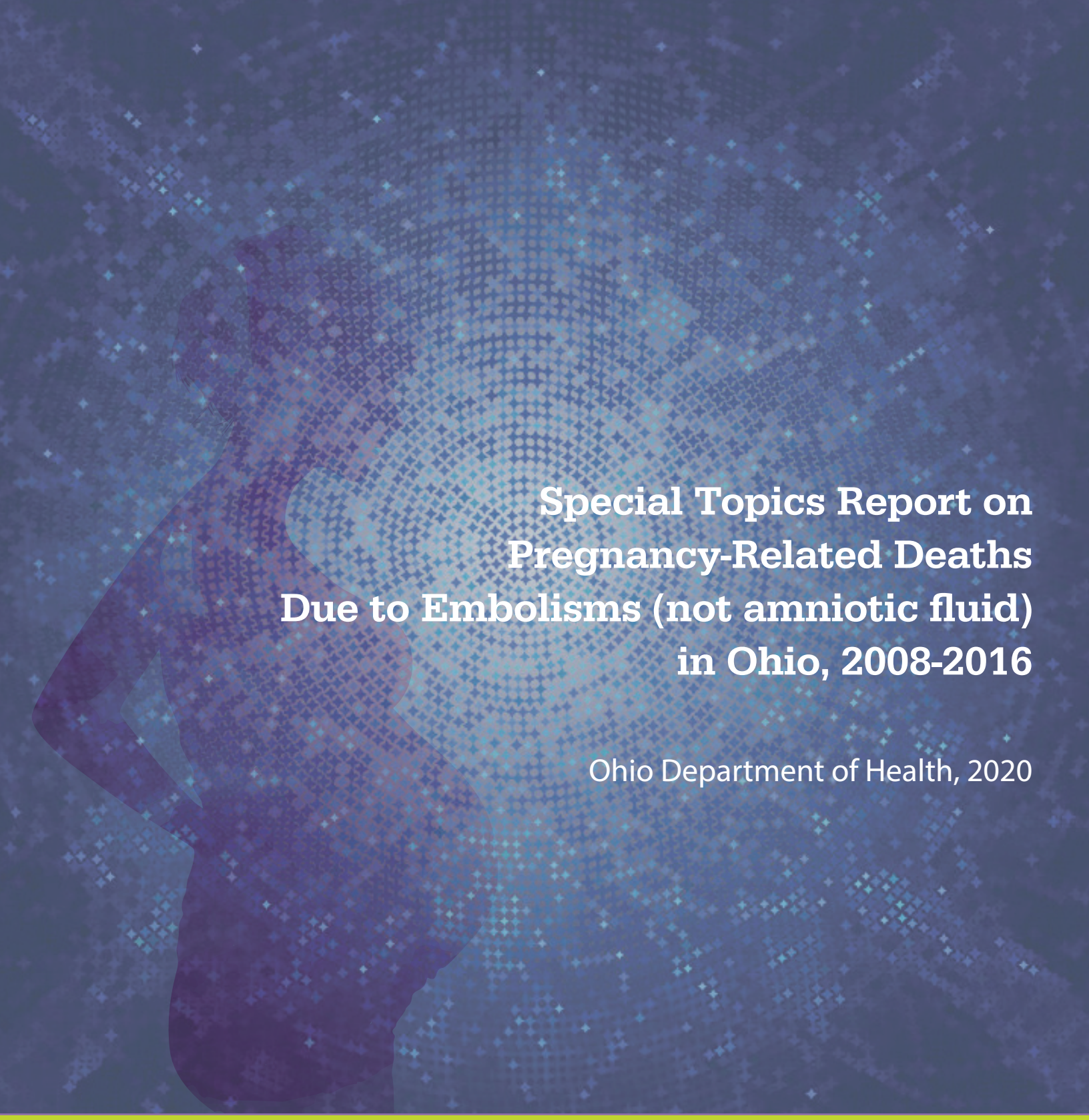

Special Topics Report on Pregnancy-Related Deaths Due to Embolisms (not amniotic fluid) in Ohio, 2008-2016

Ohio Department of Health, 2020

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Overview

The Ohio Department of Health (ODH) established the Ohio Pregnancy-Associated Mortality Review (PAMR) to identify and review pregnancy-associated deaths with the goal of developing interventions to reduce maternal mortality, particularly for pregnancy-related deaths.

