

## A Reference Guide for Certification of Deaths Associated With Pregnancy on Death Certificates

### Introduction

Death certificates are the primary source of data for official mortality statistics in the United States. Data are collected from death certificate records and used for: public health research and prevention; comparing trends across local, state, and national levels; and setting public health goals.

The statistical data derived from death certificates are only as accurate as the information provided on the records. Consequently, all people involved in death certification are crucial to ensuring that the reporting of the circumstances and causes of death is accurate and complete. Correct and specific information on the underlying cause and other contributing causes of death is critical for determining public health priorities and interventions.

Although general guidance and instructions are available on how to complete the death certificate (1,2), this reference guide provides physicians, medical examiners, coroners, and other medical certifiers with specific recommendations and examples of documenting different types of deaths associated with pregnancy, to improve consistency and accuracy in reporting. Deaths associated with pregnancy include a subset of deaths—maternal deaths—which are used to produce the official maternal mortality statistics in the United States (3). Appropriately characterizing deaths associated with pregnancy on death certificates helps improve the quality of both mortality data and official maternal mortality statistics.

This reference guide includes:

- Detailed instructions for completing the death certificate for deaths associated with pregnancy.
- Scenarios describing different types of deaths associated with pregnancy and sample certifications ([Appendix I](#)).
- Resources and websites with additional information ([Appendix II](#)).
- Definition of terms ([Appendix III](#)).

### Who Completes the Death Certificate?

The medical information on the death certificate is reported by the medical certifier, who is legally responsible for completeness and accuracy of all information in the medical section, including pregnancy status. The medical portion of the death certificate must be certified within the time specified in the law or regulation of the state or locality in which the death occurs. The authority for medical certification varies by state, but the certifier usually is one of the following:

- Physician
- Medical examiner
- Coroner

In some states, certifiers may also include:

- Physician assistant
- Nurse practitioner
- Others

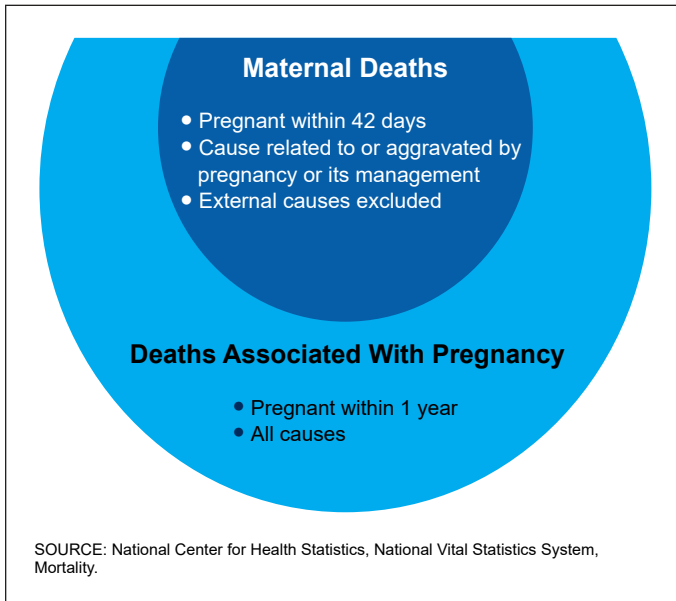
### What are “Deaths Associated With Pregnancy” and “Maternal Deaths”?

**Deaths associated with pregnancy** consist of deaths that occur during pregnancy, at the time of delivery, or within 1 year postpartum, regardless of the cause, location of pregnancy, or pregnancy outcome. These deaths comprise the broader category of deaths from which **maternal deaths** are identified.

A **maternal death**—as defined by the World Health Organization (WHO) and adopted by the National Center for Health Statistics (NCHS)—is “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes” (4). Maternal deaths are a subset of deaths associated with pregnancy ([Figure 1](#)). Unlike deaths associated with pregnancy, maternal deaths do not include accidents, homicides, and suicides (3,5).

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**Figure 1. Diagram of maternal deaths and deaths associated with pregnancy from death certificates**



A **late maternal death** is “the death of a woman from direct or indirect obstetric causes more than 42 days but less than one year after termination of pregnancy” (4).

## Certifying Deaths Associated With Pregnancy

Certifiers should verify the pregnancy status and obstetric history of all female decedents of reproductive age. Possible sources of this information include, but are not limited to, medical records, laboratory tests, family interviews, clinical history, and autopsy report, if available.

The task of the medical certifier is to determine the cause(s) and manner of death, as well as the **decedent’s pregnancy status within the past year**, and accurately report this information on the death certificate. In addition to reporting cause of death, documentation of a current or recent pregnancy is important in

determining whether pregnancy was a factor that resulted in, or contributed to, a death. The fact and timing of pregnancy may be reported in Part I or Part II and in the pregnancy checkbox.

Parts I and II of the cause-of-death section, where the medical certifier documents the causes of death and other significant conditions that contributed to death, are used together with the pregnancy checkbox information to help identify and code all deaths associated with pregnancy, including maternal deaths.

