



## **Florida's Pregnancy-Associated Mortality Review 2013 Update**

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## Summary

Florida's Pregnancy-Associated Mortality Review (PAMR) is an ongoing surveillance process that involves data collection and examination of maternal deaths to promote evidence-based actions for individual behavioral changes, health care system improvements, and prevention of pregnancy-related deaths (PRDs). [For additional details about the PAMR team and process, please refer to Appendix 2]

The 2013 data update report provides an overview and comparisons of PRD data and trends for Florida between the years 1999 and 2013. Distributions of PRDs are shown by race/ethnicity, age, BMI, timing of deaths, pregnancy outcome, type of delivery and cause of death, and, when applicable, pregnancy-related mortality ratios (PRMRs).

In 2013, the data linkage process identified 178 pregnancy-associated Florida resident deaths occurring to residents of Florida from January 1, 2013, to December 31, 2013. The PAMR case selection committee identified that 63 of these pregnancy-associated deaths that occurred in 2013 were most likely to be pregnancy-related. Upon full team review of the 63 death cases, the PAMR committee found 54 (85.7%) of these deaths to actually be pregnancy-related.

The pregnancy-related mortality ratio (PRMR) in Florida in 2013 was 25.1 per 100,000 live births. Although the 2013 PRMR ratio was the highest since 2009 (26.2 per 100,000 live births), the trend for the period 1999-2013 was not statistically significant.

For 2013:

- Of the 54 PRDs
  - 33.3% were non-Hispanic White women
  - 33.3% were non-Hispanic Black women
  - 27.8% were Hispanic women
  - 5.6% were non-Hispanic other Races women
- The leading pregnancy-related causes of death in 2013 were hemorrhage (16.1%) and hypertensive disorders (15.9%).
- Of the 54 PRDs, 68.5% occurred during the postpartum period.
  - 40.7% of postpartum PRDs occurred prior to hospital discharge
  - 27.8% of postpartum PRDs occurred after hospital discharge
- PRDs by outcome of pregnancy
  - 44.4% after a live birth delivery
  - 22.2% during or after an emergency delivery

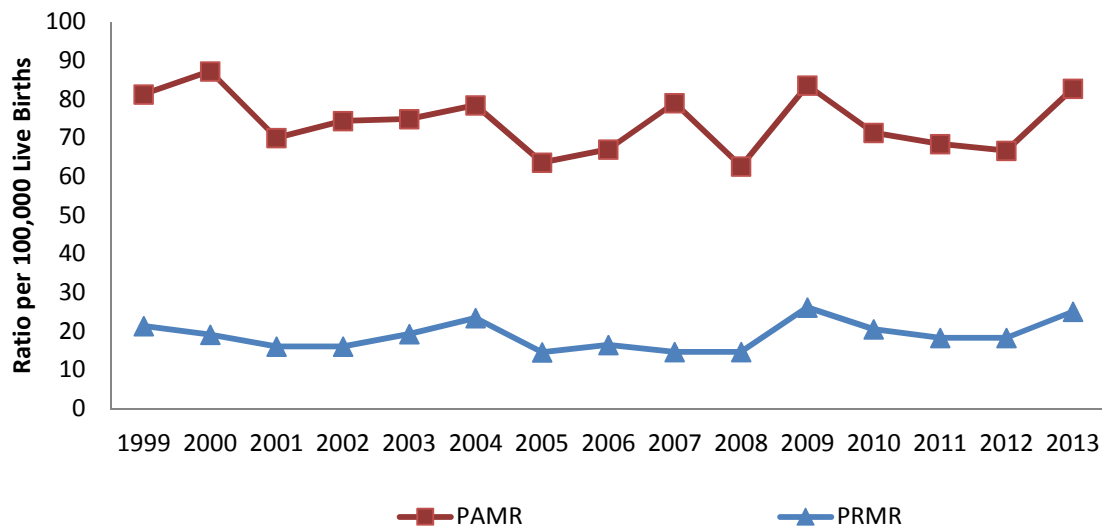
- 16.7% while still pregnant (undelivered)
  - 9.3% after an ectopic pregnancy
  - 3.7% after a miscarriage/abortion
  - 3.7% after a stillbirth
- In 2013, 38 PRDs occurred during or after delivery
  - (26) 70.0% had cesarean as a delivery method
    - 10.5% were planned cesarean deliveries
    - 57.9% were unplanned cesarean deliveries
- In 2013, (36) 66.7% of women whose deaths were pregnancy-related had overweight or obese body mass index classifications.

## Pregnancy-Related Mortality Findings — Florida, 2013

### Pregnancy-Associated and Related Deaths

A *pregnancy-associated death (PAD)* is a death of a woman from any cause, while she is pregnant or within one year of termination of pregnancy, regardless of the duration and site of pregnancy. A *pregnancy-related death (PRD)* is a death of a woman directly attributed to pregnancy and/or childbirth. PRDs are subsets of pregnancy-associated deaths [For PAMR processes see Appendix 2]. Florida’s pregnancy-associated mortality ratios (PAMR) and pregnancy-related mortality ratios (PRMR) are shown in Figure 1.

**Figure 1. Pregnancy-Associated Mortality Ratios and Pregnancy-Related Mortality Ratios, Florida 1999-2013**



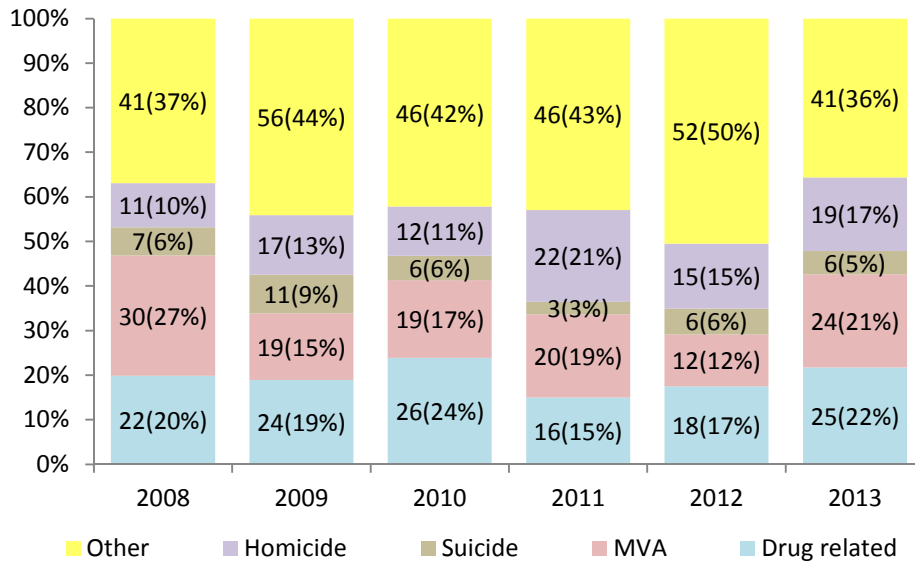
Year	# PAD	#PRD	%PRD	Year	# PAD	#PRD	%PRD
1999	160	42	26.3	2006	159	39	24.5
2000	178	39	21.9	2007	189	35	18.5
2001	144	33	22.9	2008	145	34	23.4
2002	153	33	21.6	2009	185	58	31.4
2003	159	41	25.8	2010	153	44	28.8
2004	171	51	29.8	2011	146	39	26.7
2005	144	33	22.9	2012	142	40	28.2
				2013	178	54	30.3

- The total number of PADs in Florida ranged from 142 to 189 per year between 1999 and 2013. The number of PADs in 2013 was 178.
- The proportion of PAD that are PRD ranged from 18.5% to 31.4% between 1999 and 2013. In 2013, 30.3% of PADs were determined to be PRDs by the Florida PAMR Committee.