A pregnancy-related death is the death of a woman while pregnant or within one year of pregnancy from any cause related to or aggravated by the pregnancy or management, excluding accidental or incidental causes. A pregnancy-associated death is the broader category and includes the death of a woman while pregnant or anytime within one year of pregnancy regardless of cause.

The purpose of this PAMR special topics data brief is to supplement the comprehensive report, A Report on Pregnancy-Associated Deaths in Ohio 2008-2016, with additional information on leading causes of pregnancy-related deaths.

Background on Embolism (not amniotic fluid) in Pregnancy

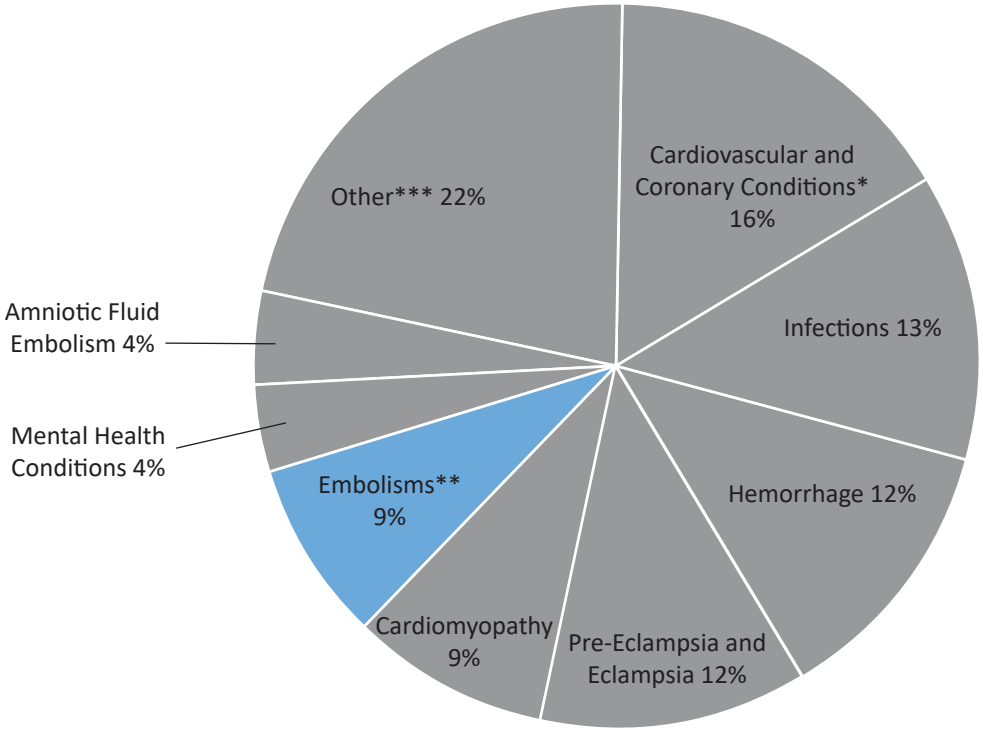
Venous thromboembolism (VTE) may be either a deep vein thrombosis (DVT), 75-80% of cases, or a pulmonary embolism (PE), 20-25% of cases. Women who are pregnant or post-partum have a fourfold to fivefold increased risk of thromboembolism compared with non-pregnant women. The risk of VTE is particularly elevated during the postpartum period and especially following cesarean delivery. There are changes in physiology and anatomy that cause this increased risk. These include increased levels of clotting factors that normally would stop bleeding; women being less active and not moving around as much; and the uterus getting bigger and compressing the large veins in the legs and pelvis, which leads to decrease in venous flow. For the purpose of analyzing embolism and pregnancy, the embolism category includes thromboembolism and unspecified embolisms, but excludes amniotic fluid embolism, which has its own category.