## Completing Part I

The certifier determines the sequence of conditions that directly caused the death and documents these conditions in Part I of the cause-of-death section (Figure 2). Part I should outline a logical sequence of events that led to death, with the immediate cause of death on line (a) and the underlying cause of death on the lowest line used in Part I.

The immediate cause of death is the final condition that resulted in death. The reported immediate cause of death should not be the mechanism of death or terminal event. Examples of conditions that should *not* be reported include “cardiac arrest,” “asystole,” “cardiopulmonary arrest,” or similar descriptions of death. These terms are mechanisms that describe the death event and do not provide information about the cause(s) of death.

The following conditions may be reported on line (a) but require listing additional causes—as in any intermediate causes and an underlying cause of death—on the lines below:

- Cerebral edema
- Disseminated intravascular coagulation
- Heart or cardiac failure
- Hemorrhage
- Hypotension
- Multi-organ failure

**Figure 2. Part I of cause-of-death section of death certificate**

<b>CAUSE OF DEATH (See instructions and examples)</b>		Approximate interval: Onset to death
<p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p>		
<p>IMMEDIATE CAUSE (Final disease or condition resulting in death) -----&gt;</p>	a. _____ Due to (or as a consequence of):	_____
<p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p>	b. _____ Due to (or as a consequence of):	_____
	c. _____ Due to (or as a consequence of):	_____
	d. _____	_____

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

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- Seizure
- Sepsis or septic shock

Certifiers will usually use line (b) and, depending on the complexity of the case, may need the additional lines. The condition that initiated the chain of events resulting in death—the underlying cause—should be reported on the lowest line used in Part I. Certifiers should be as clear, precise, and complete as possible, avoiding abbreviations or acronyms.

### Completing Part II

In Part II, the certifier lists all other important conditions that contributed to the death but were not part of the causal sequence documented in Part I (Figure 3).

For more information on death certification in general, see the “Cause of Death Mobile Application” at <https://www.cdc.gov/nchs/nvss/mobile-app.htm> and “Improving Cause of Death Reporting” online training at [https://www.cdc.gov/nchs/nvss/improving\\_cause\\_of\\_death\\_reporting.htm](https://www.cdc.gov/nchs/nvss/improving_cause_of_death_reporting.htm). Also see the *Physician’s Handbook on Medical Certification of Death* (1) and the *Medical Examiners’ and Coroners’ Handbook on Death Registration and Fetal Death Reporting* (2) for more information.

### Reporting effects of pregnancy in Parts I and II

If pregnancy caused or contributed to the death, whether during pregnancy or up to 1 year after the end of pregnancy, it is critical that words indicating pregnancy or its effects appear in Part I, Part II, or both. Examples of modifying words that can be a part of the cause-of-death statement and help with the identification of maternal deaths include, but are not limited to:

- Abortion
- Amniotic
- Antepartum

- Birth
- Delivery or delivered
- Ectopic
- Gestational age
- Labor
- Miscarriage or miscarried
- Obstetric
- Peripartum or postpartum
- Placenta or placental
- Pregnancy or pregnant
- Pregnancy termination
- Prenatal
- Trimester
- Uterine

For example, if a woman died as a result of a hemorrhage following delivery, report “Postpartum hemorrhage” rather than “Hemorrhage” in Part I of the death certificate. Similarly, if a woman died as a result of an amniotic embolism, “Amniotic embolism” should be reported on the death certificate rather than “Embolism.” This guidance does not apply to deaths where pregnancy was incidental to death.

### Pregnancy checkbox

The pregnancy checkbox is designed to capture information on the pregnancy status of all females at death and up to 1 year before death, regardless of the cause of death (Figure 4). If the decedent was pregnant in the last year, properly indicate the time frame in which she was pregnant, as in, at the time of death, within 42 days of death, or between 43 days and 1 year before death. The time frame helps determine the appropriate cause-of-death codes to assign, which is needed for the correct classification of

Figure 3. Part II of cause-of-death section of death certificate

PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I		33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No
		34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH?  <input type="checkbox"/> Yes <input type="checkbox"/> Probably  <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year  <input type="checkbox"/> Pregnant at time of death  <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death  <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death  <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH  <input type="checkbox"/> Natural <input type="checkbox"/> Homicide  <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation  <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

**Figure 4. Pregnancy checkbox in cause-of-death section of death certificate**

PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I		33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No
		34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH?  <input type="checkbox"/> Yes <input type="checkbox"/> Probably  <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year  <input type="checkbox"/> Pregnant at time of death  <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death  <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death  <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH  <input type="checkbox"/> Natural <input type="checkbox"/> Homicide  <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation  <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

maternal deaths. If the decedent was not pregnant within the last year, indicate “Not pregnant within past year” in the pregnancy checkbox.

The flowchart (Figure 5) outlines key questions for certifiers to ask when reporting pregnancy status in the pregnancy checkbox.

## Amending Death Certificates

The medical certifier who reported the medical information on a death certificate has the authority to amend the medical information on that death record. The amendment process may be used to correct an error or include additional information that becomes available after the initial certification. The medical certifier should contact the vital records (VR) registrar when made aware that the information on the death record is incomplete or inaccurate. Medical certifiers may also be contacted by the VR registrar in their state about amending or confirming information on a record, and a timely response is important for the correct information to be incorporated into final mortality data.

