COMMONWEALTH of VIRGINIA
Department of Health
Karen Shelton, MD
State Health Commissioner
P O BOX 2448
RICHMOND, VA 23218
TTY 7-1-1 OR
1-800-828-1120

July 3, 2023

MEMORANDUM

TO: The Honorable Janet D. Howell
Co-Chair, Senate Finance and Appropriations Committee

The Honorable George L. Barker
Co-Chair, Senate Finance and Appropriations Committee

The Honorable Barry D. Knight
Chair, House Appropriations Committee

The Honorable Terry L. Austin
Vice Chair, House Appropriations Committee

FROM: Karen Shelton, MD
State Health Commissioner, Virginia Department of Health

SUBJECT: Triennial Maternal Mortality Review Team Report

This report is submitted in compliance with the Virginia Acts of the Assembly – § 32.1-283.8 (G).

> *The Team shall compile triennial statistical data, which shall be made available to the Governor and the General Assembly. Any statistical compilations prepared by the Team shall be public record and shall not contain any personal identifying information.*

Should you have any questions or need additional information, please feel free to contact me at (804) 864-7002.

KS/AJ
Enclosure

Pc: The Honorable John Littel, Secretary of Health and Human Resources

2023

Virginia Maternal Mortality Review Team Triennial Report: 2018-2020

VIRGINIA DEPARTMENT OF HEALTH
OFFICE OF THE CHIEF MEDICAL EXAMINER

VIRGINIA MATERNAL MORTALITY REVIEW TEAM

2022 Triennial Report: 2018-2020

Mission Statement

Virginia's Maternal Mortality Review Team is dedicated to the identification and review of all pregnancy-associated deaths in the Commonwealth and the development of interventions that reduce preventable deaths.

This report is supported in part by a Grant Number B04MC21433 from the Maternal and Child Health Bureau (Title V, Social Security Act), Health Resources and Services Administration, U.S. Department of Health and Human Services.

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Executive Summary

The Virginia Maternal Mortality Review Team (MMRT) is proud to present the 2022 Triennial Report as mandated by Code of Virginia, § 32.1-283.8. This report provides a three-year overview of the patterns and trends in pregnancy-associated deaths in the state of Virginia from 2018 to 2020. Data for 2019-2020 is preliminary.[1] Pregnancy-associated death is defined as "the death of a woman while pregnant or within one year of pregnancy regardless of the outcome of the pregnancy or the cause of death."[2] The MMRT is dedicated to understanding the circumstances surrounding each of these deaths so that strategies can be developed to reduce maternal mortality across the Commonwealth. The MMRT is an ongoing collaborative effort led by the Virginia Department of Health's Office of Family Health Services and Office of the Chief Medical Examiner.

Data Highlights

- From 2018 to 2020, there were 170 pregnancy-associated deaths in the State of Virginia.
- During this time, the pregnancy-associated death rate increased from 37.1 to 86.6 per 100,000 live births.
- Approximately 41% of deaths occurred between 43 days and 365 days after the end of the pregnancy.
- Over 30% of pregnancy-associated deaths involved women ages 35 and older.
    - Pregnancies over 35 are considered high-risk and account for 20.8% of all live births from 2018-2020.
- The Eastern Health Planning Region had the highest rate of pregnancy-associated deaths at 84.0 per 100,000 live births, followed by the Central (61.5 per 100,000 live births) and Southwestern (60.0 per 100,000 live births) Health Planning Regions.
- Black women continue to experience higher rates of pregnancy-associated deaths when compared to their White counterparts.
- Black women are more likely to die from cardiac disorders, cancers, and the exacerbation of chronic illness than other races.
- Statistically, white women were significantly more likely to die of accidental causes than any other race ($p<.01$).
- Statistically, black women were significantly more likely to die by homicide than any other race ($p<.01$).
- The rate of pregnancy-associated deaths by suicide increased from 1.0 per 100,000 live births in 2018 to 7.4 per 100,000 live births in 2020.
- Approximately 88% of accidental deaths were from accidental overdoses.
- The rate of accidental overdoses also increased from 12.0 per 100,000 live births in 2018 to 22.2 per 100,000 live births in 2020.
- Pregnancy-associated death rates were consistently higher in non-rural areas versus rural areas.

[1] It is estimated that data for 2019 and 2020 will be finalized by September of 2023.