PAMR Findings

Cause of Death

Figure 1 displays the underlying causes of 2008 to 2016 pregnancy-related deaths. Embolism (not amniotic fluid) comprised 9% of deaths.

Figure 1: Underlying Causes of Pregnancy-Related Deaths by Leading Causes, Ohio 2008-2016



**Not including cardiomyopathy.*

***Not including amniotic fluid embolism.*

****Includes cerebrovascular accident, homicide, and other causes.*

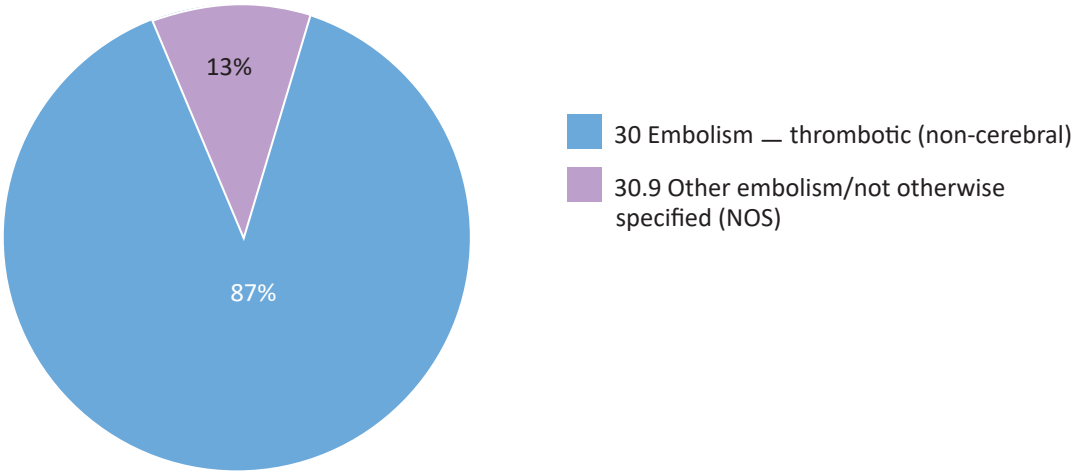
As represented in Table 1, from 2008 to 2016, there were 17 pregnancy-associated embolism (not amniotic fluid) deaths. Broken down by specific Pregnancy Mortality Surveillance System (PMSS)[1] cause of death, embolism — thrombotic (non-cerebral) was the most common (n=15), 13 of which were pregnancy-related, followed by other embolism/not otherwise specified (NOS) (n=2), all of which were pregnancy-related.

Table 1: Pregnancy-Associated Deaths Due to Embolism (not amniotic fluid) by Specific Pregnancy Mortality Surveillance System (PMSS) Cause of Death and Relatedness, Ohio 2008-2016

PMSS Cause of Death	Pregnancy-Related	Pregnancy-Associated, but not Related	Unable to Determine	Pregnancy-Associated (Total)
30 Embolism — thrombotic (non-cerebral)	13	2	0	15
30.9 Other embolism/not otherwise specified (NOS)	2	0	0	2
Total	15	2	0	17

Among the 15 pregnancy-related deaths due to embolism from 2008 to 2016, 87% were classified as embolism — thrombotic (non-cerebral) and 13% were classified as embolism/not otherwise specified (NOS).

Figure 2: Pregnancy-Related Deaths Due to Embolism (not amniotic fluid) by Pregnancy Mortality Surveillance System (PMSS) Cause of Death, Ohio 2008-2016



The data presented throughout the remainder of the report are restricted to the 15 of 17 deaths due to embolism (not amniotic fluid) determined to be pregnancy-related.