## Coding and Disseminating Data on Maternal Deaths

Pregnancy checkbox reporting can affect maternal mortality statistics, which may then affect prevention efforts. Because maternal deaths are relatively rare events in the United States, small inaccuracies on death records can have a substantial impact on the overall statistics. Consequently, it is critical that certifiers accurately report pregnancy status and maternal causes of death on death certificates.

NCHS uses information from each death certificate to assign *International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD–10)* cause-of-death codes. Maternal deaths are identified using underlying cause-of-death codes A34, O00–O95, and O98–O99, which align with the WHO definition of maternal deaths. Deaths with these codes are included in calculating maternal mortality rates. ICD–10 code

O96 is used to identify late maternal deaths; deaths with these codes are included in late maternal mortality rates (4).

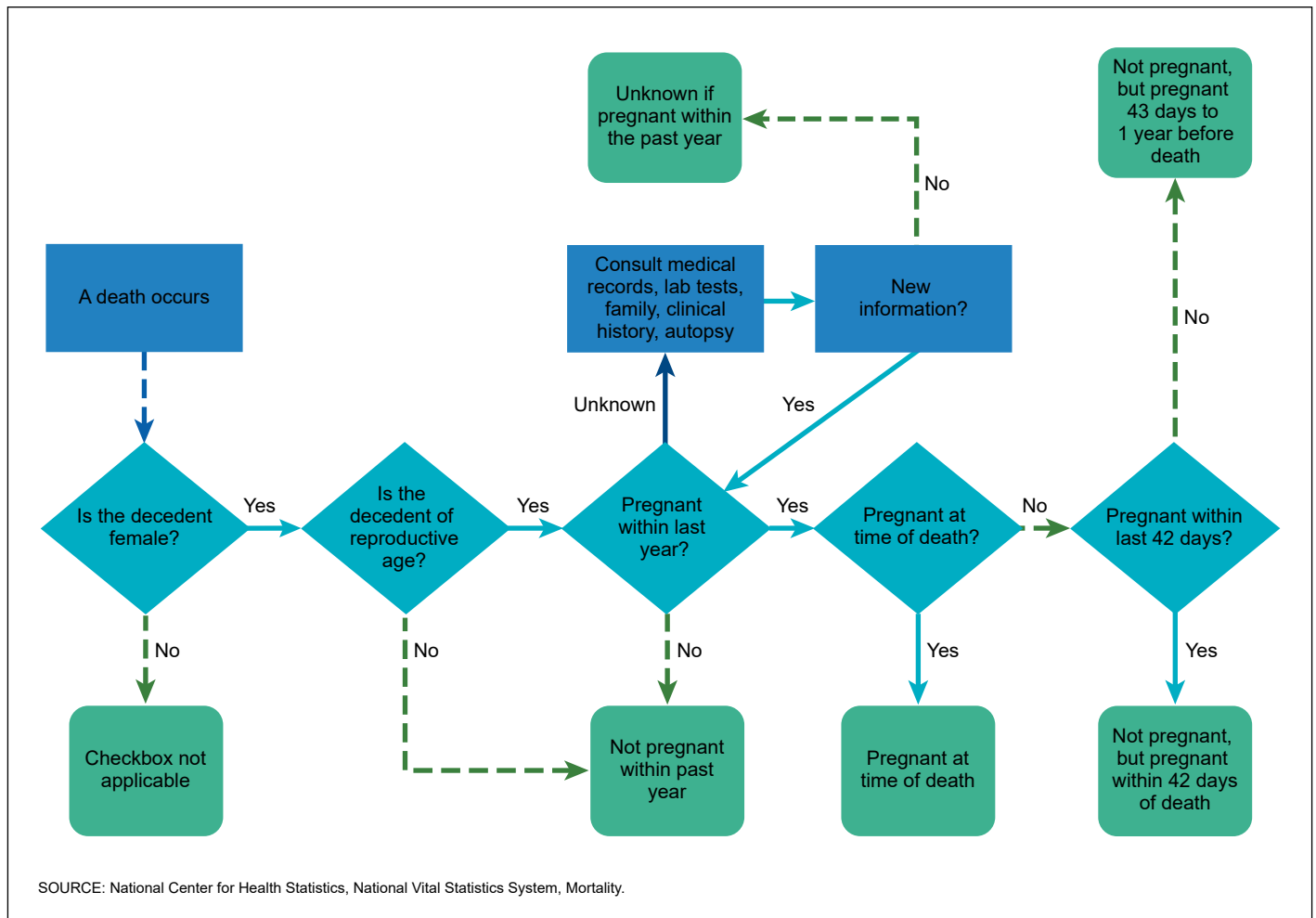
NCHS uses the coded data for statistical reporting. NCHS makes mortality data and statistics as widely available as possible while maintaining confidentiality standards. The accuracy of the resulting codes and statistics depend on the quality of the information included on death certificates that NCHS obtains from state or local vital records and statistics offices.

## Summary

The accurate completion of death certificates is vital to various public health efforts surrounding maternal mortality surveillance and prevention, as well as to the official reporting of maternal deaths in the United States.