[2] Association for Maternal and Child Health Programs. (2022, August 8). Definitions. Retrieved from Review to Action: https://reviewtoaction.org/learn/definitions

Introduction

This report presents the pregnancy-associated deaths identified and tracked by the Virginia Maternal Mortality Surveillance Program (MMSP) housed in the Virginia Department of Health (VDH), Office of the Chief Medical Examiner. Data from the MMSP are also used for the review of these deaths by the MMRT.

Data Collection and Preparation

The data in this report reflect pregnancy-associated deaths that fall under the purview of the Virginia Maternal Mortality Review Team and are tracked using the Pregnancy-Associated Mortality Surveillance System. Several methods are utilized to identify cases of Pregnancy Associated Death (PAD) in Virginia. First, the VDH Office of Vital Records identifies cases of pregnancy-associated death in three categories: 1) examining the death certificate check box related to pregnancy status; 2) reviewing death certificate cause of death indicating death was directly attributable to pregnancy; and 3) matching death certificates of women of reproductive age with birth and fetal death certificates to identify deaths occurring among women who delivered in the year preceding death. Additional cases are identified through the Virginia Violent Death Reporting System (VVDRS). Using information obtained from the death certificates, birth certificates, and fetal death certificates and the VVDRS, the Maternal Mortality Program Managers identify and request records or abstracts records from the hospital where the birth or pregnancy occurred, birth attendants records, hospital records where the death occurred, autopsy records, and the Medical Examiner case investigation records. These records are used to confirm that the decedent was pregnant within 365 days of death.

Statistical Summary

- Data are based upon Virginia residents who died a pregnancy-associated death within the state.
- Rates:
    - Rates are per 100,000 live births among the specific Virginia population being described. This is the standard method both nationally and internationally. All rates in this report are per 100,000 live births unless otherwise noted.
    - Rates calculated from small case amounts (< 5) are considered unreliable and should be interpreted with caution.
    - Live birth numbers are used to depict the risk of maternal death relative to the number of live births during the same time period and essentially captures the risk of death in a single pregnancy or a single live birth event.
- Race/Ethnicity:
    - Race is presented as White, Black, and Other. This is a standard classification method in the OCME and other VDH offices.
    - White and Black races represent those who have been identified as of non-Hispanic ethnicity.
    - 'Other' races are persons who are identified as being of Asian or Native American race or Hispanic ethnicity.

Overview of Maternal Mortality Projects

Pregnancy-Associated Mortality Surveillance System

The Pregnancy-Associated Mortality Surveillance System (PAMSS) collects information on all pregnancy-associated deaths among Virginia residents. This surveillance system allows for the identification and monitoring of patterns and trends related to pregnancy-associated deaths in Virginia, provides a

snapshot of maternal mortality, and helps inform policy decisions of public health importance. Data from PAMSS includes not only surveillance data, but also data collected from the Maternal Mortality Review Team Process. Current PAMSS data indicates pregnancy-associated deaths in Virginia remain a significant public health problem.

Maternal Mortality Review Team

Virginia's Maternal Mortality Review Team (MMRT) is one of the longest continuously functioning multidisciplinary review teams in the United States. The MMRT was established in March 2002 as a partnership between the Office of Family Health Services and the OCME. The team was codified during the 2019 General Assembly session via House Bill 2546 effective July 1, 2019, with the OCME continuing to provide coordination for the team. The MMRT is multidisciplinary and includes representatives from the Medical Society of Virginia; Virginia Section of the American College of Obstetricians and Gynecologists; Virginia College of Emergency Physicians; Virginia Chapter of the American College of Nurse Midwives; Association of Women's Health, Obstetrics and Neonatal Nurses; Virginia Chapter of the National Association of Social Workers; Virginia Hospital and Healthcare Association; Virginia Sexual and Domestic Violence Action Alliance; Virginia Dietetic Association; local health departments; and state planning agencies. Maternal mortality review is supported by the Virginia Department of Health, Office of Family Health Services with Title V funds from the U.S. Department of Health and Human Services, Maternal and Child Health Bureau (see Appendix A).

Virginia's MMRT is dedicated to the identification of all pregnancy-associated deaths in the Commonwealth and the development of recommendations for interventions in order to reduce preventable deaths. The team collects records from the hospital where the birth or pregnancy-related issue, concern, or termination occurred; the birth attendant's records; hospital records where the death occurred; the autopsy records; and the Medical Examiner case investigation records. The team also collects records from other health care providers and specialists, social service agencies, and mental health facilities to ensure that each review is comprehensive and thoroughly assesses the woman's life, health, and healthcare utilization in the five years prior to her death. The team reviews each case to determine the community-related, patient-related, healthcare facility-related, and/or healthcare provider-related factors that contributed to the woman's death. Consensus decision-making is used to determine whether the death was preventable and/or related to the pregnancy. The team also assesses or recommends needed changes in the care received that may have led to better outcomes.