### Not-Pregnancy-Related Deaths

The leading causes of maternal death in the not-pregnancy-related cases for 2008-2013 and documented in the death certificates is shown in Figure 2. These are maternal deaths that were identified through the data identification process described in Appendix 2. In 2013, deaths due to cancer and other miscellaneous causes represented 36% of not-pregnancy-related cases, while drug related, motor vehicle accidents (MVA), and homicide had percentages from 17% to 25%. Suicides represented 5% of the not-pregnancy-related deaths.

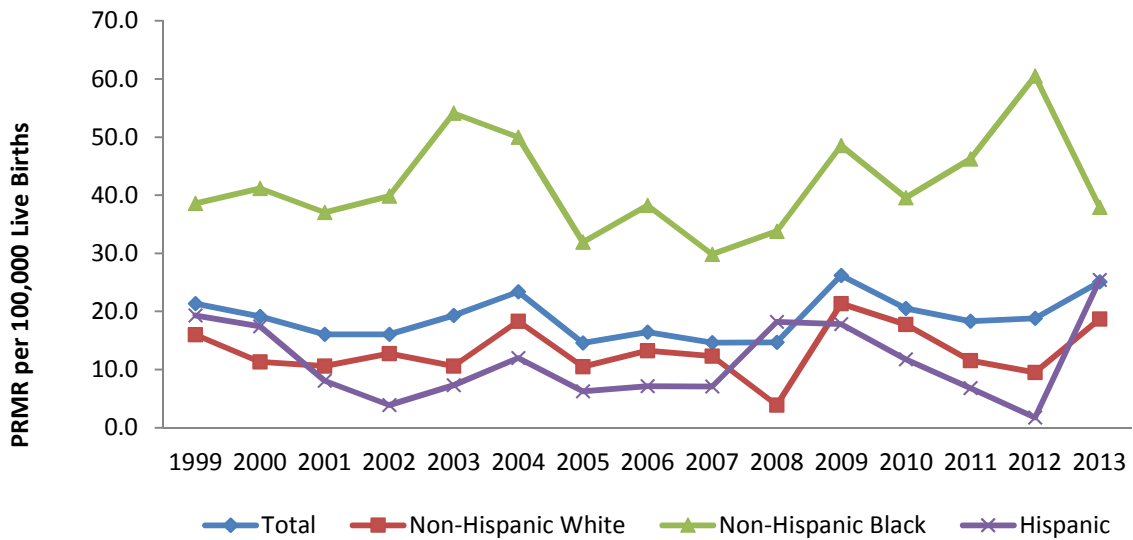
**Figure 2. Not-Pregnancy-Related Death Cases by Cause of Death Florida, 2008-2013**



### Pregnancy-Related Mortality Ratios (PRMR)

A measure of PRDs is the PRMR. The PRMR is the number of PRDs per 100,000 live births. In assessing mortality, it is customary to view mortality measures over an extended period of time to identify increasing or decreasing trends. Figure 3 displays PRMRs for Florida between 1999 and 2013 by race and Hispanic ethnicity.

**Figure 3. Pregnancy-Related Mortality Ratios (PRMRs) by Race/Ethnicity Florida, 1999-2013**



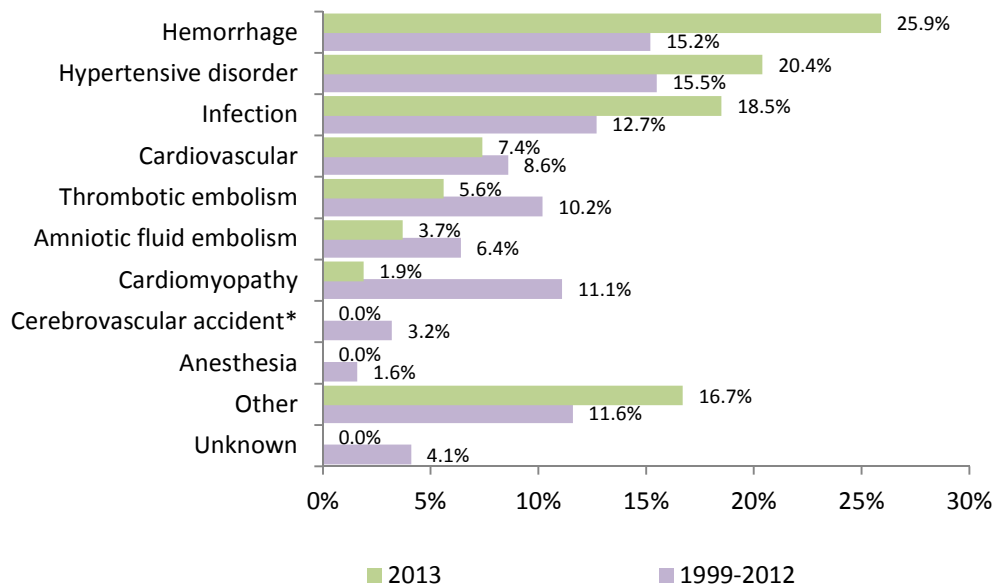
- During the period 1999-2013, the overall Florida PRMR fluctuated between 14.6 and 26.2. The Florida PRMR of 26.2 in 2009 was the highest value followed by Florida PRMR in 2013 with 25.1 maternal deaths per 100,000 live births.
- As evidenced in Figure 3, racial disparities are present and consistent with PRMR in Florida. Between 1999 and 2013, annual PRMRs among non-Hispanic Black women have been at least two times higher than the PRMRs for non-Hispanic White or Hispanic women. In 2013 the PRMR for non-Hispanic Black was 37.9 maternal deaths per 100,000 live births, 18.7 for non-Hispanic White, and the highest ever for Hispanic women with 25.4 maternal deaths per 100,000 live births.

## Cause of Pregnancy-Related Deaths

For each PRD case reviewed by the PAMR Committee, a primary cause of PRD is determined.

- In 2013, the leading causes of PRDs were hemorrhage 25.9%, hypertension 20.4%, and infection 18.5%.
- Figure 4 and Table 1 show how the percentage of deaths for hemorrhage, infection, other remaining causes, and hypertensive disorders were higher compared with the period 1999-2012. Also, Figure 4 and Table 1 show decreases in the percentage of deaths in 2013 due to cardiomyopathy, thrombotic embolism, and amniotic fluid embolism compared with 1999-2013. In 2013, there were no deaths caused by cerebrovascular accident or anesthesia.

**Figure 4 Distribution of Pregnancy-Related Causes of Death  
Florida, 1999-2012 (n=561) and 2013 (n=54)**



\*Cerebrovascular accident no known hypertensive disorders.

**Table 1. Distribution of Causes of Pregnancy-Related Death  
Florida, 1999-2012 and 2013**

<b>Causes of Deaths</b>	<b>1999-2012 N (%)</b>	<b>2013 N (%)</b>	<b>Change in Percentage</b>
Hemorrhage	85 (15.2)	14 (25.9)	70.4
Hypertensive disorders	87 (15.5)	11 (20.4)	31.6
Infection	71 (12.7)	10 (18.5)	45.7
Cardiovascular	48 (8.6)	4 (7.4)	-14.0
Thrombotic Embolism	57 (10.2)	3 (5.6)	-45.1
Amniotic Fluid Embolism	36 (6.4)	2 (3.7)	-42.2
Cardiomyopathy	62 (11.1)	1 (1.9)	-82.9
Cerebrovascular accident	18 (3.2)	0 (0.0)	-
Anesthesia	9 (1.6)	0 (0.0)	-
Other remaining causes*	65 (11.6)	9 (16.7)	44.0
<b>Total</b>	<b>561</b>	<b>54</b>	

\*Other remaining causes include: hematopoietic, collagen vascular diseases, metabolic (pregnancy related or non-other pregnancy related), injury, cancer, pulmonary problems, neurologic/neurovascular problems, multiple organ/system failure, gastrointestinal disorders, and other conditions.