- Incomplete or incorrect death certificate information can result in inaccurate portrayals of maternal mortality.
- Confirmation of pregnancy within the last year and appropriate description of the causes of death are priorities for medical certifiers.
- Verify the pregnancy status and obstetric history of all female decedents of reproductive age.
  - Possible sources of information include, but are not limited to:
    - Medical records
    - Laboratory tests
    - Family interviews
    - Clinical history
    - Autopsy report, if available
- If pregnancy or its management caused or contributed to the death, words associated with pregnancy should appear in Part I, Part II, or both.
- Accurate death certificate completion for all deaths associated with pregnancy, including maternal deaths, can:

Figure 5. Key questions for certifiers to ask when reporting pregnancy status



- Help ensure accurate reporting of official maternal mortality statistics in the United States.
- Lead to more accurate research for developing interventions and informing policies.
- Assist national and state surveillance projects in making valid recommendations for maternal mortality prevention.
- Provide information concerning these deaths for education and prevention of future deaths.

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**Appendix I. Deaths Associated With Pregnancy Scenarios and Sample Certifications**

**Scenario I: Pregnant woman with pulmonary embolism**

A 20-year-old woman was found dead at home. She had complained of shortness of breath before becoming unresponsive. No signs of trauma or evidence of foul play were found. She had been diagnosed with hyperemesis gravidarum and was placed on bed rest 4 days before her death. Medical history was significant for obesity. Autopsy identified a large saddle thromboembolism occluding the main pulmonary artery and extending into the lungs. The gravid uterus contained a fetus of 13 weeks estimated gestational age.

**Comment:** Part I is formatted so that sequential information is reported with one condition per line, starting with the immediate cause of death on the top line—in this instance, a saddle pulmonary thromboembolism—and going backward in time on progressively lower lines. Conditions leading to the immediate cause of death were immobility due to bed rest and hyperemesis gravidarum, the underlying cause of death on the lowest line used in Part I. Note that each condition causes the one on the line above it, and they are listed from the shortest duration to the longest (see time intervals). In Part II, list the other conditions that contributed to death but did not result in the underlying cause of death. In this scenario, the certifier determined that obesity contributed to the decedent’s pulmonary thromboembolism and her death, but it was not a part of the sequence in Part I, so they reported it in Part II. The manner of death is natural. The pregnancy checkbox is appropriately completed as pregnant at time of death.

**Scenario I**

<p align="center"><b>CAUSE OF DEATH (See instructions and examples)</b></p> <p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----&gt; resulting in death)</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p>		<p>Approximate interval: Onset to death</p> <p>Minutes _____</p> <p>Days _____</p> <p>Weeks _____</p>
<p>a. <u>Saddle pulmonary thromboembolism</u> Due to (or as a consequence of): _____</p> <p>b. <u>Immobility due to bedrest</u> Due to (or as a consequence of): _____</p> <p>c. <u>Hyperemesis gravidarum</u> Due to (or as a consequence of): _____</p> <p>d. _____</p>		
<p><b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p> <p><b>Obesity</b></p>		<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input checked="" type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

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## Scenario II: Pregnant woman involved in motor vehicle accident

A 19-year-old woman was the driver of a car attempting to make a left turn. She did not yield to traffic before entering the intersection and was struck on the driver’s side by a sport utility vehicle. The decedent was pronounced dead at the scene by an emergency medical technician. The case was referred to the local medical examiner. Autopsy findings identified a subdural hematoma, multiple rib fractures, and lacerated liver, as well as a fetus of 22–24 weeks gestation.

**Comment:** This death certificate indicates death was due to multiple injuries, and manner of death is certified as accident. The autopsy is noted as performed and findings available to complete the cause of death. Completing the injury fields also is important, including the “Describe how injury occurred” section (not shown) with the appropriate narrative to indicate that the trauma was caused by a motor vehicle accident. Alternatively, the motor vehicle accident could be reported on line (b) in Part I as the cause of the trauma. The pregnancy checkbox is appropriately completed as pregnant at time of death.

### Scenario II

<b>CAUSE OF DEATH (See instructions and examples)</b>			Approximate interval: Onset to death
<p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----&gt; resulting in death)</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p>			<p><u>Minutes</u></p> <hr/> <hr/> <hr/> <hr/>
<p>a. <u>Blunt force trauma to head and trunk</u> Due to (or as a consequence of):</p> <p>b. _____ Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____ Due to (or as a consequence of):</p>			
<p><b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>			<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input checked="" type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>	

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.



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## Scenario III: Woman who overdosed on methadone 3½ months postpartum

A 38-year-old woman ingested an overdose of methadone in the evening before death and was found unresponsive at home the next morning. Based on interviews with the family, it was determined that she was 3 months and 16 days postpartum at time of death. From the autopsy findings, toxicology results, and scene investigation, the medical certifier determined that the cause of death was methadone toxicity.

**Comment:** The cause of death is reported as methadone toxicity, and manner of death is indicated as accident. The autopsy is noted as performed and findings available to complete the cause-of-death section. The pregnancy checkbox is appropriately completed as not pregnant, but pregnant 43 days to 1 year before death. Completing the injury fields also is important, including the “Describe how injury occurred” section (not shown) with the appropriate narrative to specify the circumstances of the injury.