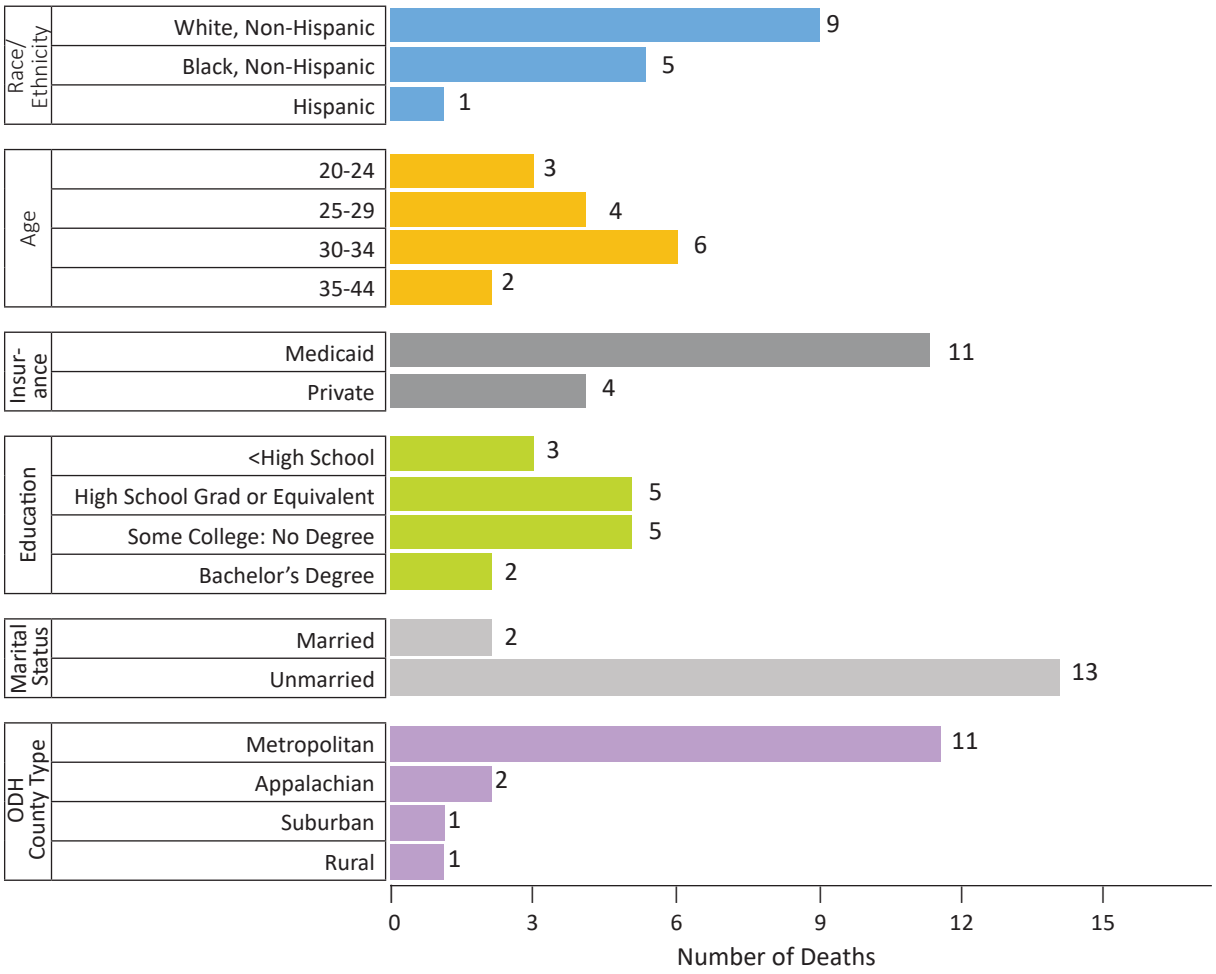
The pregnancy-related mortality ratio (PRMR) is defined as the number of pregnancy-related deaths per 100,000 live births. Given the 15 pregnancy-related deaths due to embolism (not amniotic fluid) from 2008 through 2016, the PRMR is 1.2, meaning Ohio women experienced pregnancy-related deaths due to embolism (not amniotic fluid) at a rate of 1.2 deaths per 100,000 live births.

