

Appendix 1. International Classification of Diseases-10 Codes Used to Define Pregnancy-Associated Deaths Due to Drug Overdose, Suicide, and Homicide

Cause	Description	Included ICD-10 codes
Drug-related death	Comprises unintentional and undetermined-intent deaths due to drug poisoning, drug-induced diseases, and mental/behavioral disorders due to drugs. ⁵⁶ Drug classes include opiates & narcotics, sedatives/hypnotics, stimulants, and other psychotropics. Category <i>excludes</i> deaths coded as suicides or homicides. We chose a broad definition of drug-related deaths to account for geographic and temporal variability in coroner/medical examiner coding practices, deaths involving multiple drugs, and drug availability and lethality.	X40-X44; Y10-Y14; D52.1, D59.0, D59.2, D61.1, D64.2, E06.4, E16.0, E23.1, E24.2, E27.3, E66.1, G21.1, G24.0, G25.1, G25.4, G25.6, G44.4, G62.0, G72.0, I95.2, J70.2-J70.4, K85.3, L10.5, L27.0, L27.1, M10.2, M32.0, M80.4, M81.4, M83.5, M87.1, R50.2; R78.1-R78.5; F11.0-F11.5, F11.7-F11.9, F12.0-F12.5, F12.7-F12.9, F13.0-F13.5, F13.7-F13.9, F14.0-F14.5, F14.7-F14.9, F15.0-F15.5, F15.7-F15.9, F16.0-F16.5, F16.7-F16.9, F18.0-F18.5, F18.7-F18.9, F19.0-F19.5, F19.7-F19.9.
Suicide	Comprises all deaths with self-harm intent, including via poisoning, firearm, drowning, fire/flame, sharp/blunt object, jumping from high place, motor vehicle crash, suffocation, hanging, or other specified/unspecified means.	X60 to X84, Y87.0, or U03 *Alternative definition includes Y10-Y19 (poisoning deaths of undetermined intent) as suicide instead of drug-related
Homicide	Comprises all deaths caused by another person, including via firearm, object, pushing from high place or in front of moving object, motor vehicle, neglect/abandonment, or other means. Category includes homicide via poisoning from drugs, which is historically uncommon but is increasing. We will assess the contribution of such drug homicides in our analyses.	X85-X90, X91, X93-X95, Y00-Y09, or Y87.1

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Appendix 2. Classification of Pregnancy-Associated Mortality by International Classification of Diseases-10 Code Among Women With Unknown Pregnancy Status

Temporality	ICD-10 Codes	Definition
Pregnancy	O001, O009, O019, O021, O035, O036, O039, O063, O068, O069, O077	Pregnancy with abortive outcome
	O210, O223, O225, O229, O235, O244, O249, O269	Other maternal disorders predominantly related to pregnancy
	O364, O441, O459, O460, O468, O469	Maternal care related to the fetus and amniotic cavity and possible delivery problems
	O622, O711	Complications of labor and delivery
Postpartum	O720, O721	Postpartum hemorrhage
	O850	Puerperal sepsis
	O903	Cardiomyopathy in the puerperium
	O908	Other classification of the puerperium not elsewhere classified
Pregnant 43 days to 1 year before death	O96	Death from any cause occurring more than 42 d but less than 1 year from delivery
Timing indeterminate	O266, O268, O364, O690, O753, O754, O759, O881, O882, O95, O985, O988, O990, O991, O992, O993, O994, O996, O998	

ICD-10, International Classification of Diseases, 10th revision.

Reprinted from Wallace ME, Hoyert D, Williams C, Mendola P. Pregnancy-associated homicide and suicide in 37 US states with enhanced pregnancy surveillance. *Am J Obstet Gynecol.* 2016 Sep;215(3):364.e1-364.e10. doi: 10.1016/j.ajog.2016.03.040. Copyright 2016, with permission from Elsevier.