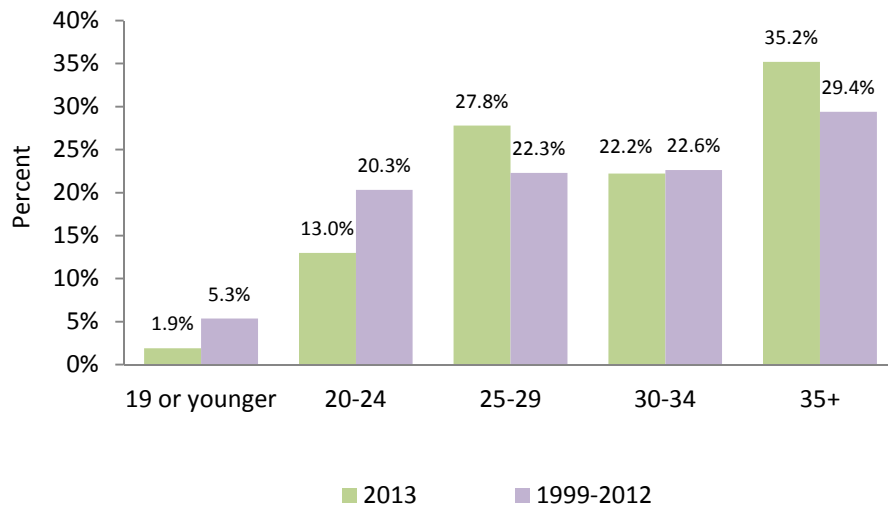
### **Pregnancy-Related Deaths by Age**

Examination of age at death can point toward the presence and types of PRD protective or risk factors among age groups, such as biological effects of the aging process. PRD distribution and PRMRs by age group are shown in Figures 5a and 5b.

- In 2013, the highest percentage of maternal deaths 35.2% occurred in women 35 years old or more. In contrast, fewer young mothers (less than 25 years old) died in 2013 compared with 1999-2012 (14.9% vs. 25.6% respectively). (Figure 5a)



**Figure 5a. Distribution of Pregnancy-Related Deaths by Age, Florida, 1999-2012 (n=561) and 2013 (n=54)**



- In 2013 the PRMR of women 35 years or more (56.3) was almost 4 times the PRMR of women less than 25 years (15.8). (Figure 5b)

**Figure 5b. Pregnancy-Related Mortality Ratios (PRMRs) by Age Florida, 1999-2013 and 2013**

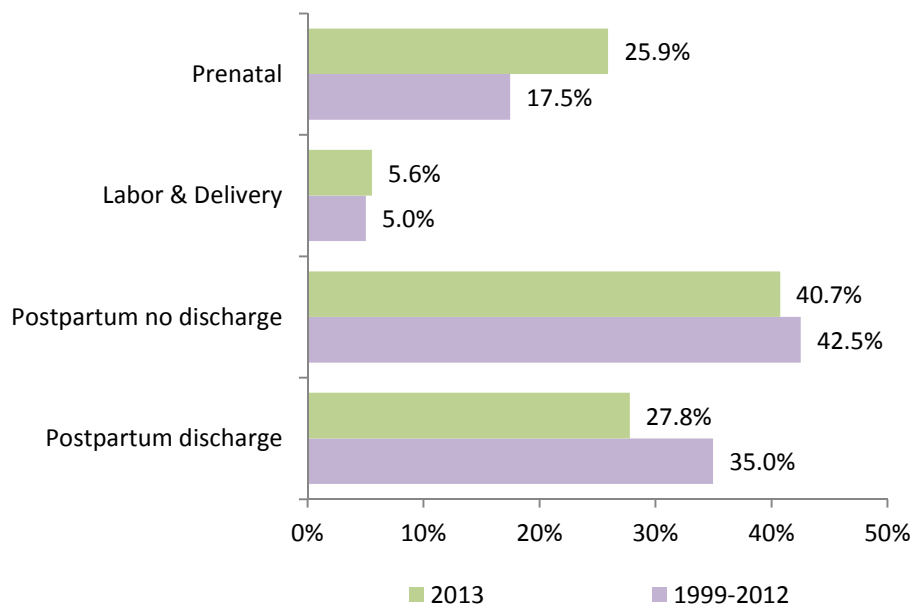


### Pregnancy-Related Deaths by Timing of Death

The PAMR process classifies timing of death for PRDs into categories defined by the three perinatal periods in which PRDs can occur: prenatal, labor and delivery, and postpartum. The postpartum period is divided into two subcategories: Postpartum not discharge from the hospital and postpartum discharge form hospital. [See Appendix 1 for detailed definitions]

PRDs by timing of death between 1999-2012 and 2013 are shown in Figure 6.

**Figure 6. Distribution of Pregnancy-Related Deaths by Timing of Death Florida, 1999-2012 (n=561) and 2013 (n=54)**



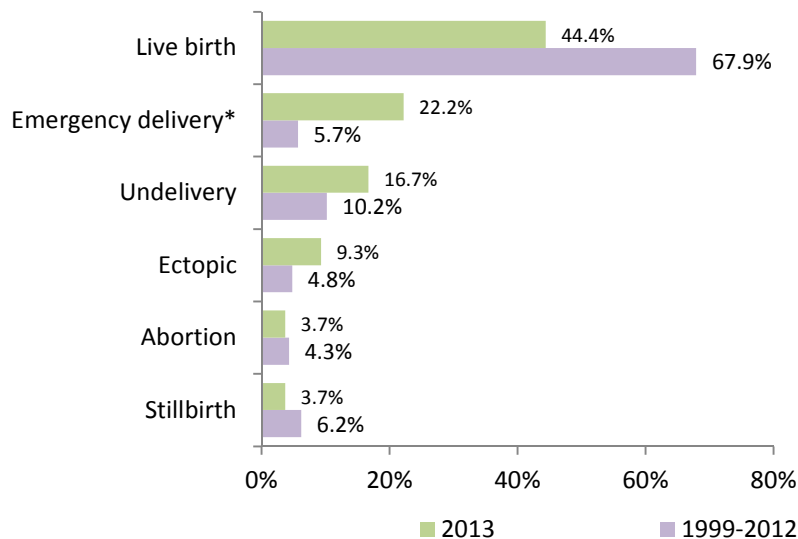
- In 2013, a majority of PRDs (68.5%) occurred during the postpartum period. There are differences between the causes of death in the postpartum period by hospital discharge status.
  - Of the postpartum PRD cases who were not discharged from the hospital, the PRD causes were: hypertensive disorders, hemorrhage, infection, cardiovascular problems, other remaining causes, and amniotic fluid embolism.
  - Of the women who died after hospital discharge, more than half died during the first six-week postpartum. The PRDs that occurred during the first six weeks postpartum were due to hypertensive disorders, infection,

thrombotic embolism, and other remaining causes. Of women who died after six-weeks postpartum and were discharged from the hospital, the causes of deaths were thrombotic embolism and cardiomyopathy.

### Pregnancy-Related Deaths by Pregnancy Outcome

In the PAMR process, pregnancy outcomes are classified as live birth, emergency delivery, undelivered, ectopic, abortion, and still birth. [See Appendix 1 for detailed pregnancy outcome definitions.] Figure 7 shows PRDs by outcome of pregnancy.