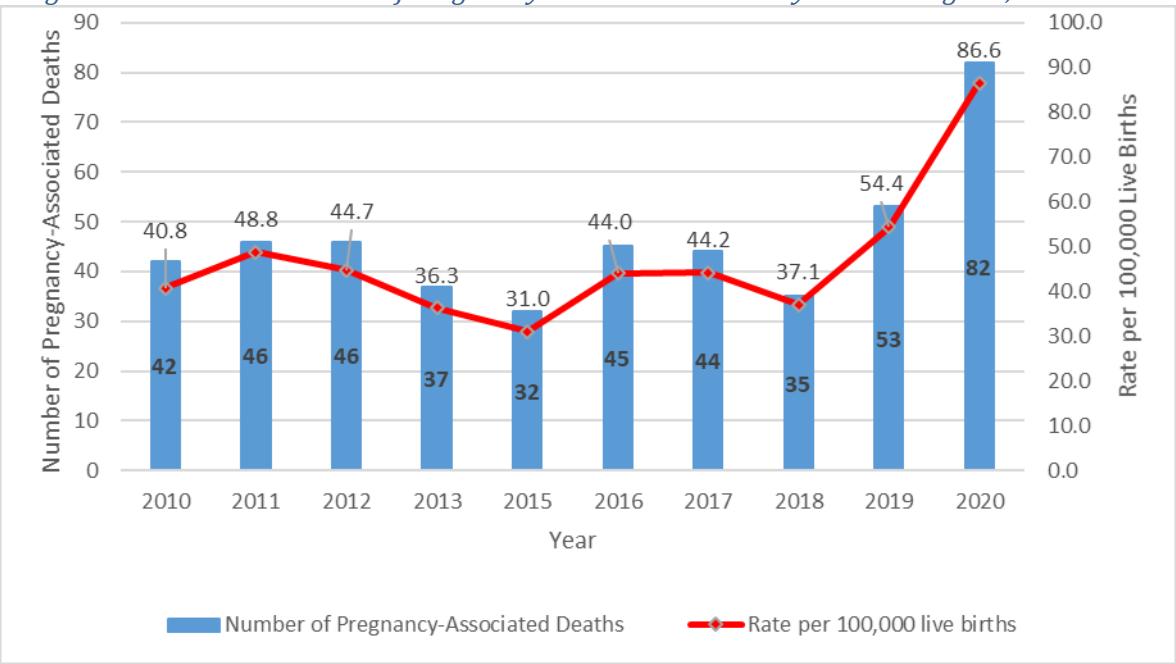
Section 1: Total Pregnancy-Associated Deaths (PAD)

Between 2010 and 2020,[3] 462 women died of a PAD in Virginia. The number of deaths and rate of deaths varied from year to year, with rates for 2019 and 2020 suggesting an increase in recent years (Figure 1). The overall maternal mortality rate[4] was 46.8 deaths per 100,000 live births during this period. Preliminary numbers for the years 2019 and 2020 suggest that maternal mortality rates in Virginia have increased significantly ($p<0.05$) (Figure 1).

[3] Data for 2014 is unavailable due to significant errors on the pregnancy checkbox in the Electronic Death Reporting System. Data for 2019 and 2020 is preliminary.

[4] Rate provided is the Maternal Mortality Rate (MMR), which is calculated by dividing the number of deaths in a category by the number of live births and then multiplying that number by 100,000. The MMR is the standard measure for evaluating maternal morbidity and mortality.

Figure 1.1: Number and Rate of Pregnancy-Associated Deaths by Year in Virginia, 2010-2020



From 2018 to 2020, there were 170 pregnancy-associated deaths identified in the state of Virginia. This represents an increase in the both the total number of pregnancy-associated deaths and the pregnancy-associated death rate for these years compared to the previous 3 years (2015-2017) when the total number of pregnancy-associated deaths was 121. The pregnancy-associated death rate more than doubled from 2018 to 2020, although this result should be interpreted with caution given the small number of deaths in each year. Black women continue to have higher rates of pregnancy-associated deaths compared to their White counterparts at rates of 89.5 vs. 53.5, respectively. It is important to note that while there was an increase in all other manners of death, the number of accidental deaths did not increase proportionally: in 2018, accidental deaths represented 37.1% of all pregnancy-associated deaths, and decreased to 28.0% of all pregnancy-associated deaths by 2020. There was also a significant increase in the proportion of suicides from 2.9% of all PAD in 2018 to 8.5% in 2020. Additionally, there were three pregnancy-associated deaths during this time that were of undetermined cause and manner (see Table 1.1).