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Appendix 3. Number and Percent of Deaths of Female Decedents Aged 15-44 Years, Overall and by Timing Relative to Pregnancy in 32 U.S. States and the District of Columbia, 2010–2019

Characteristics of decedent	All female deaths ages 15-44		Neither pregnant nor pregnant within 1 year of death		Timing relative to pregnancy						Pregnant within a year, but exact timing unknown	
	n	column %	n	column %	Pregnant at time of death		Pregnant within 42 days of death		Pregnant 43-365 days before death		n	column %
Total deaths	315,539		304,948		4,105		2,845		3,427		214	
Age	n	column %	n	column %	n	column %	n	column %	n	column %	n	column %
15-19	18,267	5.8%	17,665	5.8%	284	6.9%	116	4.1%	195	5.7%	<10	3.3%
20-24	31,508	10.0%	9,488	9.7%	807	19.7%	447	15.7%	734	21.4%	32	15.0%
25-29	41,689	13.2%	39,094	12.8%	977	23.8%	648	22.8%	929	27.1%	41	19.2%
30-34	54,453	17.3%	52,037	17.1%	856	20.9%	759	26.7%	760	22.2%	41	19.2%
35-44	169,622	53.8%	166,664	54.7%	1,181	28.8%	875	30.8%	809	23.6%	93	43.5%
Race or ethnicity												
Non-Hispanic White	193,334	61.3%	187,884	61.6%	2,130	51.9%	1,284	45.1%	1,958	57.1%	78	36.4%
Non-Hispanic Black	67,757	21.5%	64,783	21.2%	1,137	27.7%	913	32.1%	836	24.4%	88	41.1%
Hispanic	40,225	12.7%	38,608	12.7%	645	15.7%	472	16.6%	463	13.5%	37	17.3%
Non-Hispanic American Indian or Alaska Native	7,023	2.2%	6,788	2.2%	85	2.1%	58	2.0%	86	2.5%	<10	2.8%
Non-Hispanic Asian or Pacific Islander	7,200	2.3%	6,885	2.3%	108	2.6%	118	4.1%	84	2.5%	<10	2.3%
Educational attainment												
Less than high school	61,462	19.5%	59,344	19.5%	873	21.3%	560	19.7%	642	18.7%	43	20.1%
High school diploma	121,727	38.6%	117,546	38.5%	1,661	40.5%	1,061	37.3%	1,378	40.2%	81	37.9%
Some college	84,100	26.7%	81,406	26.7%	1,067	26.0%	705	24.8%	872	25.4%	50	23.4%
Bachelor's degree or more	42,222	13.4%	40,770	13.4%	455	11.1%	474	16.7%	492	14.4%	31	14.5%
Unknown	6,028	1.9%	5,882	1.9%	49	1.2%	45	1.6%	43	1.3%	<10	4.2%
Marital status												
Married	97,772	31.0%	93,708	30.7%	1,410	34.3%	1,231	43.3%	1,333	38.9%	90	42.1%
Not married	217,767	69.0%	211,240	69.3%	2,695	65.7%	1,614	56.7%	2,094	61.1%	124	57.9%

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Appendix 4. Calculations for Underreporting Drug-Related Deaths, Suicide, and Homicide

Cause of death	a) Observed pregnancy-associated death count	b) Observed pregnancy-associated death ratio	c) Proportion of total if assume level of under-reporting found in Horon & Cheng(16)	d) Expected pregnancy-associated death count (<i>a/c</i>)	e) Missed number of deaths (<i>d - a</i>)	f) Expected pregnancy-associated death ratio (100,000 x [<i>d</i> /28,856,437])	g) Observed % of all pregnancy-associated deaths*	h) Expected % of all pregnancy-associated deaths+ (100*[<i>d</i> / [11,782 +e1+e2+e3]])
Drug-related	1,349	4.7	.359	3,758	e1) 2,409	13.0	11.4	23.6
Suicide	634	2.2	.429	1,478	e2) 844	5.1	5.4	9.3
Homicide	636	2.2	.425	1,496	e3) 860	5.2	5.4	9.4

*From Table 1

†After accounting for under-reporting in all 3 categories

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Appendix 5. Count and Ratio of Pregnancy-Associated Deaths by Cause Using Original Estimates, Excluding California and Maryland, and Excluding Women Over 40 Years of Age, 2010–2019