**Figure 7. Distribution of Pregnancy-Related Deaths by Pregnancy Outcome Florida, 1999-2012 (n=561) and 2013 (n=54)**



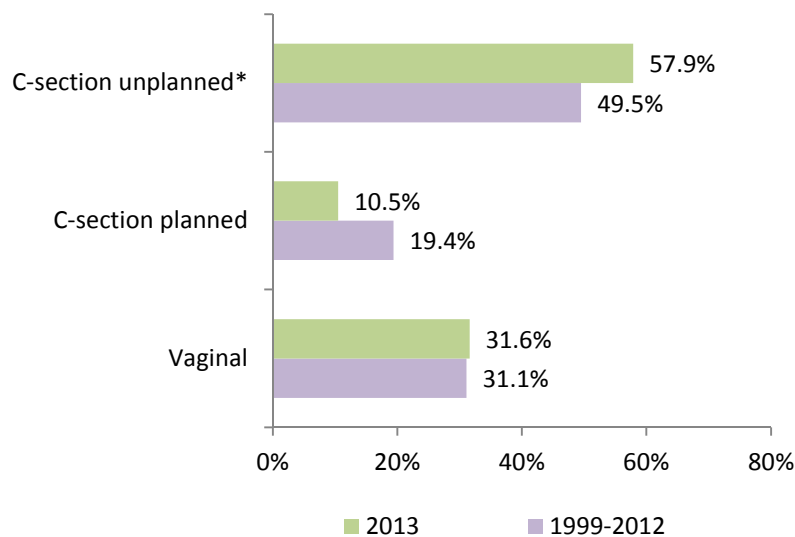
\*There were 12 emergency deliveries of which 10 were live births and 2 stillbirths.

- In 2013, the majority 44.4% of PRDs occurred after a live birth, and 22.2% were emergency Cesarean-section deliveries performed to save the mother and the infant.
- In 2013, there were 124 surviving children of mothers who died of PRDs.

## Pregnancy-Related Deaths by Type of Delivery

Type of delivery is classified by PAMR as vaginal or cesarean section (C-section). C-section deliveries are further defined as planned and unplanned. [See Appendix 1 for type of delivery definitions.] Figure 8 illustrates the PRD distribution by type of delivery for the women who died during the labor/delivery or postpartum period.

**Figure 8. Distribution of Pregnancy-Related Deaths by Delivery Type Florida, 1999-2012 (n=462), 2013 (n=40)**



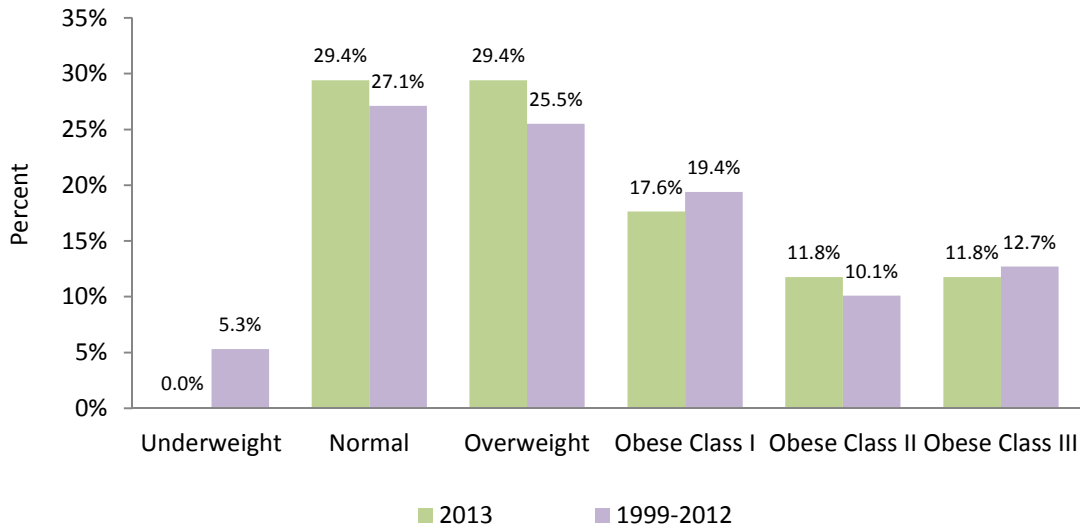
\*Of 22 (57.9%) unplanned C-sections 12 (55.0%) were emergency deliveries.

- In 2013, 68% of PRD cases that occurred during the labor/delivery or postpartum period were by C-section. In comparison, 37.7% of all live births in Florida were C-section deliveries in 2013 (not shown in figures) [1].
- Nearly 60% of the C-sections among the PRD cases that occurred in 2013 were unplanned C-section deliveries.

## Pregnancy-Related Death by Pre-Pregnancy Body Mass Index

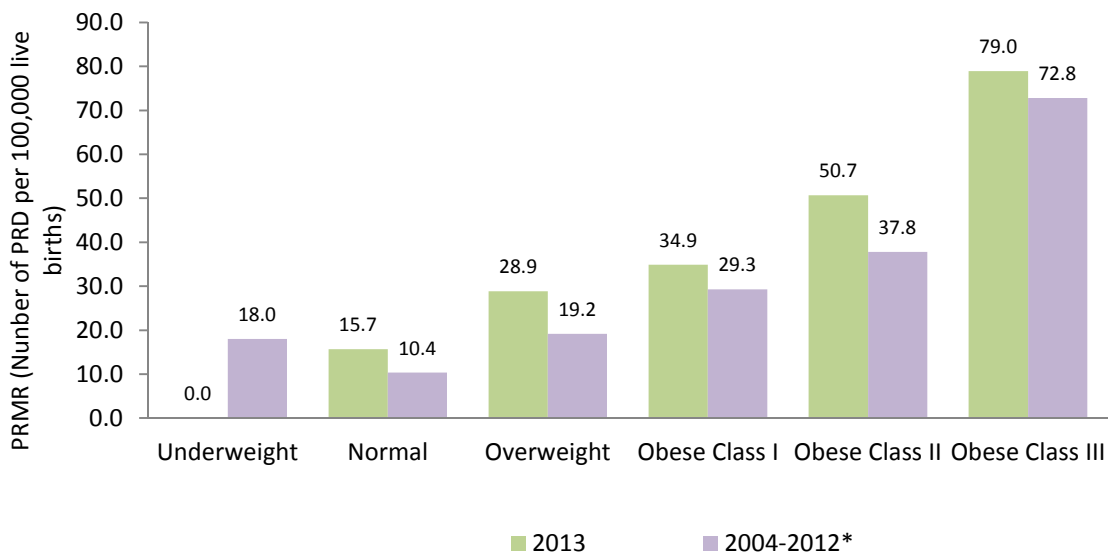
Body Mass Index (BMI) is a calculated measure of the relative percentage of body fat based on height and weight. PAMR uses the following BMI categories to examine associations between weight before pregnancy and PRD: underweight, normal weight, overweight, obese (Class I, Class II, and Class III). [See Appendix 1 for detailed definitions of BMI calculation and BMI categories.] Distributions of PRDs and PRMRs by BMI category are shown in Figures 9a & 9b, respectively.

**Figure 9a. Distribution of Pregnancy-Related Deaths by Pre-Pregnancy BMI Florida, 1999-2012 (n=561) and 2013 (n=54)**



- In 2013, 70.6% of women who experienced a PRD were in the overweight/obese pre-pregnancy BMI (Figure 9a). Comparably during the same year, a lesser percentage of all Florida women who had a live birth had an overweight/obese pre-pregnancy BMI of 48.0% (not shown in figures) [1].

