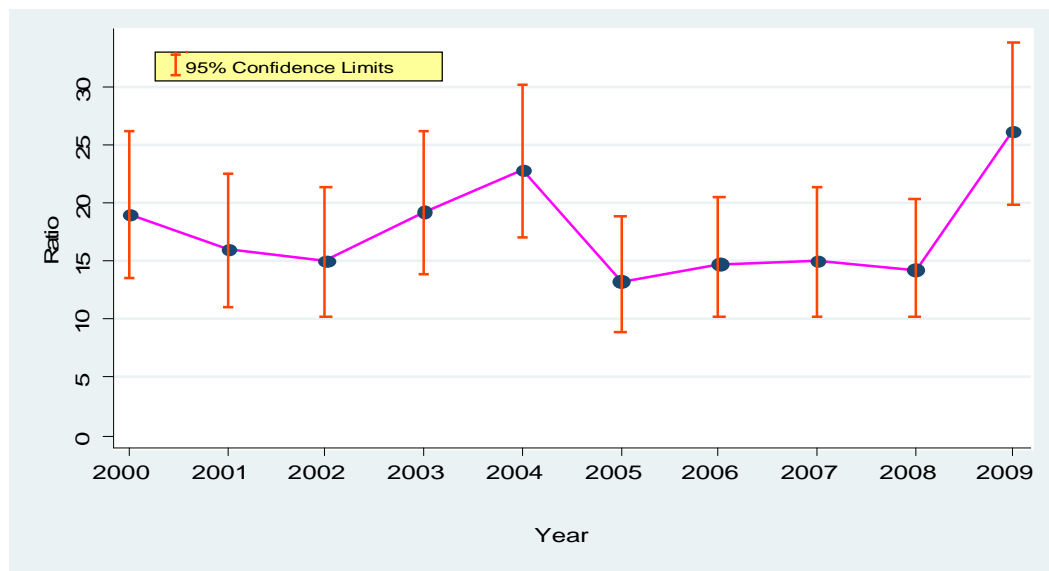
PAMR Coordinator/RN Consultant  
Infant, Maternal, and Reproductive Health Unit  
Florida Department of Health



## Pregnancy-Related Mortality Findings, Florida 2009

In 2010, the Pregnancy-Associated Mortality Review (PAMR) committee reviewed 62 pregnancy-associated deaths that occurred in 2009 and identified 58 (94.0%) deaths as pregnancy-related. Between 2000 and 2009, the pregnancy-related mortality ratio (PRMR) fluctuated from 19.1 deaths per 100,000 live births in 2000, a low of 13.3 in 2005, and a high of 26.2 in 2009. In 2007 and 2008, the ratios were 15.1 and 14.3 deaths per 100,000 live births, respectively (Figure 1). Although there was no clear PRMR trend from 2000 to 2008, the increase in the PRMR from 14.3 in 2008 to 26.2 per 100,000 live births in 2009 is statistically significant ( $p= 0.004$ )