### Scenario III

<b>CAUSE OF DEATH (See instructions and examples)</b>			Approximate interval: Onset to death
<p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----&gt; resulting in death)</p> <p>a. <u>Methadone toxicity</u></p> <p style="text-align: center;">Due to (or as a consequence of):</p> <p>b. _____</p> <p style="text-align: center;">Due to (or as a consequence of):</p> <p>c. _____</p> <p style="text-align: center;">Due to (or as a consequence of):</p> <p>d. _____</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p>			<p>Hours</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p><b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>		<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input checked="" type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input checked="" type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>	

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

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## Scenario IV: Postpartum hemorrhage

A 33-year-old woman with no significant medical history and routine prenatal care presented to labor and delivery at 41 weeks and underwent 35 hours of labor augmentation. An emergency cesarean delivery under general anesthesia was performed because of vaginal bleeding and concern for fetal well-being. Following completion of the skin closure, uterine atony was identified by palpation of a boggy uterus, and oozing was noted from the incision site. Uterine atony was treated with uterine massage and uterotonic medication. Thirty minutes after transfer to the recovery room, the decedent developed hematuria, hypotension, and disseminated intravascular coagulation. Massive transfusion, fluid resuscitation, and emergent hysterectomy were performed, but progressive shock and multi-organ failure developed and resulted in death 6 hours after delivery.

Major autopsy findings included hemoperitoneum (greater than 3.5 liters), status posthysterectomy; centrilobular hepatic necrosis; intestinal ischemia; and acute renal tubular necrosis.

The uterine specimen showed no evidence of uterine rupture, placenta accreta complex, or defect other than the hysterotomy incision. Histologic evaluation did not identify amniotic fluid embolism or other significant changes. Toxicology testing was not performed.

**Comment:** This death certificate identifies the immediate cause of death as disseminated intravascular coagulopathy, the intermediate cause of death as postpartum hemorrhage, and the underlying cause of death as uterine atony. In a cause-of-death statement with multiple linked causes, the **underlying cause of death is listed on the lowest line used**. The pregnancy checkbox appropriately indicates not pregnant, but pregnant within 42 days of death.

In cases where maternal deaths occur postpartum, particularly posthospital discharge, direct communication between the death certifier (whether a medical examiner, coroner, or hospitalist or intensivist) and the obstetric provider may provide valuable information for accurate death certification.

### Scenario IV

CAUSE OF DEATH (See instructions and examples)		Approximate interval: Onset to death
32. <b>PART I.</b> Enter the <u>chain of events</u> --diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.		
IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)	a. <u>Disseminated intravascular coagulopathy</u> <small>Due to (or as a consequence of):</small>	Hours _____
Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b>	b. <u>Postpartum hemorrhage</u> <small>Due to (or as a consequence of):</small>	Hours _____
	c. <u>Uterine atony</u> <small>Due to (or as a consequence of):</small>	Hours _____
	d. _____ <small>Due to (or as a consequence of):</small>	_____
<b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I		33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Emergency caesarean section		34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
35. DID TOBACCO USE CONTRIBUTE TO DEATH?  <input type="checkbox"/> Yes <input type="checkbox"/> Probably  <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year  <input type="checkbox"/> Pregnant at time of death  <input checked="" type="checkbox"/> Not pregnant, but pregnant within 42 days of death  <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death  <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH  <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide  <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation  <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

# Vital Statistics Reporting Guidance

## Scenario V: Maternal cancer

A 29-year-old woman presented 4 months postpartum with complaints of fatigue, easy bruising, limited exercise tolerance, and bleeding gums. A blood count showed profound leukocytosis (WBC of 27,000/uL, with identifiable circulating myeloblasts), anemia (Hct of 25%), and thrombocytopenia (platelet count of 40,000/uL). The hypercellular bone marrow contained 50% myeloblasts. She was diagnosed with acute myeloid leukemia and was admitted and treated with standard induction chemotherapy and supportive therapies. Over the course of 10 days, she developed profound pancytopenia, fever, hypotension, renal failure, and coma. Despite aggressive management, she died 2 weeks after diagnosis.

**Comment:** This death certificate identifies the immediate cause of death as pancytopenia and the underlying cause of death as acute myeloid leukemia. In a cause-of-death statement with multiple linked causes, the **underlying cause of death is listed on the lowest line used**. The pregnancy checkbox is appropriately identified as not pregnant, but pregnant 43 days to 1 year before death.

Most maternal deaths due to cancer will not be directly related to the pregnancy or postpartum events. The exception is rare pregnancy-related cancers such as choriocarcinoma. However, correct completion of the pregnancy checkbox in the death record is still critically important to the accurate and efficient collection of data for deaths associated with pregnancy.