**Figure 9b. Pregnancy-Related Mortality Ratios (PRMRs) by Pre-Pregnancy BMI Florida, 2004-2012 (n=373) and 2013(n=54)**



\*Includes 2004-2012 data when pre-pregnancy weight and height was added to the birth certificate.

- As shown in Figure 9b, PRD cases with higher pre-pregnancy BMIs had higher PRMRs. In 2013, the PRMR was 15.7 maternal deaths per 100,000 live births with normal weight pre-pregnancy BMIs versus 28.9 with overweight and 34.9, 50.7, and 79.0 obese Class I, Class II, and Class III pre-pregnancy BMIs, respectively.

### **PAMR Identified Issues and Recommendations for PRDs, 2013**

After reviewing PRD cases, the PAMR Committee identifies relevant issues related to the death and makes recommendations to promote system improvements. The PAMR Committee identified issues and recommendations are placed into four prevention categories: Clinical Factors, System Factors, Individual and Community Factors, and Death Review Factors. The following narrative outlines how the issues and recommendations were made by the PAMR Committee in 2014 by the four prevention categories. A consistent message that has been established is 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.

#### **Clinical Factors (Health Care Services, Practice, Protocols, and Care Coordination)**

Clinical factors relate to services provided by the entire health care system and include actions involving diagnosis, treatment, and communication.

#### Issues

Contributing factors mentioned in review of 2013 maternal deaths were:

- Knowledge/Skills/Assessment: 16%
- Delay of Diagnosis: 10%
- Delay of Treatment: 23%
- Lack of Diagnosis: 16%
- Lack of Treatment: 16%
- Communication/Documentation: 3%
- Care Coordination-Referrals, Transfers, Follow-up: 10%
- Prevention-Patient Education Preconception/Pregnancy/Postpartum: 6%

### Clinical Recommendations

- Postpartum follow up visits should be scheduled one week after delivery for women with chronic conditions.
- Providers should elevate patient counseling to include indigenous outreach to support management of a behaviorally challenging patient.
- Providers should stress the importance of awareness of changes in vital signs over time to indicate increasing progression of illness and guide response.
- Providers and clients should be educated to identify risk associated with genetic conditions.

### **System Factors (Health Care Management, Reimbursement and Access)**

System factors relate to system level processes involving policies, barriers to access insurance, nursing knowledge, or infrastructure.

### Issues

Contributing factors mentioned in review of 2013 maternal deaths were:

- Lack of Standardized Policies and Procedures: 28%
- Barriers to Accessing Care Insurance, Provider Shortage, Transportation: 17%
- Lack of Care Coordination: 56%

### System Recommendations

- Health care systems should involve all services to assist pregnant women to coordinate care.
- Health care systems should promote medical home for women with severe co-morbidities not just for pregnancy.
- Protocol should be established for the treatment of postpartum fever when presenting to the emergency department (ED). Streamline all prenatal or postpartum (PP) patients thru the ED and every PP patient should have an obstetric consult with exam. ED message: Any patient who is pregnant or postpartum should have obstetric consult.
- Health care systems should assess risk for all patients before starting C-section.

- Health care systems need aggressive management of sickle cell crisis in pregnancy. Patient should remain hospitalized for supportive treatment from a multidisciplinary team for sickle cell crisis during pregnancy.
- Women with severe co-morbidities need preconception or interconception care to manage disease.

### **Individual and Community Factors**

Relates to non-medical issues that have an underlying causal role in the death, such as reasons which hindered a woman or her family from recognizing a health problem or a personal decision about seeking care or following a health recommendation.

#### Issues

Contributing factors mentioned in 2013 review of maternal deaths were:

- Significant Co-Morbidity: 48%
- Lack of Patient Knowledge: 6%
- Personal Decisions (Example: Delayed Seeking Care): 35%
- Substance Abuse/Use: 6%
- Lack of Social Support: 2%
- Financial Barriers: 2%

#### Individual/Community Recommendations

- It is important to educate women about seeking care during pregnancy or postpartum for signs and symptoms of illness including fever, severe abdominal pain, headache, and respiratory symptoms such as shortness of breath.
- It is necessary to elevate health literacy in women with chronic illness for possible safe use of medications under medical supervision.
- All women of reproductive age should have preconception health education and care to address the importance of optimal weight and control of chronic diseases.
- Women should receive health education regarding personal decision to have repeat pregnancies after multiple C-sections.
- Patients with severe co-morbidities need interconceptional counseling, which includes reproductive life planning.
- Family members need to be aware of signs of aneurysms.



### **Death Review Factors.**

The PAMR process relies on information from death certificates and autopsy reports for the identification and evaluation of PRDs.

#### Issue

1. Death certificate accuracy
2. PAMR abstraction process
3. Lack of autopsy for sudden, unexplained, or inconclusive cause of death

#### Death Review Recommendations

- Medical Examiner should notify the cause of maternal death that occurred outside the hospital.
- Electronic records may contribute to segmented care due to difficulty in reading records.
- All maternal deaths should have an autopsy at the hospital.
- Abstractors need to note if an intrauterine pressure catheter (IUPC) was placed, or in the process of being placed, when the cause of death is noted as amniotic fluid embolism.

### **Committee Recommendations Related to the Leading Causes of Death**

Also outlined are PAMR Committee-identified recommendations related to three leading causes of PRD for the year 2013: hemorrhage, hypertension, and infection.

### **Hemorrhage**

#### Clinical Recommendations

- Providers should use the obstetrical hemorrhage initiative (OHI) protocol.

#### System Recommendations

- Hospitals should ensure policy/protocol in place when no gestational sac is seen on ultrasound in confirmed pregnancy. Follow up and referral needed to rule out ectopic pregnancy.
- Facilities should institute system level obstetric hemorrhage protocols.

### Individual/Community Recommendations

- Women should be advised of the increase risk of hemorrhage with repeat cesarean.
- Pregnant women with abdominal pain should seek care.
- Public service announcement stating that pregnant woman should seek medical care if she is experiencing abdominal pain.

### Death Review Recommendations

- Abstractors need to record all the events of a hemorrhage in order to see if the obstetrical hemorrhage initiative (OHI) protocol is used and document whether hospitals have massive transfusion protocol.

## **Hypertensive Disorders**

### Clinical Recommendations

- Providers should consider giving a pregnant woman low dose aspirin during pregnancy for prophylactic use when at risk for preeclampsia and the benefits of aspirin outweigh the risks.
- Emergency department physician and others should be educated about the warning signs of preeclampsia.
- Hospitals should have protocols on how to manage the postpartum patients with elevated blood pressure.
- Providers should consider antihypertensive medication before discharge for a woman with a history of elevated blood pressure.
- Providers need to complete follow-up on all lab orders to assist with diagnosis of preeclampsia.
- Providers need to treat hypertension within 30 minutes of patient arrival.

### Individual/Community Recommendations

- Pregnant women should have a prescription for a blood pressure monitor and receive specific instructions about how to use and when to contact their health care provider.

## **Infection**

### Clinical Recommendations

- Providers should be aware of the increased risk of serious morbidity and mortality for pregnant women with influenza.
- Providers should receive education to emphasize follow-up education and counseling when pregnant women refuse flu vaccine.
- Providers should document whether flu vaccine was given or not given and the reason if not given.
- Providers should give Tamiflu immediately as supportive treatment to pregnant women with respiratory influenza symptoms and not rely on flu swab results.
- Providers should stabilize patient with upper respiratory infection prior to delivery.

### System Recommendations

- Facilities should have standard protocols to treat influenza-like illness in pregnant women.
- Facilities should have standard protocol on admission to stabilize patient with positive sepsis screen.