**Figure 1 Pregnancy-Related Mortality Ratios, Florida 2000-2009**

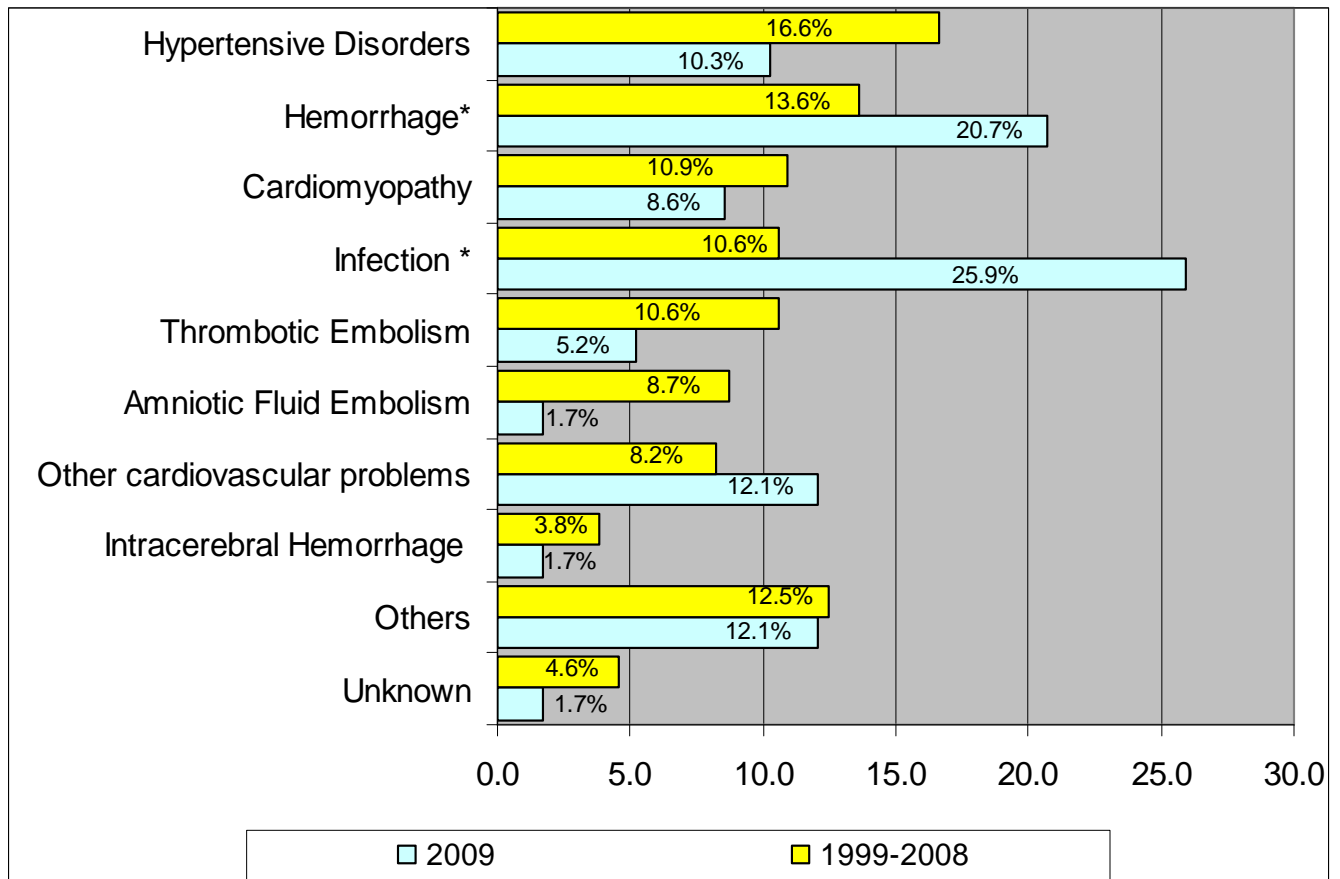


### Cause of Death

The leading causes of pregnancy-related death in 2009 were infection (25.9%), hemorrhage (20.7%), and other cardiovascular (12.1%) (Figure 2 and Table 1). The category, “Other remaining causes,” tied for the third leading cause accounting for 12.1% of deaths. These other causes include: hematopoetic (3.4%), other conditions not specified (3.4%), collagen vascular diseases (1.7%), metabolic (1.7%), and neurologic/neurovascular problems (1.7%). Figure 2

and Table 1 show that the percentages of deaths for infection (25.9% vs.10.6%), and hemorrhage (20.7% vs. 13.6%) were significantly higher in 2009 than in the ten-year period of 1999-2008. Of 15 infection deaths in 2009, 13 (87%) were associated with flu-like symptoms including 6 (58%) H1N1 cases confirmed. Of 12 hemorrhage deaths, 7 (58.3%) were related to ectopic pregnancies. In 2009, there was a decrease in deaths for hypertensive disorders (10.3% vs. 16.6%), cardiomyopathy (8.6% vs. 10.9%), thrombotic embolism (5.2% vs. 10.6%), and amniotic fluid embolism (1.7% vs. 8.7%) when compared with 1999-2008, but none of these decreases were statistically significant.