Table 1.1: Overall Pregnancy-Associated Deaths: Selected Variables Highlighted by Year, 2018-2020

	2018 (*n* = 35)			2019 (*n* = 53)			2020 (*n* = 82)			Total (*n* = 170)		
Pregnancy-Associated Rate	**37.1**			**54.4**			**86.6**			**59.4**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Manner												
Natural	17	48.6	17.1	28	52.8	28.7	42	51.2	44.4	87	51.2	29.8
Accidental	13	37.1	13.0	21	39.6	21.6	23	28.0	24.3	57	33.3	19.5
Homicide	4	11.4	4.0	3	5.7	3.1	8	9.8	8.5	15	9.0	5.1
Suicide	1	2.9	1.0	0	0.0	0.0	7	8.5	7.0	8	4.8	2.7
Undetermined	0	0.0	0.0	1	1.9	1.0	2	2.4	2.1	3	1.8	1.0
Race												
White	19	54.3	30.8	27	50.9	44.9	51	62.2	84.9	97	57.1	53.9
Black	11	31.4	52.4	22	41.5	103.3	24	29.3	112.8	57	33.5	80.5
Other	5	15.0	29.3	4	7.5	24.9	7	8.5	43.6	16	7.6	26.6
Age												
19 and under	2	5.7	52.0	3	5.7	82.1	3	3.7	85.4	8	4.7	72.7
20-24	5	14.3	29.3	8	15.1	48.4	10	12.2	64.0	23	13.5	46.7
25-29	15	42.9	54.0	12	22.6	44.6	17	20.7	66.0	44	25.9	54.7
30-34	7	20.0	22.9	9	17.0	29.8	23	28.0	77.5	39	22.9	43.1
35-39	3	8.6	17.9	13	24.5	79.2	19	23.2	116.9	35	20.6	70.8
40 and over	3	8.6	81.3	8	15.1	211.6	10	12.2	257.6	21	12.4	185.0
Education												
Less than High School	2	5.7	2.0	7	13.2	7.2	17	20.7	17.9	26	15.3	8.9
High School Diploma	22	62.9	22.1	27	50.9	27.7	28	34.2	29.5	77	45.3	26.4
More than High School	11	31.4	11.0	19	35.8	19.5	37	45.1	39.0	67	39.4	23.0
Interval Between End of Pregnancy and Death												
Pregnant at the Time of	16	45.7	16.1	21	39.6	20.5	27	32.9	28.5	63	37.7	21.6

	2018 (*n* = 35)			2019 (*n* = 53)			2020 (*n* = 82)			Total (*n* = 170)		
Pregnancy-Associated Rate	**37.1**			**54.4**			**86.6**			**59.4**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Death												
0-42 days	7	20.0	7.0	14	26.4	13.3	16	19.5	16.9	36	21.6	12.3
43-365 days	12	34.3	12.0	18	34.0	17.4	39	47.6	41.2	68	40.7	23.3

	2018 (*n* = 35)			2019 (*n* = 53)			2020 (*n* = 82)			Total (*n* = 170)		
Pregnancy-Associated Rate	**37.1**			**54.4**			**86.6**			**59.4**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Health Planning Region												
Central	9	25.7	45.0	13	24.5	66.5	14	17.1	74.0	36	21.2	61.5
Eastern	10	28.6	50.0	18	34.0	92.5	21	25.6	111.0	49	28.8	84.0
Northern	4	11.4	20.0	9	17.0	46.0	11	13.4	58.0	24	14.1	41.0
Northwest	3	8.6	15.0	7	13.2	36.0	16	19.5	84.5	26	15.3	44.5
Southwest	9	25.7	45.0	6	11.3	31.0	20	24.4	105.5	35	20.6	60.0
Rural vs. Non-Rural Areas												
Rural Areas	8	22.8	26.0	10	18.9	33.1	22	26.8	74.8	40	23.5	44.3
Non-Rural Areas	27	77.1	39.5	43	81.1	64.0	60	73.2	91.7	130	76.5	64.7