### Individual/Community Recommendations

- Every pregnant woman and family members should have a flu shot. It is important to institute coverage for flu immunization in Medicaid.

### Death Review Recommendations

- Medical examiners should add infectious agents to death certificates (MRSA, influenza, etc.).

## Assessing Preventability of Maternal Deaths in Florida in 2013

In 2014, the Florida PAMR Committee initiated the assessment of preventability of PRDs. After a series of discussions with the PAMR preventability work group and mirroring the California PAMR process, [2] two new columns were included in the PAMR review form.

First, the PAMR Committee reached consensus on whether the death appeared to have been preventable and to what degree the death was preventable with the following question: *If specific actions had been implemented, to what degree would these actions have changed the woman's trajectory and led to her survival?* There were three possible answers to this question:

- **Strong:** A case with a strong chance for an altered outcome would likely have factor(s) identified that definitely contributed to the death (e.g., misdiagnosis, wrong drug, or particular patient action) so that if the correct diagnosis had been made (or correct drug given or patient action had been different), the fatal course would have been reversed. For a strong chance to alter outcome, there are often obvious deficiencies for which there are clear alternative action(s) that can be identified retrospectively. The alternative actions would likely target precipitating conditions or actions that either set in motion a cascade of unsuccessful 'catch-up' or 'salvage' actions, or were critical tipping points after which little could have been done.
- **Possible:** A case with some chance for an altered outcome would have fewer or weaker contributing factors and fewer or less specific quality improvement areas identified. These cases may parallel cases of women with similar conditions who survived; in that there may be a multitude of factors and actions that *could* have been reversed. However in these cases, it would have required actions that were beyond what could feasibly be accomplished in that setting or required an uncommon synchronization of corrective actions to have occurred. So while there is usually *something* that could have been done to have improved care and possibly reversed the fatal trajectory, the specific actions and their impact is less clear.
- **None:** A case with no chance to alter outcome has no clear point of prevention or intervention identified. In such cases, no intervenable risks were presented and there were no instances where improved care or alternative actions might have changed the outcome.

Second, for each PAMR case, the PAMR Committee would identify whether health care providers, facility, or patient/community factors contributed to the death with the following question: *Do the factors identified in the improvement categories contribute to the maternal death?* This question has two choices to select (If the factor does not contribute to the death, the question should be left blank).

- Definitely: In the reviewer’s best judgment, the factor was present and definitely contributed to the cause of death.
- Probably: In the reviewer’s best judgment, the factor was present and probably contributed to the cause of death.

These assessments of preventability are based on PAMR Committee review and represent the first year of collecting these factors. The Florida PAMR Committee review members hope this information will help to focus the PAMR team recommendations.

## Results

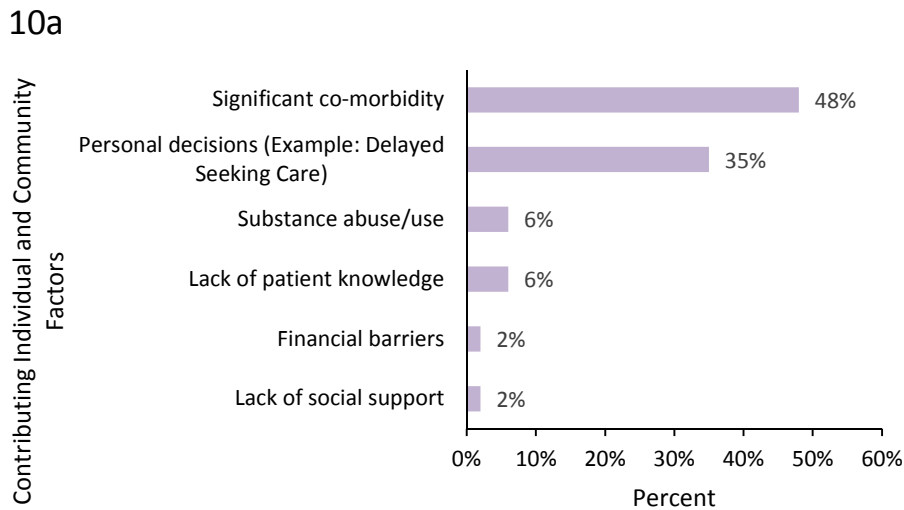
Overall, in 2013, 37% of PRDs had a strong chance to alter the outcome and prevent the maternal death, and nearly 75% had a least a possible chance to alter the outcome. The leading causes of death showed variation (Table 2). Intrauterine hemorrhage and infection both had 50% strong chance to alter the outcome, while hypertensive disorders and thrombotic embolism had 36% and 33%, respectively.

**Table 2. Pregnancy-Related Death and Preventability, Florida 2013 (n=54)**

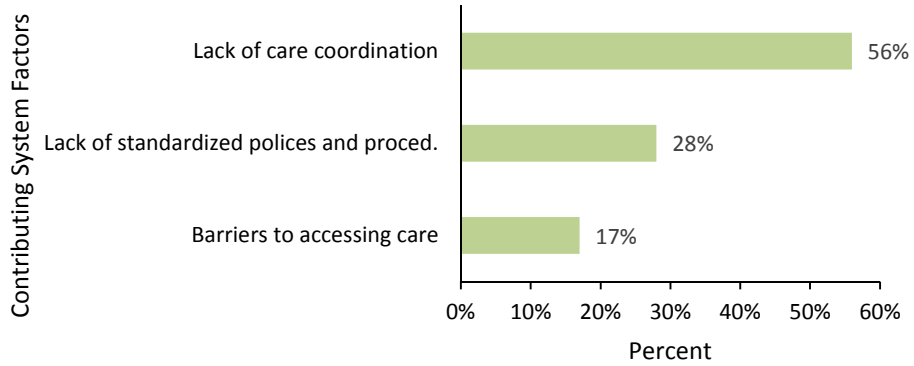
	Chance to alter outcome				Total	% Strong Chance to alter outcome
	Strong	Possible	None	N/I		
Hemorrhage	6	3	0	5	14	42.9%
<i>Intrauterine</i>	4	1	0	3	8	50.0%
<i>Ectopic</i>	2	2	0	2	6	33.3%
Hypertensive disorder	4	3	1	3	11	36.4%
Infection	5	3	0	2	10	50.0%
Cardiovascular	1	2	0	1	4	25.0%
Thrombotic embolism	1	2	0	0	3	33.3%
Amniotic fluid embolism	0	1	0	1	2	0.0%
Cardiomyopathy	0	1	0	0	1	0.0%
Other	3	5	0	1	9	33.3%
Total	20	20	1	13	54	37.0%

For 2013 PRDs, the Florida PAMR Committee identified definite and possible factors that could contribute to the cause of deaths. These factors were identified by Individual/Community Factors, System Facility Factors, and Clinical Factors. Each patient may have had multiple contributing factors. By individual and community factors the most definitely contributed factors were significant co-morbidities, personal decisions, lack of patient knowledge, substance abuse, delayed seeking care, lack of social support and financial barriers. Systems issues were related to lack of care coordination, lack of standardized policies/procedures, and barriers to accessing care insurance/provider shortage/transportation. Clinical factors issues were delay of treatment, lack of treatment, lack of diagnosis, knowledge/skill assessment, delay of diagnosis, care coordination-referrals, prevention-patient education, and communication/documentation (Figures 10a, 10b and 10c).