**Figure 2: Distribution of Pregnancy-Related Causes of Deaths  
Florida  
1999-2008 (n=368), 2009 (n=58)**



\* p < 0.05

**Table 1: Distribution of Causes of Pregnancy-Related Death, Florida 1999-2008 and 2009**

Causes	1999-2008 N (%)	2009 N (%)
Hypertensive disorders	61 (16.6)	6 (10.3)
Hemorrhage	50 (13.6)	12 (20.7)*
Cardiomyopathy	40 (10.9)	5 (8.6)
Infection	39 (10.6)	15(25.9)*
Thrombotic embolism	37 (10.0)	3 (5.2)
Amniotic fluid embolism	34 (9.2)	1 (1.7)
Other Cardiovascular	30 (8.2)	7 (12.1)
Anesthesia	5 (1.4)	0 (0.0)
Others	55 (15.0)	7 (12.1)
Unknown	17 (4.6)	1 (1.7)
Total	368	58

\*p < 0.05

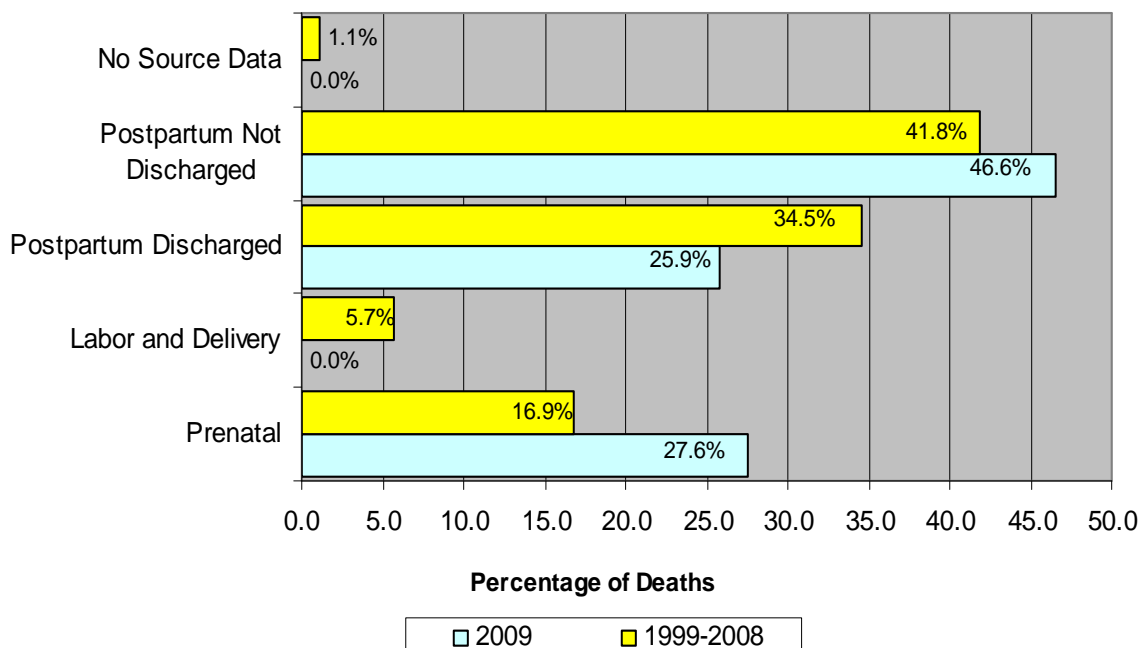
### **Timing of Death**

Figure 3 presents pregnancy-related deaths by timing of death: prenatal, labor and delivery, or postpartum. In 2009, 72.4% of the deaths occurred during the postpartum period (the period following birth up to one year). Forty-six percent of all deaths occurred postpartum prior to discharge from the delivery hospital and 26% occurred postpartum after hospital discharge. Figure 3 presents the data for the ten-year period of 1999-2008 compared with single year data from 2009.

Among women who were discharged from the hospital after delivery, the most common causes of death occurring during the first six weeks were other cardiovascular conditions (36.4%), infection (18.2%), and other causes (18.2%). For those women who were not discharged, the

most common causes of death were infection (34.6%), hemorrhage (19.2%), hypertensive disorders (15.4%), and other causes (11.5%). For 2009, the increase in deaths during the prenatal period is attributed to ectopic pregnancies and the increase in deaths among postpartum women not discharged is related to flu-like infections.