Figure 1.2: Percent of Pregnancy-Associated Deaths by Manner of Death, 2018-2020

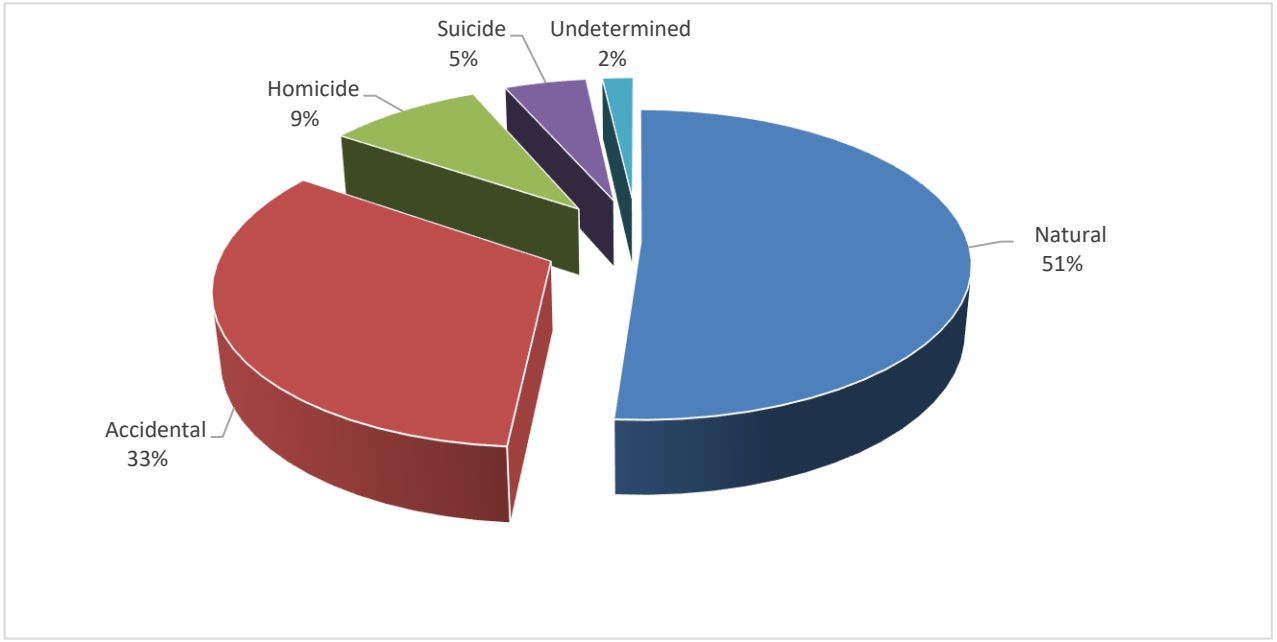
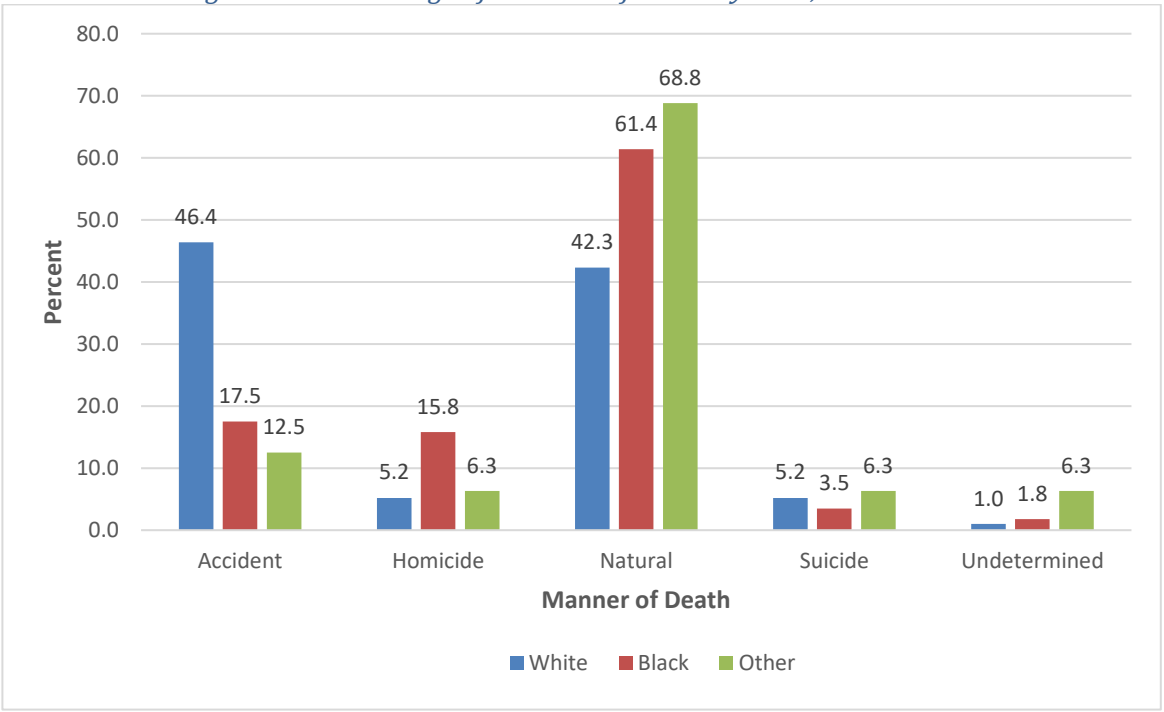