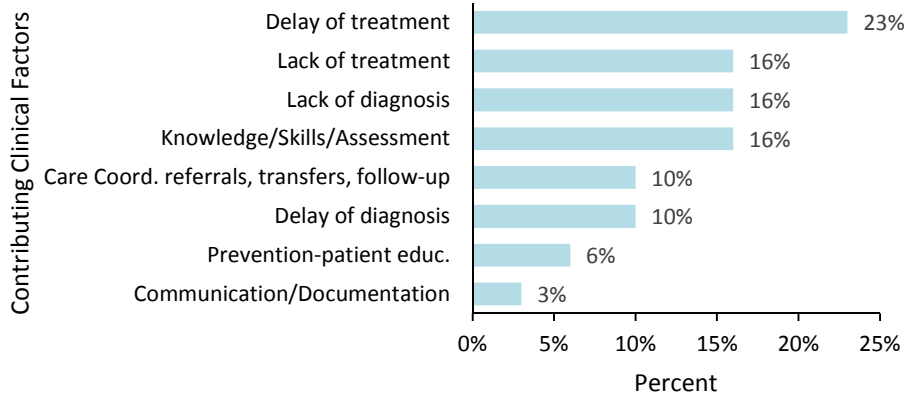
**Figures 10a, 10b, and 10c. Contributed Factors among Pregnancy-Related Deaths, Individual and Community Factors (10a), System Factors (10b) and Clinical Factors (10c), Florida, 2013**



10.b



10.c



By cause of death, intrauterine hemorrhage had the higher percent of factor contributors (75%), followed by women who died from infection (60%), and women whose cause of dead was cardiovascular problems (50%) (Table 3).

**Table 3. Pregnancy-Related Death by Definitely Factor Contributed and Cause of Death, Florida 2013 (n=54)**

	Factors that Contributed			Total	% Definitely Factor Contributed
	Definitely	Possible	N/I		
Hemorrhage	8	3	3	14	57.1%
<i>Intrauterine</i>	6	0	2	8	75.0%
<i>Ectopic</i>	2	3	1	6	33.3%
Hypertensive disorder	2	5	4	11	18.2%
Infection	6	2	2	10	60.0%
Cardiovascular	2	1	1	4	50.0%
Thrombotic embolism	1	1	1	3	33.3%
Amniotic fluid embolism	0	1	1	2	0.0%
Cardiomyopathy	1	0	0	1	100.0%
Other	6	2	1	9	66.7%
Total	26	15	13	54	48.1%

### Conclusion

The death of a woman due to pregnancy is a loss to a family, community, state, and nation. Florida has been actively conducting ongoing surveillance of maternal mortality cases since 1996. To date, over 2,300 pregnancy-associated cases have been reviewed by a multidisciplinary PAMR team of maternal child specialists. Each de-identified case is carefully and respectfully considered by the team before issues are identified and recommendations are made.

The 2013 report shows the consistent disparity in pregnancy-related deaths between non-Hispanic Black and non-Hispanic White women. Non-Hispanic Black women were two times as likely to have a pregnancy-related death compared to non-Hispanic White women.

The Healthy People goal for 2020 is to reduce the rate of maternal mortality to 11.4 maternal deaths per 100,000 live births [3]. Florida's pregnancy-related ratio from 1999-2013 averaged 18.9 deaths per 100,000 live births, therefore much work is still needed to meet the Healthy People goal.



## **Recommendations to Action**

Florida's PAMR findings and recommendations are proposed to improve risk factors among individuals, communities, clinical and health care systems not only to reduce maternal deaths but to consequently improve maternal morbidity. The department collaborates with diverse public and private organizations to pursue multifaceted approaches to moving recommendations into tangible actions.

### *Individual/Community, Clinical and System*

Beginning in 2011, the department, in partnership with the Florida Perinatal Quality Collaborative (FPQC), and the March of Dimes established a perinatal health care quality initiative to reduce non-medically indicated deliveries <39 weeks gestation (NMID).

In July 2012 through December 2013, the department, the FPQC, and the March of Dimes joined with the national Collaborative Improvement and Innovation Network (CoIIN), sponsored by the Health Resources and Services Administration (HRSA), to focus on reducing early elective deliveries (EED). Primary activities included the development of a hospital toolkit to assist hospitals in reducing their NMID rates, grand hospital rounds and consultations, provider education and data support to 55 participating Florida hospitals.

During 2012, the department, the FPQC, and the March of Dimes coordinated with the Florida Association of Healthy Start Coalitions to lead an effort in educating pregnant women in the community on NMID by offering provider education packets and e-bulletins. Data provided by the FPQC indicates Florida's NMID rate decreased by 15% between 2010 and 2013.

### *Clinical and System*

In fiscal year 2014/15, the department contracted with the FPQC to implement the Obstetric Hemorrhage Initiative (OHI) addressing the leading cause of maternal death by providing an evidence-based toolkit to hospital participants and support for implementation of evidence-based guidelines. A highlighted activity in the hospital toolkit is interdisciplinary simulation drills designed to improve response times and treatment approaches in an obstetric hemorrhage event. Participating hospitals seek to improve

their risk assessment rates, as well as diagnosis and treatment approaches. The OHI is ongoing and the FPQC will continue to offer technical support and self-assessment tools to hospitals pursuing this quality improvement initiative.

*Individual/Community, Clinical and System*

The department is currently contracting with the FPQC to implement a Hypertension in Pregnancy (HIP) initiative. The HIP initiative is a quality improvement effort to address one of the leading causes of maternal mortality and morbidity in the state. A primary focus is the development of a toolkit to guide hospital participants in implementation and evaluation of quality improvement processes related to prevention, diagnosis and treatment of hypertensive disorders in pregnancy.

*Individual/Community*

A reoccurring recommendation from Florida's PAMR committee is the importance of women achieving optimal health and control of chronic diseases prior to pregnancy. Florida's Healthy Start Program, administered by the department statewide, provides support services for pregnant women, infants and children to age three. In 2014, the department added interconception care services (ICC) as a core component to the Healthy Start program. ICC services are provided to women who have had a pregnancy and are at high risk of having a poor birth outcome for a subsequent pregnancy. Reasons for a high-risk determination could be a previous fetal or infant loss; a low birth weight or pre-term baby; a chronic disease; such as hypertension, obesity or diabetes, previous pre-eclampsia or eclampsia, previous gestational diabetes; substance use or abuse; depression; or any other condition that could result in a poor birth outcome.

In August 2014, the department, in partnership with the national Association of Maternal and Child Health Programs, was selected as a participant in the Every Mother Initiative Action Learning Collaborative. The collaborative is designed to support and improve maternal mortality reviews and translation of recommendations into actions by facilitating peer-to-peer maternal mortality site visits between selected states and implementing a community-driven project while applying sustainable approaches to screening, prevention, treatment, and promotion of healthy behaviors. The Collaborative included the department partnering with REACHUP, INC., a community based non-profit to raise awareness of preconception health and to expand the Preconception Peer Educator

(PPE) program in historically black colleges and universities. The PPE program trains students to educate their peers and raise awareness of infant mortality, maternal mortality, health disparities, healthy behaviors and encourages participants to engage in community awareness events.

*Clinical*

A PAMR Action Subcommittee is being developed to focus on fine tuning and rapidly and widely distributing PAMR recommendation messaging to professional, clinical and community organizations through multiple communication venues.

The mixture of these efforts highlights the PAMR emphasis on actively improving maternal outcomes through the evaluation of maternal mortality cases, the development of expert recommendations, and the innovative translation of recommendations into effective actions.