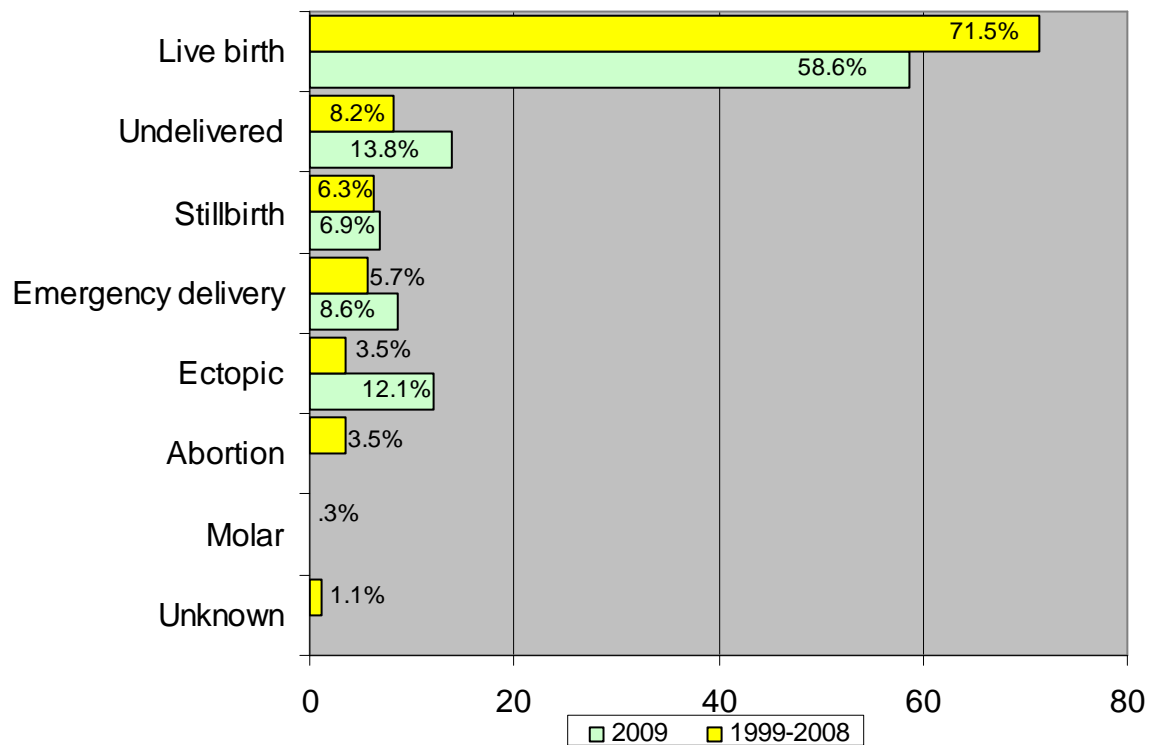
**Figure 3: Percent Pregnancy-Related Deaths by Timing of Death  
Florida 1999-2008 (n=368) and 2009 (n=58)**



**Pregnancy Outcome**

Figure 4 presents the pregnancy-related deaths by outcome of pregnancy. In 2009, 13.8% of deaths occurred before delivering the baby, 58.6% occurred after a live birth, 6.9% occurred after a stillbirth, 12.1% occurred after an ectopic pregnancy, and 8.6% were emergency Cesarean deliveries to save the live birth.