[1] *The Centers for Disease Control and Prevention (CDC) Pregnancy Mortality Surveillance System (PMSS) established underlying cause of death codes, which are a standard approach for classifying pregnancy-related deaths in a clinically meaningful way. The PAMR committee assigns a PMSS cause of death as part of the review. CDC PMSS: https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm.*

Demographics

Figure 3 describes the demographic characteristics of 15 women who died of pregnancy-related embolism (not amniotic fluid). Most deaths occurred among women aged 30 to 34, with Medicaid insurance, who were unmarried, lived in metropolitan counties, and were white, non-Hispanic. While most deaths were among white, non-Hispanic, there was a disproportionate number of deaths among black, non-Hispanic women, compared with the overall population.

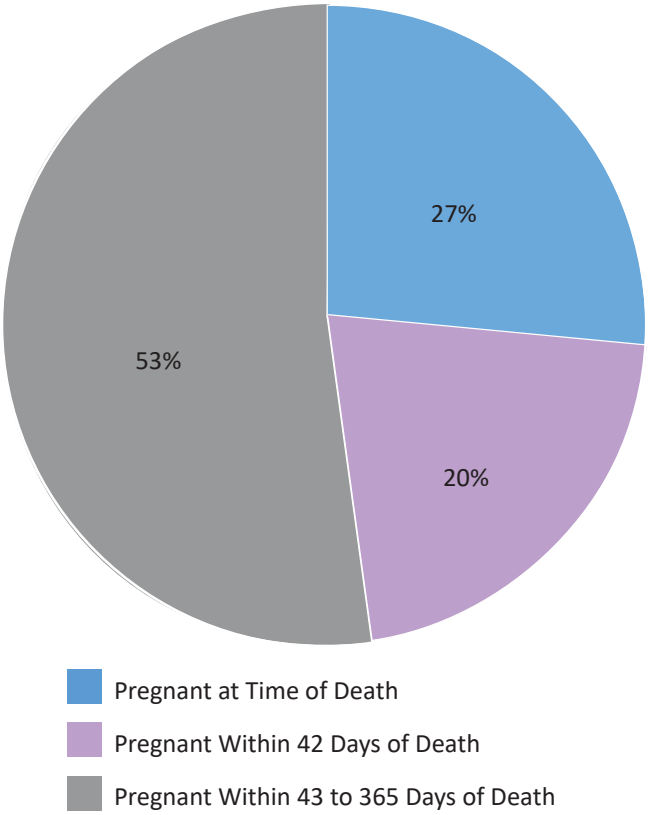
Figure 3: Pregnancy-Related Deaths Due to Embolism (not amniotic fluid) by Maternal Demographics, Ohio 2008-2016



Data interpretation example: The row for Medicaid insurance means that 11 of the 15 women who died of pregnancy-related embolism (not amniotic fluid) occurred among women who had Medicaid insurance from 2008 to 2016.

As shown in Figure 4, the majority of pregnancy-related deaths due to embolism (not amniotic fluid) occurred within 43 to 365 days of pregnancy.

Figure 4: Timing of Death in Relation to Pregnancy Among Pregnancy-Related Deaths Due to Embolism (not amniotic fluid), Ohio 2008-2016



Note: The pregnant at time of death classification includes deaths that occurred the day of delivery.

Fourteen of 15 (93%) pregnancy-related deaths due to embolism (not amniotic fluid) occurred in the hospital, with eight being inpatient and six being outpatient/emergency department (ED). Figure 5 describes the place of death and specifies hospital location.

Figure 5: Pregnancy-Related Deaths Due to Embolism (not amniotic fluid) by Place of Death, Ohio 2008-2016