Year	Drug-related deaths			Suicide			Homicide		
	Original estimates	Excluding CA and MD	Excluding women >40 years	Original estimates	Excluding CA and MD	Excluding women >40 years	Original estimates	Excluding CA and MD	Excluding women >40 years
	Count (ratio)			Count (ratio)			Count (ratio)		
2010	80 (2.7)	66 (2.8)	72 (2.4)	56 (1.9)	47 (2.0)	53 (1.8)	54 (1.8)	39 (1.7)	52 (1.8)
2011	108 (3.7)	100 (4.3)	104 (3.6)	65 (2.2)	54 (2.3)	60 (2.1)	56 (1.9)	47 (2.0)	56 (1.9)
2012	83 (2.8)	75 (3.2)	79 (2.7)	53 (1.8)	44 (1.9)	50 (1.7)	44 (1.5)	38 (1.6)	44 (1.5)
2013	97 (3.3)	80 (3.4)	95 (3.3)	57 (2.0)	51 (2.2)	55 (1.9)	65 (2.2)	59 (2.5)	63 (2.2)
2014	99 (3.4)	93 (3.9)	96 (3.3)	71 (2.4)	60 (2.5)	64 (2.2)	54 (1.8)	48 (2.0)	53 (1.8)
2015	121 (4.1)	110 (4.6)	115 (3.9)	63 (2.2)	52 (2.2)	58 (2.0)	45 (1.5)	43 (1.8)	45 (1.5)
2016	155 (5.3)	135 (5.7)	149 (5.1)	66 (2.3)	61 (2.6)	64 (2.2)	77 (2.6)	64 (2.7)	73 (2.5)
2017	184 (6.5)	165 (7.2)	176 (6.2)	49 (1.7)	43 (1.9)	47 (1.7)	81 (2.9)	71 (3.1)	81 (2.9)
2018	206 (7.4)	190 (8.4)	197 (7.1)	85 (3.1)	73 (3.2)	82 (2.9)	78 (2.8)	71 (3.1)	78 (2.8)
2019	216 (7.8)	199 (8.9)	206 (7.5)	69 (2.5)	63 (2.8)	66 (2.4)	82 (3.0)	75 (3.4)	82 (3.0)
Total	1349 (4.7)	1213 (5.2)	1289 (4.5)	634 (2.2)	548 (2.4)	599 (2.1)	636 (2.2)	555 (2.4)	627 (2.2)

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Year	Obstetric deaths			Other deaths		
	Original estimates	Excluding CA and MD	Excluding women >40 years	Original estimates	Excluding CA and MD	Excluding women >40 years
	Count (ratio)			Count (ratio)		
2010	618 (20.9)	521 (22.0)	572 (19.4)	263 (8.9)	235 (9.9)	247 (8.4)
2011	679 (23.3)	586 (25.1)	618 (21.2)	269 (9.2)	232 (9.9)	235 (8.1)
2012	660 (22.6)	567 (24.2)	597 (20.5)	182 (6.2)	161 (6.9)	180 (6.2)
2013	728 (25.1)	641 (27.5)	648 (22.4)	213 (7.3)	190 (8.1)	201 (6.9)
2014	716 (24.3)	619 (26.2)	639 (21.7)	227 (7.7)	202 (8.5)	215 (7.3)
2015	686 (23.4)	599 (25.3)	620 (21.1)	242 (8.2)	218 (9.2)	237 (8.1)
2016	718 (24.7)	624 (26.6)	645 (22.2)	189 (6.5)	161 (6.9)	184 (6.3)
2017	711 (25.1)	613 (26.7)	658 (23.2)	203 (7.2)	175 (7.6)	202 (7.1)
2018	703 (25.2)	607 (26.8)	634 (22.7)	224 (8.0)	198 (8.7)	215 (7.7)
2019	770 (28.0)	681 (30.4)	708 (25.7)	162 (5.9)	144 (6.4)	159 (5.8)
Total	6989 (24.2)	6058 (26.0)	6339 (22.0)	2174 (7.5)	1916 (8.2)	2075 (7.2)

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Appendix 7. Number of Pregnancy-Associated Deaths by Cause and Year, Comparing Original Definition of Drug-Related Deaths and Suicide to Alternative Definition*

Measure	Pregnancy-associated deaths				Number of births
	Original definition		Alternative definition*		
	Drug-Related	Suicide	Drug-Related	Suicide	
Number of deaths					
Year					
2010	80	56	70	66	2,954,034
2011	108	65	101	72	2,914,824
2012	83	53	78	58	2,915,408
2013	97	57	90	64	2,898,700
2014	99	71	90	80	2,943,675
2015	121	63	110	74	2,936,361
2016	155	66	148	73	2,911,965
2017	184	49	171	62	2,838,136
2018	206	85	196	95	2,789,355
2019	216	69	208	77	2,753,979
All years	1349	634	1262	721	28,856,437
Pregnancy-associated death ratio*	4.7	2.2	4.4	2.5	--
Percent of all deaths	11.4%	5.4%	10.7%	6.1%	--

$$* \text{Pregnancy-associated death ratio} = \frac{\text{pregnancy-associated deaths}_c}{\text{live births}} \times 100,000$$

*Alternative definition includes Y10-Y19 (poisoning deaths of undetermined intent) as suicide instead of drug-related.

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