Figure 1.3: Percentage of Manners of Death by Race, 2018 – 2020.



Section 2: Manners of Death

Natural Deaths

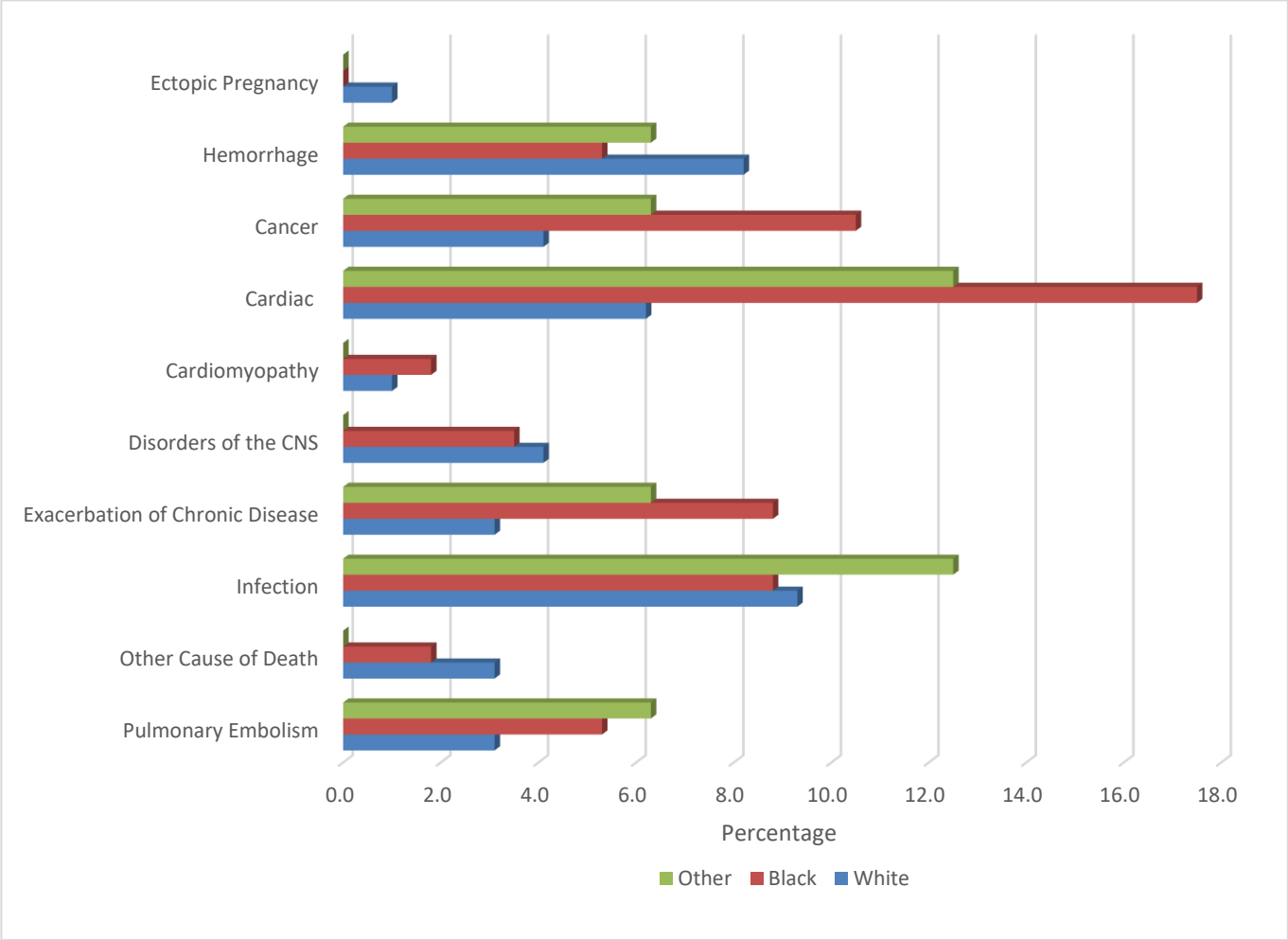
The pregnancy-associated death rates for all causes of natural deaths more than doubled, from 17.1 in 2018 to 44.4 in 2020, with the exception of the exacerbation of chronic diseases and pulmonary embolisms. Both the exacerbation of chronic diseases and pulmonary embolisms decreased slightly during the same time period. Black women consistently had higher rates of natural pregnancy-associated deaths when compared to their White counterparts. In 2019, the rate for Black women was over three times as high as the rate for White women (65.8 vs. 18.3, respectively).