**Figure 4: Percent Pregnancy-Related Deaths by Pregnancy Outcome  
Florida 1999-2008 (n=368) and 2009 (n=58)**

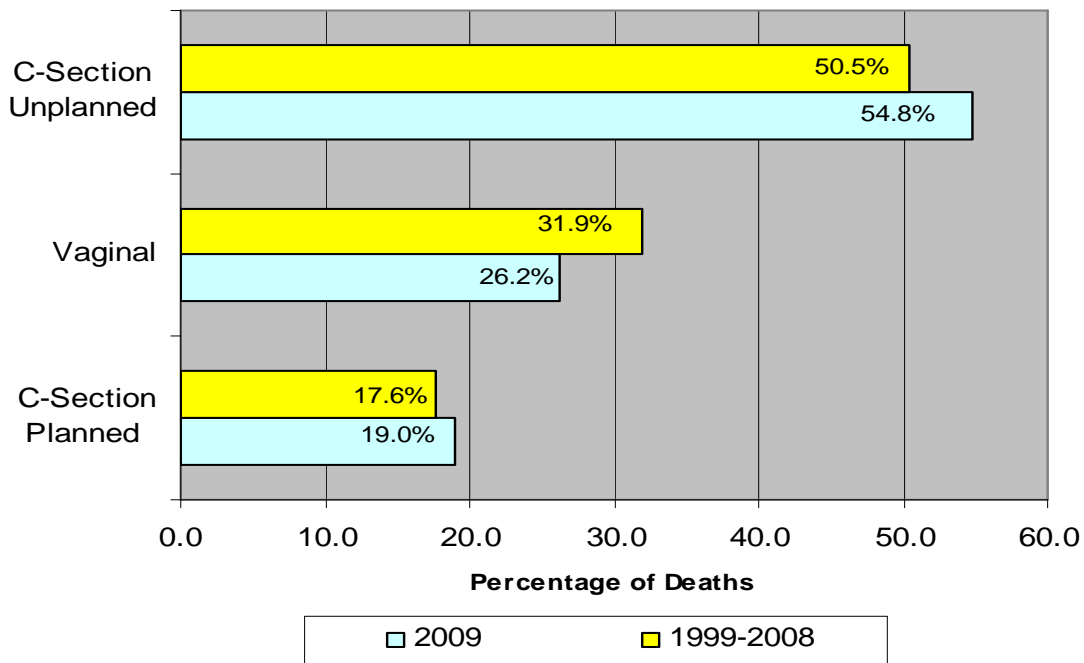


**Number of known surviving children = 99**

**Type of Delivery**

Figure 5 shows the percentage of women in 2009 who died by type of delivery. During 2009, the majority (73.8%) of these deliveries were cesarean (C-Section). Of the 31 women who died after cesarean delivery, 8 (25.8%) were planned and 23 (74.2%) were unplanned. In 2009, the percentage of women who died after a vaginal delivery decreased when compared with the 1999-2008 period (26.2% vs. 31.9%). This is likely due to the increasing rate of C-Sections among all births over this time period.

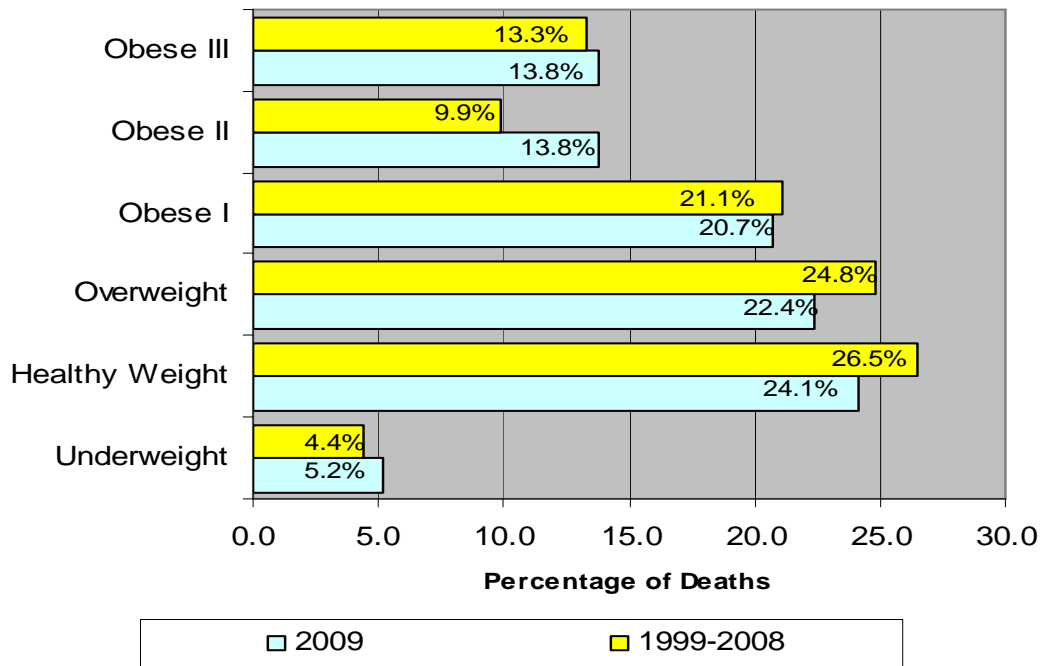
**Figure 5: Percent Pregnancy-Related Deaths by Type of Delivery**  
**Florida 1999-2008 (n=301), 2009 (n=42)**



**Weight**

In 2009, the majority (70.7%) of women experiencing a pregnancy-related death fell into the overweight and obese I, II, or III categories (Figure 6). Almost half (48.3%) were classified as obese. This compares to 20% of all women having a live birth who were classified as being obese in 2009. Figure 5 presents data for 2009 and the period of 1999-2008 for comparison. The percentage of deaths among obese women increased in 2009 compared to the 10 year period. Some of this increase is because of the overall increase in obesity among women having live births.