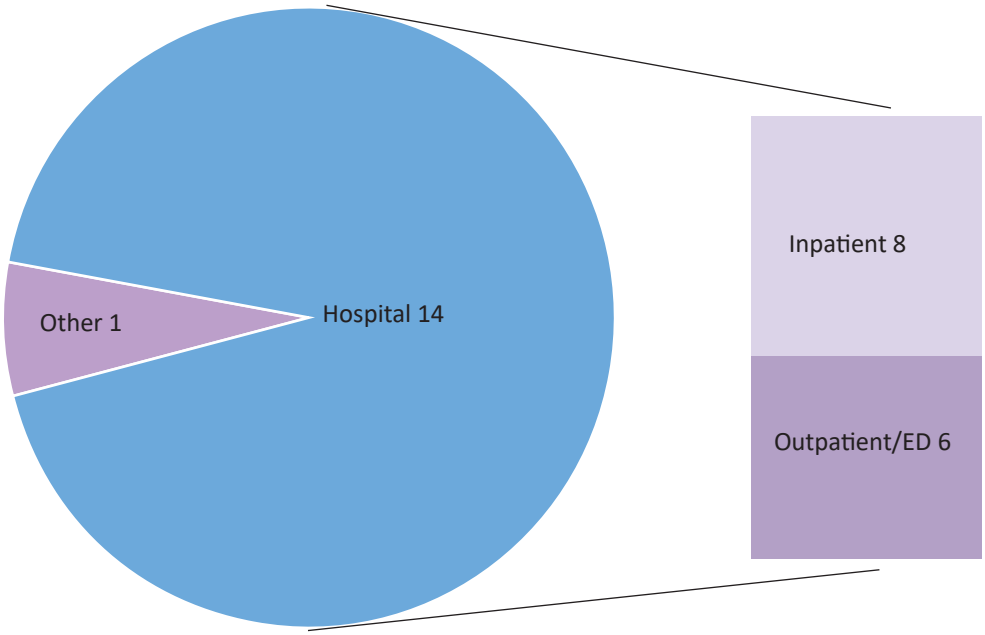
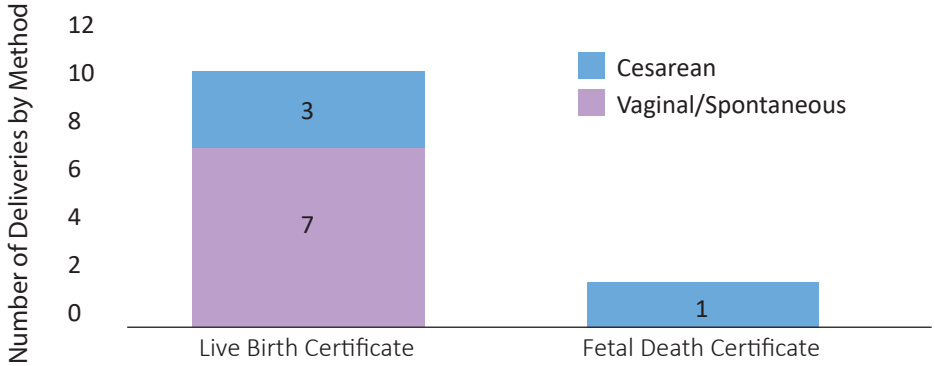


Figure 6 describes the delivery methods by certificate type. Among the 15 pregnancy-related deaths due to embolism (not amniotic fluid), 10 linked live birth certificates and one linked fetal death certificates, which document method of delivery, were obtained. When the fetus is less than 20 weeks gestation or not extracted, the completion of a fetal death certificate is not required.

Figure 6: Pregnancy-Related Deaths Due to Embolism (not amniotic fluid) with Linked Birth or Fetal Death Certificates by Certificate Type and Method of Delivery, Ohio 2008-2016



Contributing Factors and Preventability

For each case, the review committee identifies factors that contributed to the death. These factors include steps along the way that, if altered, may have prevented the woman's death. The committee considers factors that operate at the following levels: *patient/family, healthcare provider, facilities* where the woman sought care, and *systems* that influence the lifestyle, care, and health services for the woman. Contributing factors are further broken down into classes and dominant, representative themes.