Table 2.1: Natural Pregnancy-Associated Deaths, 2018-2020: Selected Characteristics

	2018 (*n* = 17)			2019 (*n* = 28)			2020 (*n* = 42)			Total (*n* = 87)		
Pregnancy-Associated Rate	**17.1**			**28.7**			**44.4**			**30.1**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Race												
White	5	29.4	8.1	11	39.3	18.3	25	59.5	42.9	41	47.1	22.8
Black	8	47.1	38.1	14	50.0	65.8	13	31.0	62.9	35	40.2	55.8
Other	4	23.6	23.4	3	10.7	18.7	4	9.5	25.4	11	12.6	22.5
Cause of Death												
Cancer	1	5.9	1.0	4	14.3	4.1	6	14.3	6.3	11	12.6	3.8
Cardiac	4	23.5	4.0	5	17.9	5.1	8	19.0	8.5	17	19.5	5.8
Cardiomyopathy	1	5.9	1.0	0	0.0	0.0	1	2.4	1.1	2	2.3	0.7
Disorders of the Central Nervous System	1	5.9	1.0	0	0.0	0.0	4	9.5	4.2	5	5.7	1.7
Ectopic Pregnancy	0	0.0	0.0	0	0.0	0.0	1	2.4	1.1	1	1.1	0.3
Exacerbation of Chronic Disease	2	11.8	2.0	4	14.3	4.1	3	7.1	3.2	9	10.3	3.1
Hemorrhage	2	11.8	2.0	3	10.7	3.1	7	16.7	7.4	12	13.8	4.1
Infection	3	17.6	3.0	5	17.9	5.1	8	19.0	8.5	16	18.4	5.5
Pulmonary Embolism	2	11.8	2.0	5	17.9	5.1	2	4.8	2.1	9	10.3	3.1
Other Cause of Death	0	0.0	0.0	2	7.1	2.1	2	4.8	2.1	4	4.6	1.3
Undetermined	1	5.9	1.0	0	0.0	0.0	0	0.0	0.0	1	1.1	0.3
Age												
19 and under	0	0.0	0.0	0	0.0	0.0	1	2.4	28.5	1	1.1	9.1
20-24	2	11.8	11.7	3	10.7	18.2	3	7.1	19.2	8	9.2	16.2
25-29	6	35.3	21.6	6	21.4	22.3	8	19.0	31.1	20	23.0	24.9
30-34	4	23.5	13.1	4	14.3	13.3	9	21.4	30.3	17	19.5	18.8
35-39	2	11.8	11.9	9	32.1	54.9	12	28.6	73.8	23	26.4	46.6
40 and over	3	17.6	81.2	6	21.4	158.7	9	21.4	231.8	18	20.7	202.6
Education												
Less than High School	0	0.0	0.0	2	7.1	2.1	8	19.1	7.4	10	11.5	3.4