## Scenario V

CAUSE OF DEATH (See instructions and examples)		Approximate interval: Onset to death
<p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----&gt; resulting in death)</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p>		<p>Days _____</p> <p>Weeks _____</p>
<p>a. <u>Pancytopenia</u> Due to (or as a consequence of): _____</p> <p>b. <u>Acute myeloid leukemia</u> Due to (or as a consequence of): _____</p> <p>c. _____ Due to (or as a consequence of): _____</p> <p>d. _____</p>		
<p><b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>		<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input checked="" type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

# Vital Statistics Reporting Guidance

## Scenario VI: Woman with ruptured ectopic pregnancy

A 35-year-old woman with a history of sickle cell anemia presented to the emergency room with abdominal pain and nausea. She was treated in the emergency room for what was termed “flu” and sickle cell crisis for about 20 hours until she collapsed and died. The autopsy identified an 11-week-gestation ruptured ectopic pregnancy.

**Comment:** This death certificate identifies the immediate cause of death as intra-abdominal hemorrhage and the underlying cause of death as ruptured ectopic pregnancy. In a cause-of-

death statement with multiple linked causes, the **underlying cause of death is listed on the lowest line used**. The manner of death is natural. The autopsy was noted as performed and findings available to complete the cause of death. The pregnancy checkbox appropriately indicates pregnant at time of death.

Deaths of women of reproductive age should be investigated to determine if the woman was pregnant at the time of death. This will prevent missed maternal deaths due to ectopic pregnancy or other undiagnosed pregnancy complications. The lack of complete reporting of maternal deaths has led to misestimations of the magnitude, leading causes, and timing of maternal deaths.

### Scenario VI

CAUSE OF DEATH (See instructions and examples)			Approximate interval: Onset to death
<p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----&gt; resulting in death)</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p>			
a.	Intra-abdominal hemorrhage	Due to (or as a consequence of):	Minutes _____
b.	Ruptured ectopic pregnancy	Due to (or as a consequence of):	Hours _____
c.	_____	Due to (or as a consequence of):	_____
d.	_____	Due to (or as a consequence of):	_____
<p><b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>		<p>33. WAS AN AUTOPSY PERFORMED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input checked="" type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>	

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

# Vital Statistics Reporting Guidance

## Scenario VII: Suicide of postpartum woman

A 28-year-old woman was found by her husband hanging in a closet in their home. From family interviews, it was noted that she was 12 weeks postpartum after delivering a healthy baby boy. Her husband noticed that she complained of headaches, abdominal pain, and trouble sleeping. For 3 days before her death, she was very tearful and expressed feelings of not being a good mother and wife, as well as feeling guilty about returning to work. Autopsy findings demonstrated a furrow of the neck and pulmonary edema. Toxicology results were negative for drugs of abuse.

**Comment:** This death certificate indicates the cause of death as hanging and manner of death as suicide. The autopsy was noted as performed and findings available to complete the cause of death. The pregnancy checkbox is appropriately completed as not pregnant, but pregnant 43 days to 1 year before death.

This example demonstrates the importance of investigating the history of the decedent in determining her pregnancy or postpartum status. Completing the injury fields also is important, including the “Describe how injury occurred” section (not shown) with the appropriate narrative to specify the circumstances of the injury.

### Scenario VII

<b>CAUSE OF DEATH (See instructions and examples)</b>		Approximate interval: Onset to death  <b>Minutes</b>
<p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----&gt; resulting in death) a. <u>Hanging</u> Due to (or as a consequence of): _____</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p> <p>b. _____ Due to (or as a consequence of): _____</p> <p>c. _____ Due to (or as a consequence of): _____</p> <p>d. _____</p>		
<p><b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>		<p>33. WAS AN AUTOPSY PERFORMED?  <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input checked="" type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input checked="" type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

# Vital Statistics Reporting Guidance

## Scenario VIII: Homicide of pregnant woman

A 31-year-old woman was pronounced dead at the hospital after sustaining a gunshot wound of the chest. The coroner’s scene investigation indicated that she was working at a gas station when she was involved in a verbal altercation in the parking lot with another woman and was shot. Autopsy identified a penetrating gunshot wound of the chest, perforation of the lungs and heart, hemothoraces, and a fetus consistent with about 13 weeks gestation. Toxicology results were negative for drugs of abuse.

**Comment:** This death certificate identifies the cause of death as gunshot wound of the chest and manner of death as homicide. The autopsy was noted as performed and findings available to complete the cause of death. The pregnancy checkbox is appropriately completed as pregnant at time of death. Completing the injury fields also is important, including the “Describe how injury occurred” section (not shown) with the appropriate narrative to specify the circumstances of the injury.

### Scenario VIII

<b>CAUSE OF DEATH (See instructions and examples)</b>		Approximate interval: Onset to death
<p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----&gt; resulting in death)</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p>		<p><b>Minutes</b></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>a. <u>Gunshot wound of the chest</u></p> <p style="text-align: right;">Due to (or as a consequence of):</p> <p>b. _____</p> <p style="text-align: right;">Due to (or as a consequence of):</p> <p>c. _____</p> <p style="text-align: right;">Due to (or as a consequence of):</p> <p>d. _____</p>		
<p><b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>		<p>33. WAS AN AUTOPSY PERFORMED?  <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input checked="" type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input type="checkbox"/> Natural <input checked="" type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