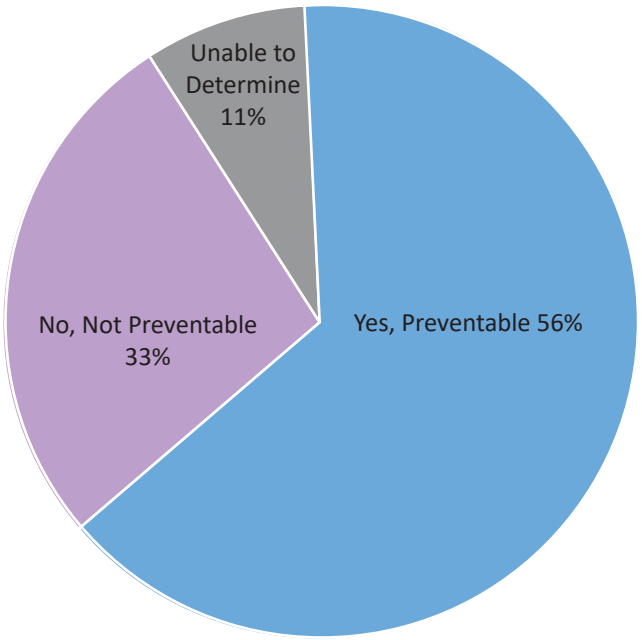
Table 2: Contributing Factors of Pregnancy-Related Deaths Due to Embolism (not amniotic fluid), Ohio 2008-2016

Patient/Family		
Factor Class	**Count**	**Representative Themes**
Chronic Disease	12	Obesity, other chronic medical conditions.
Knowledge	7	Delay or failure to seek care, lack of knowledge regarding importance of care, lack of knowledge of treatment or follow-up.
Delay	4	Delay or failure to seek care.
Adherence	2	Noncompliance with medical recommendations.
Social Support/Isolation	1	Isolation: lack of family/friend support system.
Substance Use Disorder - Alcohol, Illicit/ Prescription Drugs	2	
Tobacco Use	1	
Provider		
Factor Class	**Count**	**Representative Themes**
Clinical Skill/Quality of Care	4	Use of ineffective treatment, misdiagnosis.
Assessment	3	Failure to screen/inadequate assessment for risk.
Delay	2	Delay in or lack of diagnosis, treatment, or follow-up.
Referral	1	Failure to refer or seek consultation.
Other	1	Inadequate preconception counseling.
System		
Factor Class	**Count**	**Representative Themes**
Clinical Skill/Quality of Care	1	
Continuity of Care/Care Coordination	1	Case coordination/management after discharge.

Note: No contributing factors related to facilities were identified among pregnancy-related deaths due to embolisms (not amniotic fluid).

Prior to 2012, the committee did not consistently determine preventability; therefore, Figure 7 displays preventability determination of 2012 through 2016 deaths. A death is considered preventable if the committee determines that there was at least some chance of the death being averted. Fifty-six percent of pregnancy-related deaths due to embolism (not amniotic fluid) were deemed preventable.

Figure 7: Preventability of Pregnancy-Related Deaths Due to Embolism (not amniotic fluid), Ohio 2012-2016



Case Summary: Thromboembolism

"Janice" was 28 years old and was pregnant for the first time. Her medical history was significant for tobacco use (she smoked one pack per day) and morbid obesity (body mass index—49).

Prenatal Care: Janice began prenatal care at eight weeks of pregnancy, which is considered adequate, and she had regular visits with an OB/GYN doctor. Her prenatal course was uncomplicated until 37 weeks of pregnancy, when she was admitted to the hospital after her water broke; she was not yet in labor. She was also diagnosed with pre-eclampsia, a potentially dangerous condition of pregnancy in which blood pressure is high and there is protein in the urine (proteinuria). Her labor was induced.

Delivery Hospitalization: After 21 hours in labor, the heart rate monitoring showed that the baby had a very concerning heart rate. Due to that concern, the doctor delivered her via cesarean section. The baby had no complications. Janice's hospital stay was complicated by anemia (low blood count) due to blood loss during her cesarean section surgery. She was transfused with two units of blood. She was also diagnosed with sleep apnea and placed on oxygen when sleeping. She went home four days after her delivery.

Postpartum: One week after delivery, she went to the emergency department (ED) with pain in her left leg. To check for a deep venous thromboembolism ("blood clot"), an ultrasound was performed. No blood clot was found, and she was discharged home. Three days later, her heart stopped suddenly, and she collapsed at home. Her family called an ambulance and she was pronounced dead shortly after arrival to the emergency department. The county coroner performed an autopsy. The cause of death was found to be a pulmonary thromboembolism (blood clot in the lungs) that had moved into her lungs from a blood clot in her left leg.