**Figure 6: Percent of Pregnancy-Related Deaths by BMI**  
**Florida 1999-2008 (n= 294) and 2009 (n= 58)**



**Pregnancy-Associated Cases Selected for Team Review**

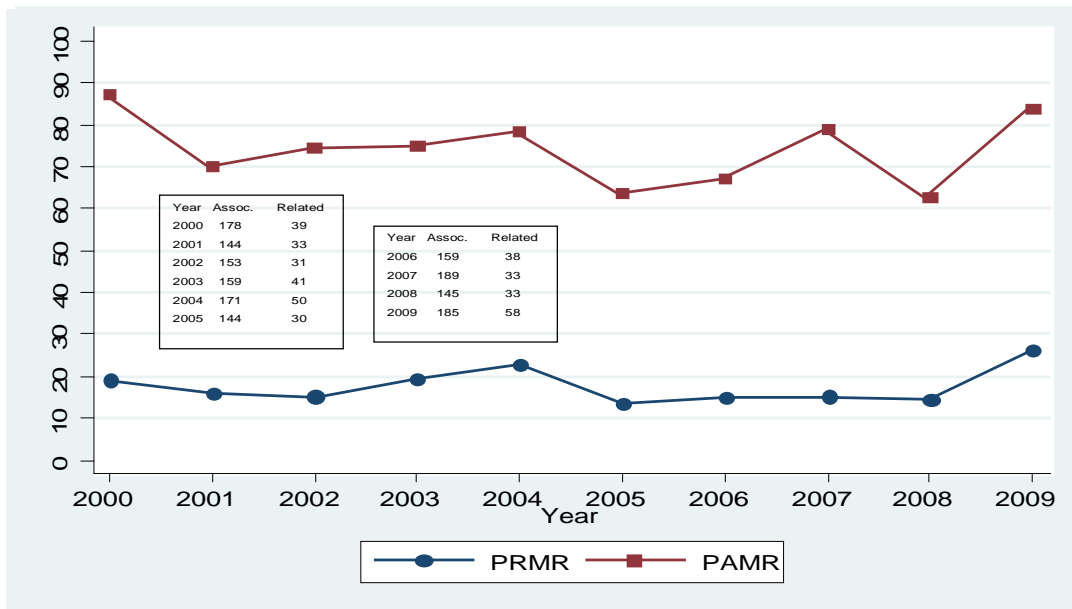
The PAMR process begins with collecting data for all reported deaths that are associated with pregnancy. The Florida Department of Health implemented database linkages to maximize the identification of pregnancy-associated deaths: a death to a woman during pregnancy or up to one year after the pregnancy ends, regardless of the cause of death. The list of pregnancy-associated deaths is collected through an enhanced surveillance system beyond what is routinely reported as a maternal death. A death is included in the list of pregnancy-associated deaths if any of the following four criteria are met:

1. The response on the death certificate is “yes” to the question, “If female, was she pregnant in the past year?”
2. The ICD-10 (cause of death diagnosis code) indicates a death classified as being due to “Pregnancy, Childbirth, and the Puerperium (Chapter XV O00-O09).”
3. There is a matching birth or fetal death record within 365 days prior to the woman’s death.
4. There is a matching Healthy Start Prenatal Screen (Florida’s universal prenatal screening tool used to identify and assess pregnant women at risk for adverse birth outcomes) within 365 days prior to the woman’s death.



Once identified, the death certificates of all pregnancy-associated deaths are reviewed by a multi-disciplinary team consisting of an obstetrician, nurse, and epidemiologist and categorized as pregnancy-related, possible pregnancy-related, and not pregnancy-related. Approximately 15 cases are chosen each quarter for record abstraction and team review. Preference is given to those deaths categorized as pregnancy-related, followed by a random selection of possibly pregnancy-related and not pregnancy-related until a total of 15 cases has been reached. Florida's pregnancy-associated mortality rates and pregnancy-related mortality rates are shown in Figure 7. Pregnancy-related deaths are a subset of pregnancy-associated deaths. Although there was an increase in pregnancy-associated mortality rate in 2009, the increase was not as striking as the increase in the pregnancy-related mortality ratio. Table 2 displays the characteristics of those deaths that were not chosen for review by the PAMR team.