# Vital Statistics Reporting Guidance

## Scenario IX: Woman with postpartum cardiomyopathy

A 40-year-old woman had an uncomplicated pregnancy and delivery at 38 weeks and was discharged home on postpartum day 2. Medical history included mild asthma and prepregnancy body mass index of 33.1. At 2 weeks postpartum, she presented to the emergency room (ER) with right-sided chest pain radiating down her right arm and shortness of breath of 2 hours' duration. Chest X-ray showed cardiomegaly. She was treated with IV morphine, oral hydromorphone, and albuterol/steroid inhalation and was discharged after 3 hours with stable vital signs (BP 121/76 mmHg, P 90/min, RR 16/min). At 6 weeks postpartum, she presented to an ER for chest pain and shortness of breath and a history of nocturnal dyspnea, cough, chest pressure, nausea, and vomiting. She was hypotensive, tachycardic, and tachypneic (BP 84/64 mmHg, P 94/min, RR 26/min), with signs of heart failure, including bilateral lower extremity

edema, a systolic murmur, and pulmonary edema. Chest radiograph showed cardiomegaly and small pleural effusions, and an echocardiogram showed reduced ejection fraction (20%–30%), severe mitral and tricuspid regurgitation, and a dilated and hypokinetic right ventricle. A coronary angiogram showed normal coronary arteries. Aggressive treatment in the intensive care unit, including an intra-aortic balloon pump, was unsuccessful, and she died 7 days after admission. The cause of death was postpartum cardiomyopathy.

**Comment:** This death certificate identifies the immediate cause of death as congestive heart failure and the underlying cause as postpartum cardiomyopathy. The manner of death is natural. An autopsy was considered unnecessary, and the certificate indicates that no autopsy was performed. The pregnancy checkbox is appropriately completed as not pregnant, but pregnant 43 days to 1 year before death.

### Scenario IX

CAUSE OF DEATH (See instructions and examples)		Approximate interval: Onset to death
<p>32. <b>PART I.</b> Enter the <u>chain of events</u>--diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.</p> <p>IMMEDIATE CAUSE (Final disease or condition -----&gt; resulting in death)</p> <p>Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b></p>		<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>a. <u>Congestive heart failure</u> Due to (or as a consequence of):</p> <p>b. <u>Postpartum cardiomyopathy</u> Due to (or as a consequence of):</p> <p>c. _____ Due to (or as a consequence of):</p> <p>d. _____ Due to (or as a consequence of):</p>		<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p><b>PART II.</b> Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p>		<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>35. DID TOBACCO USE CONTRIBUTE TO DEATH?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Probably</p> <p><input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown</p>	<p>36. IF FEMALE:</p> <p><input type="checkbox"/> Not pregnant within past year</p> <p><input type="checkbox"/> Pregnant at time of death</p> <p><input type="checkbox"/> Not pregnant, but pregnant within 42 days of death</p> <p><input checked="" type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death</p> <p><input type="checkbox"/> Unknown if pregnant within the past year</p>	<p>37. MANNER OF DEATH</p> <p><input checked="" type="checkbox"/> Natural <input type="checkbox"/> Homicide</p> <p><input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation</p> <p><input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined</p>

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.



### Appendix II. How Information on Death Certificates is Used to Help Prevent Maternal Deaths

#### Maternal Mortality Review Committees

Maternal mortality review committees (MMRCs) are state- or locality-based multidisciplinary groups, which identify deaths that occurred during or within the year after the end of pregnancy to determine those causally related to pregnancy and make recommendations for prevention of future deaths. Information from death certificates is used to a) help identify deaths for MMRC review and b) provide information that MMRCs use together with additional sources, such as prenatal care, emergency transport, social services, and incarceration records, to develop comprehensive narratives of events and circumstances throughout a woman's life and at the time of her death. By accurately documenting pregnancies on death certificates, certifiers help ensure that MMRCs have identified and reviewed all of the relevant deaths within their jurisdiction.

#### MMRC Success Stories

##### Colorado: Campaign to Prevent Deaths From Pregnancy-associated Depression and Anxiety

Colorado began a campaign to prevent deaths from pregnancy-associated depression and anxiety after the Colorado MMRC noted a large number of deaths from suicide and overdose, making self-harm a leading cause of pregnancy-associated deaths in Colorado (6).

##### Florida: Getting Urgent Maternal Mortality Messages to Providers

Since 2015, the Florida Pregnancy-Associated Mortality Review (PAMR) committee has issued “Urgent Maternal Mortality Messages” informed by PAMR’s findings about leading causes of maternal death in Florida (7).

##### Georgia: Evaluating and Improving the Reporting of Pregnancy Status on Death Certificates

Georgia’s MMRC provides a prime example of maternal mortality data quality improvement (8). Georgia’s MMRC works with the state Department of Public Health to improve maternal mortality case identification through better reporting of pregnancy status on the death certificate. Georgia’s MMRC had found that of death certificates indicating the decedent was pregnant within 1 year of death, about one in four were inaccurate (9).

##### Michigan: Increasing Access to Substance Use Disorder Treatment for Pregnant Women

After finding that more than one-third of pregnancy-associated deaths from 2011 to 2015 were injury-related due to accidental drug overdose, the Michigan Maternal Mortality Surveillance Injury Committee began efforts to increase pregnant women’s access to substance use disorder (SUD) treatment. The initiative includes medical provider education on care coordination and enrollment of pregnant women in the Maternal Infant Health Program, which uses evidence-based screening tools and risk identification for SUDs (10).