Six Key Questions

Was the Death Pregnancy-Related?

Yes. Women who are pregnant or in the postpartum period have a four to five times increased risk of thromboembolism compared with non-pregnant women (ACOG Practice Bulletin, 2018). Pregnancy causes changes such as an increased number of clotting factors, slower movement of blood through the veins of the legs and pelvis, and reduced activity of pregnant women. Risk factors include:

- Cesarean delivery, particularly when complicated by postpartum hemorrhage or infection.
- Obesity.
- Hypertension and pre-eclampsia.
- Autoimmune disease.
- Heart disease.
- Sickle cell disease.
- Twins or other multiple gestation.

What Was the Cause of Death?

Pulmonary thromboembolism (blood clot in the lungs).

Was There Some Opportunity to Alter Outcome?

There were two good opportunities to alter the outcome. The first is in the area of prevention. Before any cesarean delivery, pneumatic compression devices (automatic plastic squeeze boots) should be placed on each leg. Early movement is recommended after cesarean delivery and the pneumatic compression devices should be left in place until the patient is able to walk around. Discharge instructions should warn the patient to seek immediate medical attention if she experiences lower leg pain, swelling of the lower leg or shortness of breath.

The second opportunity is in the area of diagnosis. The patient had an ultrasound of the leg when she experienced pain. It did not show any evidence of a blood clot, but given her obesity and recent pregnancy, she was at high risk for such a clot. Ultrasound testing is not perfect. When results are negative in a patient who is at high risk for thromboembolism, additional testing is recommended.

What Were the Factors That Contributed to This Death?	What Are the Recommendations and Actions That Address Those Contributing Factors?
Obesity.	Maintain a high index of suspicion for thromboembolism with a false negative screening test in high-risk patients.
Smoking.	Provide evidence-based smoking cessation counseling and treatment to all pregnant patients.
Inappropriate care. She did not receive either intrapartum or postpartum DVT prophylaxis (pneumatic compression devices).	Implement the AIM safety bundle for venous thromboembolism prevention.
Misdiagnosis in the emergency room.	When results are negative in a patient that is high risk for thromboembolism, additional testing is recommended.

What is the Anticipated Impact of Those Actions if Implemented?

Prevention of thromboembolism in a large group of pregnant and postpartum women.

Committee Recommendations

As part of the review of each death, the committee identifies recommendations (including strategies and action steps) that may address factors that contributed to the death. Those recommendations were grouped into categories and themes.

Table 3: Committee Recommendations of Reviewed Pregnancy-Related Deaths Due to Embolism (not amniotic fluid), Ohio 2008-2016

Category	Themes
Patient Education	Ensure patients are informed and understand the information, including discharge instructions, they have been provided.
	Recommend OB consultations for all postpartum patients (within six weeks of delivery) who are seen in the emergency department or admitted to hospital.
Provider Training	Educate providers on recognition, treatment, and prevention of obstetric complications, including thromboembolism.
Quality of Care	Provide counseling regarding hypercoagulable state in pregnant and post-partum patients.
	Screen for thrombophilia.
	Case coordination for closer management of medications.
Treatment	Deep vein thrombosis (DVT) prophylaxis and treatment.
	Give thrombolytic in emergency department.

PAMR Initiatives

ODH is implementing Urgent Maternal Warning Signs education in public health settings (e.g., WIC clinics, home visiting sites, Healthy Start locations). This education focuses on teaching moms about severe symptoms that can occur during pregnancy or in the postpartum period and should never be ignored. The education helps teach women when they need to seek immediate care or schedule a follow-up appointment with their doctor. This work is aligned with the recently released campaign from the Council on Patient Safety. This project will be completed over a five-year period (2019 to 2024). Additionally, ODH is working with a vendor to conduct regional and virtual implicit bias trainings for 1,000 maternal health providers across Ohio. Participants in the training can expect to define and understand implicit bias, recognize sources of implicit bias, identify bias at work in maternal health services, and practice culturally intelligent strategies to disrupt bias. Trainings will be ongoing from 2020 to 2022.

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