**Figure 7: Pregnancy-Associated Mortality Ratio (PAMR) and Pregnancy-Related Mortality Ratio (PRMR). Florida 2000-2009**



**Table 2: 2009 PAMR Data on Non-Selected Cases  
(n=116)**

**Classification at Selection**

Pregnancy Related = 0  
Possibly Pregnancy Related = 11  
Not Related = 105

**PAMR Selection**

ICD – 10 = 43  
Prenatal Screen = 29  
Pregnancy √ Box = 79  
Birth/Fetal Death Certificate = 89

**Age**

< 16 = 0  
16 – 19 = 10  
20 – 24 = 24  
25 – 29 = 29  
30 – 34 = 27  
35 – 39 = 20  
> 39 = 6

**Race / Ethnicity**

White Non-Hispanic = 62  
Black Non-Hispanic = 23  
Hispanic = 20  
Other (specify) = Haitian (4), Asian (6),  
Spaniard (2), Am. Indian (1), Caribbean  
(1)

**Marital Status**

Married = 48  
Separated = 2  
Divorced = 10  
Widowed = 0  
Never Married = 55  
Unknown = 1

**Place of Birth**

Florida = 45  
Other US = 48  
Outside US = 22  
Unknown = 1

**Education Level**

8th or less = 5  
HS, no diploma = 20  
HS diploma or GED = 39  
College, no diploma = 22  
College with degree = 29  
Unknown = 1

**Leading Causes of Death:**

Accidental Drug Overdose = 24  
Motor Vehicle Accident = 19  
Homicide = 17  
Cancer = 17  
Suicide = 11  
AIDS = 6  
Cardiac Disease = 6 (*atherosclerosis, HTN, dysrhythmia, cardiomyopathy*)  
*most > 150 days out from pregnancy termination*  
Pulmonary Embolus = 3 > 124 days out  
Other miscellaneous = 19

**ME Referred = 86**

**Autopsy = 84**

## **Florida PAMR Issues and Recommendations for 58 Pregnancy-Related Deaths in 2009**

After reviewing pregnancy-related deaths, the PAMR committee identifies relevant issues related to the death and makes recommendations in an effort to prevent such future deaths. The following text summarizes the identified issues into four prevention categories: Clinical Factors, System Factors, Individual and Community Factors, and Death Review Factors. Recommendations are listed under the specific cause of death categories.

**CLINICAL FACTORS:** Relates to services provided by the entire health care system.

**Issues** – A lack of services evidenced by:

1. Incomplete assessment.
2. Inadequate documentation.
3. Lack of coordination and follow-up, particularly of high-risk women.
4. Deficient communication between staff and patients.
5. Lack of association between a change in mental status and deteriorating medical condition.
6. Prevention-Patient Education (Preconception/Pregnancy/Postpartum)

**SYSTEM FACTORS:** A lack of policies and procedures may lend itself to deficient quality of care, which potentially can affect a woman's health outcome.

**Issues**

1. Barriers to accessing care: lack of insurance, provider shortage, transportation.
2. Lack of standardized policies and procedures.

**INDIVIDUAL/COMMUNITY FACTORS:** It has been established that a woman's health prior to her pregnancy can greatly affect the birth outcome, as well as the woman's health status after birth. Some deaths may be associated with a woman's personal decision regarding her health and her care. It is important that healthcare providers enable women to make informed decisions.

## **Issues**

1. Women presenting in pregnancy with pre-existing medical conditions, such as hypertension, obesity, diabetes, and asthma.
2. Lack of documentation of patient education and counseling regarding a woman's risk factors.

**DEATH REVIEW FACTORS:** The PAMR process relies on information from death certificates and autopsy reports for the identification and evaluation of pregnancy-related deaths.

## **Issues**

1. Lack of autopsy on unexplained or inconclusive deaths.
2. Death certificates not always completed accurately.
3. Missing prenatal records in hospital charts.

## **2009 RECOMMENDATIONS:**

### **Cause of Death: Hemorrhage**

- It is important to be prepared for increasing potential for percreta / acreta in patients with previous cesarean deliveries.
- Be aware of appropriate use and timing for administration of pitocin after delivery.
- Be aware of and monitor for signs of impending hemorrhage and know the factors that increase a woman's risk for hemorrhage.
- Maintain high index of suspicion for women of reproductive age presenting with bleeding and pain.
- Providers who deliver care to women in prison should have protocols to routinely test women routinely for pregnancy and be aware of symptoms of ectopic pregnancy.
- Educate the community on signs and symptoms that may signify a potential complication in pregnancy and stress the importance of seeking prompt care.
- Recommend inclusion of potential complications in early pregnancy and warning signs on home pregnancy tests kits.
- It is important for all hospital facilities to have procedures in place for addressing medical emergencies in obstetric deliveries.