##### Ohio: Obstetric Emergency Simulation Trainings

Ohio began implementing obstetric emergency simulation trainings following a recommendation from Ohio’s PAMR committee based on the number of reviewed cases that were related to obstetric emergencies (11).

##### Texas: Evaluating Pregnancy Checkbox Data and Improving Maternal Mortality Reporting

A review of 147 death certificate records with *International Statistical Classification of Diseases, 10th Revision* (ICD–10) obstetric cause-of-death codes (O codes) in Texas found that about 50% of the pregnancy checkboxes incorrectly indicated pregnancy status. The corrected maternal mortality rate was less than one-half of the rate calculated based on the uncorrected death certificate data (12).

#### Public Health Surveillance and Statistics

Death certificate information is used by the Centers for Disease Control and Prevention’s (CDC) Pregnancy Mortality Surveillance System (PMSS), state and local public health agencies, and the National Vital Statistics System to conduct surveillance and monitor trends in maternal mortality over time and among demographic groups. The PMSS uses information from death certificates, independent of ICD–10 cause-of-death coding, to determine whether deaths that occurred during pregnancy or within 1 year following pregnancy are causally related to pregnancy (13). In contrast to PMSS, state and local maternal mortality surveillance is largely based on ICD–10 cause-of-death codes provided through National Center for Health Statistics (NCHS) processing of death certificate records. Although differing in approach, both PMSS and state and local surveillance rely on accurate documentation of pregnancies on death certificates to achieve accurate and effective surveillance of maternal mortality. Accurate documentation of the timing of pregnancy is needed to appropriately classify and code maternal deaths to ensure their inclusion in state and national statistics. Effective surveillance increases understanding of both the causes of maternal deaths and the trends and risk factors associated with these deaths.

### Research

Similar to state and local public health surveillance, maternal mortality researchers primarily use cause-of-death codes from NCHS processing of death certificates. Researchers develop a depth of information related to specific causes of maternal deaths, risk factors, improving systems of risk-appropriate care and health equity, and developing and evaluating interventions. Credible and reliable analyses from researchers, including evaluation of interventions to reduce maternal mortality, depend on complete and accurate information on death certificates and subsequent coding by NCHS.

In 2016, four state health departments (Georgia, Louisiana, Michigan, and Ohio) implemented a pregnancy checkbox quality assurance pilot to improve the accuracy of information from the pregnancy checkbox on death certificates and resulting state maternal mortality estimates (9,14). In these four states, 21% of women with a death associated with pregnancy as indicated by the pregnancy checkbox were confirmed not to have been pregnant through the quality assurance process (9). As a result, these four states were able to develop achievable best practices for validating pregnancy status for timely confirmation or correction (14).

### Agencies and Organizations

Agencies such as CDC, Health Resources and Services Administration, Centers for Medicare & Medicaid Services, National Institutes of Health, and state health departments, as well as professional organizations such as the American College of Obstetricians and Gynecologists, state-based perinatal quality collaboratives, state hospital associations, and state and national nonprofit organizations, use information from MMRCs, public health surveillance, vital statistics, and research to inform actions addressing gaps in systems of care, evaluate and improve policies and programs, allocate resources, and implement interventions for prevention.

### Families and Communities

Like agencies and organizations, families and communities are consumers of maternal mortality information from MMRCs, public health surveillance, and research. This information can help increase awareness among families and communities about warning signs of common maternal causes of death and actions to address emerging threats where pregnancy places women at increased risk, such as pandemic influenza (H1N1) (15). Using documented information about maternal deaths for education and prevention of future deaths is one way to help honor and remember these women.

### Appendix III. Definitions

**Death associated with pregnancy:** A death that occurred during pregnancy, at the time of delivery, or within 1 year postpartum, regardless of the cause, location of pregnancy, or pregnancy outcome.

**ICD cause-of-death code:** Code assigned to each cause of death, typically used in aggregate statistical analysis.

**Immediate cause of death (defined by NCHS):** The final disease, injury, or complication directly causing death.

**Jurisdiction:** Geographic entity, as in state, city, or territory, with authority to make decisions and enact policies.

**Maternal death (defined by WHO):** “The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes” (4). Additionally,

- Maternal deaths are a subset of deaths associated with pregnancy.
- This definition is the primary definition used by WHO and NCHS for maternal mortality used in international comparisons.

**Maternal Mortality Review Committee:** A multidisciplinary group of professionals with expertise in maternal health, which identifies and reviews pregnancy-associated deaths to determine factors associated with or that caused the deaths, and makes recommendations to prevent future deaths.

**Underlying cause of death (defined by WHO):** Either “(a) the disease or injury which initiated the chain of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury” (4).

**Vital record:** Report of live birth, death, fetal death, marriage (divorce, dissolution of marriage, or annulment), and data related to such reports, which have been accepted for registration and incorporated into the official records of a vital records and statistics office.

**Vital records and statistics office:** Government office with legal responsibility to collect, store, and disseminate records of vital events.

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