## Appendix 1 - Definitions

- *Body Mass Index (BMI)* - is a calculated measure of the relative percentage of body fat based on height and weight.
  - *Formula for BMI calculation:  $BMI = (\text{weight (pounds)}/\text{height (inches)}^2) \times 703$*
  - *BMI Classifications and Value Ranges for Adults (ages 20 or older)*
    - Underweight: BMI <18.5
    - Normal Weight: BMI 18.5 - 24.9
    - Overweight: BMI 25.0 - 29.9
    - Obese Class I: BMI 30.0 - 34.9
    - Obese Class II: BMI 35.0 - 39.9
    - Obese Class III: BMI 40.0 or more
  
- *Pregnancy-associated death* - a death of a woman from any cause, while she is pregnant or within one year of termination of pregnancy, regardless of the duration and site of pregnancy.
  
- *Pregnancy-associated mortality ratio (PRMR)* - number of pregnancy-related deaths per 100,000 live births; a measure of maternal mortality.
  
- *Pregnancy-related death* - a death of a woman that is directly attributed to pregnancy and/or childbirth.
  
- *Pregnancy outcome*
  - *Abortion* - A procedure to end a pregnancy. Medicinal and surgical methods are used to remove an embryo or fetus and placenta from the uterus [2].
  - *Ectopic* – Occurs when the fertilized egg grows in an abnormal place outside the uterus, usually in the fallopian tubes [4].
  - *Emergency delivery* – An unplanned, emergency cesarean delivery (C-section) due to deteriorating maternal or fetal status. The outcome could be a live birth or fetal death/stillbirth [5].
  - *Postmortem/perimortem cesarean section*: – An unplanned, emergency cesarean delivery (C-section) that is conducted shortly after a maternal death or during the maternal death process [6].
  - *Live birth* – The complete expulsion or extraction from the mother of a product of human conception that shows evidence of life after expulsion/extraction [5].
  - *Molar* – (also known as hydatidiform mole) A noncancerous (benign) tumor that develops in the uterus. A molar pregnancy starts when an egg is

fertilized, but instead of continuing to the stages of a viable pregnancy, the placenta develops into an abnormal mass of cysts [7].

- *Stillbirth* – Death of a fetus before the complete expulsion or extraction from the mother irrespective of the duration of pregnancy; the death is indicated by the fact that after expulsion or extraction, the fetus does not show any evidence of life [5].
- *Undelivered* – A woman that dies before delivering or the extraction of her fetus [5].
- *Timing of death* - perinatal period in which PRDs occur; three main classifications
  - *Prenatal PRD* – occurs between conception and birth.
  - *Labor and Delivery PRD* – occurs between the start of the delivery process and ends when the mother leaves the delivery room.
  - *Postpartum PRD* – occurs during the period after labor and delivery and up to one year after delivery or termination of pregnancy. The Postpartum PRD classification has two sub classifications:
    - *Postpartum – Not discharged from the Hospital/Health Facility PRD* – occurs in the postpartum period after delivery or termination of pregnancy and before discharge from the hospital/birth facility.
    - *Postpartum – Discharged from Hospital/Health Facility PRD* – occurs in the postpartum period after delivery/termination of pregnancy and after discharge from a hospital or health facility up to one year after the delivery/termination event.
- *Type of delivery*
  - *Cesarean* – An assisted delivery procedure where an infant or fetus is delivered through surgical incisions made in the abdomen and the uterus [8].
  - *Vaginal* – Delivery of an infant or fetus through the vaginal canal.

## **Appendix 2 - PAMR Case Selection Process for Team Review**

The PAMR process begins with collecting data for all Florida resident deaths that are associated with pregnancy. A pregnancy-associated death is defined as a death to a woman during pregnancy or up to one year after the pregnancy ends, regardless of the cause of death. The Florida Department of Health (DOH) has implemented a process of data linkages to maximize the identification of pregnancy-associated deaths. This enhanced surveillance system fosters improved case identification when compared with a more limited process utilized by the Bureau of Vital Statistics.

Cases are included in the listing 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 cause of death International Classification of Diseases (ICD) diagnosis code indicates a death classified as being due to “Pregnancy, Childbirth, and the Puerperium”.
- 3) There is a matching birth or fetal death record within 365 days prior to the woman’s death.
- 4) There is a matching Florida universal prenatal screening tool, which is used to identify and assess pregnant women at risk for adverse birth outcomes within 365 days prior to the woman’s death.

A pregnancy-related death (PRD) is a pregnancy-associated death which resulted from 1) complications of the pregnancy itself, 2) the chain of events initiated by the pregnancy that led to death, or 3) aggravation of an unrelated condition by the physiologic or pharmacologic effects of the pregnancy that subsequently caused death. A possible PRD is a pregnancy-associated death where determination of the death could not be conclusively classified as either related or not related to the pregnancy. Pregnancy-associated deaths due to a cause deemed unrelated to pregnancy are classified as not pregnancy-related.

Quarterly, the PAMR case selection committee composed of PAMR team members (an obstetrician, a nurse, PAMR data manager, and an PAMR coordinator) reviews ascertained pregnancy-associated cases by cause and time of death to categorize the cases as pregnancy-related, possibly pregnancy-related, or not pregnancy-related. The

pregnancy-associated cases determined to be either pregnancy-related or possibly pregnancy-related are submitted for record abstraction and subsequent review by the full PAMR Committee. Abstraction and review preference is given to case deaths categorized as pregnancy-related. If there are fewer than 15 pregnancy-related deaths in a given quarter to review, case abstraction and review of “possibly pregnancy-related” and “not pregnancy-related” cases may occur.

*For additional details of the PAMR case ascertainment process, see the following:  
Burch D, Noell D, Hill WC, Delke I. Pregnancy-associated mortality review: the Florida experience. *Semin Perinatol*. 2012; 36: 31-6.*

### **Appendix 3 – Florida Pregnancy Associated Mortality Review Members, 2014**

#### *PAMR Committee Co-Chairs*

- **Kris-Tena Albers, ARNP, CNM** – Chief, Bureau of Family Health Services, DOH
- **Anthony Gregg, MD** - Professor & Chief, Division of Maternal-Fetal Medicine/Department of Obstetrics and Gynecology/University of Florida

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#### *PAMR Committee Review Team*

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**Jessica Brown, R.N.**, Maternal & Child Health Section, Department of Health DOH

**Gene Burkett, M.D** - Professor, University of Miami, Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology

**Donna Carden, M.D.**, Professor, University of Florida, Department of Emergency Medicine

**Anthony Clark, MD** - Medical Examiner, KWB Pathology Associates; Medical Examiner's Commission

**Cheryl Clark, DrPH, RHIA** - Sr. MCH Epidemiologist/Training & Research Manager, Community Health Practice & Analysis Unit, DOH

**Mary Kaye Collins, CNM, MN, JD, FACNM** - Assistant Professor, Nursing, Indian River State College; American College of Nurse-Midwives

**Carol Cox, MD** – University of Florida, Department of Obstetrics and Gynecology

**Isaac Delke, MD** - Professor and Medical Director, University of Florida, College of Medicine; ACOG

**Karen Harris, MD, MPH** - Vice Chair, Florida District XII/ACOG; President, North Florida Women's Physicians, PA

**Nancy Hardt, MD** - Professor, Obstetrics and Gynecology; Pathology/University of Florida

**Leticia Hernandez, PhD, MS** - Training & Research Consultant; Community Health Practice & Analysis Unit, DOH

**Joan Hulett, RNC** Retired, Florida Chapter Association of Women's Health, Obstetric and Neonatal Nurses

**Jane Murphy, MPA** - Executive Director, Healthy Start Coalition of Hillsborough County

**William Sappenfield, MD, MPH** - Professor & Chair, College of Public Health, Chair Lawton and Rhea Chiles Center/University of South Florida

**Robert Yelverton, MD** – Chair, Florida District XII/ACOG

ACOG = American Congress of Obstetricians and Gynecologists; DOH = Florida Department of Health



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