### **Cause of Death: Infection**

- Monitoring vital signs are extremely important and can be a first indicator of a serious problem.
- Promote the importance of influenza vaccination for pregnant/postpartum women.
- Maintain a high index of suspicion of H1N1 in pregnant and postpartum patients even those with subtle respiratory symptoms.
- Recommend performing PCR testing opposed to rapid Influenza testing (due to decreased sensitivity of rapid test).
- Provide prompt antiviral treatment for pregnant/postpartum women who present with flu-like symptoms.
- Important to follow up on influenza vaccination for pregnant women who have previously denied vaccination.
- Increase community awareness of need to access prompt care for influenza symptoms particularly if pregnant.
- Raise awareness on benefits of immunizations and influenza vaccinations particularly for pregnant/postpartum women with asthma.
- Increase provider awareness of low tolerability of respiratory conditions in pregnancy.
- Encourage coordination and collaboration of services for pregnant women with acute and chronic medical conditions.
- Consider performing electrolyte studies in patients with gastrointestinal conditions.
- Be alert to a patient's changing mental status due to hypoxia and the effects that hypoxia may have on an individual's ability to make medical decisions and/or sign informed consents.
- It is important to assess childcare support and resources, for single women with acute/chronic medical conditions.

### **Cause of Death: Thrombotic Embolism**

- It is important to consider options for thromboembolism prophylaxis.

### **Cause of Death: Hypertensive Disorders**

- Provider training is important to promote early recognition and treatment of hypertension and preeclampsia.
- Important to include shortness of breath as a potential warning sign on postpartum discharge instructions.

### **Cause of Death: Cardiomyopathy**

- Important to provide focused preconception counseling to patients with a family history of chronic conditions including cardiac problems, hypertension and asthma.
- Increase community awareness of pregnancy risks when a patient has chronic cardiac condition.

### **Cause of Death: Other Cardiovascular Problems**

- It is important to stress to patients the benefits of compliance with medical treatments.
- Be aware of contraindication of administering brethine in women with cardiac conditions.
- Provide a thorough cardiac assessment and/or obtain cardiac consult prior to discharge for women with known or suspected cardiac conditions.
- Patients presenting with unusual or atypical symptoms may require a collaborative assessment by providers.
- Perform thorough cardiac/lung assessments on initial prenatal visits.

### **Cause of Death: Other Conditions**

- All healthcare providers must remember the importance of reviewing vital signs.
- OB providers need to closely monitor pregnant women with chronic illness and provide referrals to specialist for unstable conditions.
- Increase provider understanding of the unique needs of a pregnant sickle cell patient.
- Evaluate the level of care required for women with chronic illness based on the individual and status of their condition.
- It is important for obstetric providers to evaluate liver function tests on pregnant women presenting with right upper quadrant pain.
- Be aware of contraceptive benefits/risks associated with chronic conditions.
- Include Healthy Start staff as part of healthcare team. (Care and services should be coordinated).

- Pregnant women with uncontrolled seizure disorder should be referred to a neurologist for evaluation and consultation for appropriate medication dosing.
- Providers should consider performing baseline electrolytes and 24 urine test in women with a history of anemia/bulimia.
- Healthy Start (HS) may need to find creative ways to engage women with multiple social issues to encourage HS participation.

### **Other Recommendations**

- Encourage Medical Examiners to perform autopsy on sudden unexplained deaths even if substance abuse is a factor.
- It is important for prenatal records to be sent to delivering hospital prior to the 36<sup>th</sup> week.
- Consider adding a special category for coding of pregnancy-related deaths due to respiratory infection.
- The entire medical chart should be made available for medical chart reviewers.
- Electronic records should include the nursing progress notes.
- It is important to document the cause of death (COD) completely and correctly on death certificates.

### **Summary**

In 2009, the pregnancy-related mortality ratio in Florida was 26.2. This was a significant increase from the 2008 pregnancy-related mortality ratio of 14.3 ( $p= 0.004$ ). The increase in pregnancy-related deaths in 2009 is largely attributed to the deaths due to ectopic pregnancy and influenza. A special analysis is currently underway to examine the increase in the number of deaths due to ectopic pregnancy. It is our hope that recommendations for improvements in providing care will result in a reduction or prevention of pregnancy-related deaths in the future.