	2018 (*n* = 17)			2019 (*n* = 28)			2020 (*n* = 42)			Total (*n* = 87)		
Pregnancy-Associated Rate	**17.1**			**28.7**			**44.4**			**30.1**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
High School Diploma	11	64.7	11.0	15	53.6	15.4	14	33.3	14.8	40	46.0	13.7
More than High School	6	35.3	6.0	11	39.3	11.3	20	47.6	21.1	37	42.5	12.7
Interval Between End of Pregnancy and Death												
Pregnant at the Time of Death	7	41.2	7.0	9	32.1	9.2	15	35.7	15.8	31	35.6	10.6
0-42 days	5	29.4	5.0	9	32.1	9.2	11	26.2	11.6	25	28.7	8.6
43-365 days	5	29.4	4.0	10	35.7	10.3	16	38.1	16.9	31	35.6	10.6
Health Planning Region												
Central	5	29.4	25.0	9	32.1	46.0	8	19.0	42.5	22	25.3	37.5
Eastern	3	17.6	15.0	10	35.7	51.0	10	23.8	53.0	23	26.4	39.5
Northern	3	17.6	15.0	5	17.9	25.5	7	16.7	37.5	15	17.2	20.5
Northwest	1	5.9	5.0	1	3.6	5.0	8	19.0	42.5	10	11.5	17.0
Southwest	5	29.4	25.0	3	10.7	15.5	9	21.4	57.5	17	19.5	29.0

Figure 2.1: Percentage of Natural Causes of Death by Race, 2018-2020



Accidental Deaths

The pregnancy-associated death rate for accidental causes increased each year, from 13.0 in 2018 to 24.3 in 2020. Nearly 88% of these deaths were from accidental overdoses across all three years. In 2020, there were 21 total pregnancy-associated deaths related to accidental overdoses. This is the highest total number of accidental overdoses for any given year in the Pregnancy-Associated Mortality Surveillance System. Among White decedents, the rate of accidental pregnancy-associated deaths is consistently higher than their Black counterparts for each year.

Table 2.2: Accidental Pregnancy-Associated Deaths, 2018-2020: Selected Characteristics

	2018 (*n* = 13)			2019 (*n* = 21)			2020 (*n* = 23)			Total (*n* = 57)		
Pregnancy-Associated Rate	**13.0**			**21.6**			**24.3**			**19.6**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Race												
White	12	92.3	19.5	15	71.4	25.0	18	78.3	30.9	45	78.9	25.0
Black	1	7.7	4.8	5	23.8	23.5	4	17.4	19.4	10	17.5	15.9
Other	0	0.0	0.0	1	4.8	6.2	1	4.3	6.4	2	3.5	0.7
Cause of Death												
Drowning	0	0.0	0.0	0	0.0	0.0	1	4.3	1.1	1	1.8	0.3
Motor Vehicle-Driver or Passenger	1	7.7	1.0	4	19.0	4.1	1	4.3	1.1	6	10.5	2.1
Accidental Overdose	12	92.3	12.0	17	81.0	17.4	21	91.3	22.2	50	87.7	17.1
Age												
19 and under	1	7.7	26.0	2	9.5	54.8	1	4.3	28.5	4	7.0	36.3
20-24	1	7.7	5.8	4	19.0	24.2	4	17.4	25.6	9	15.8	18.3
25-29	8	61.5	28.8	6	28.6	22.3	6	26.1	23.3	20	25.1	24.9
30-34	2	15.4	6.5	4	19.0	13.3	8	34.8	26.5	14	24.6	15.5
35-39	1	7.7	6.0	3	14.3	18.3	4	17.4	24.4	8	14.0	16.2
40 and over	0	0.0	0.0	2	9.4	52.9	0	0.0	0.0	2	3.5	17.6
Education												
Less than High School	2	14.3	2.0	3	14.3	3.1	7	30.4	7.4	12	21.1	4.1
High School Diploma	7	53.8	7.0	12	57.1	12.3	7	30.4	7.4	26	45.6	8.9
More than High School	4	30.8	4.0	6	28.6	6.2	9	39.1	9.5	19	33.3	6.5
Interval Between End of Pregnancy and Death												

	2018 (*n* = 13)			2019 (*n* = 21)			2020 (*n* = 23)			Total (*n* = 57)		
Pregnancy-Associated Rate	**13.0**			**21.6**			**24.3**			**19.6**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Pregnant at the Time of Death	7	53.8	7.0	10	47.6	10.3	6	26.1	6.3	23	40.4	7.9
0-42 days	2	15.4	2.0	4	19.0	4.1	3	13.0	3.2	9	15.8	3.1
43-365 days	4	30.8	4.0	7	33.3	6.2	14	60.9	14.8	25	43.8	8.2
Health Planning Region												
Central	2	15.4	10.0	4	19.0	20.5	3	13.0	16.0	9	15.8	15.5
Eastern	6	46.2	30.0	6	28.6	31.0	6	26.1	31.5	18	31.6	31.5
Northern	1	7.7	5.0	3	14.3	15.5	2	8.7	10.5	6	10.5	10.5
Northwestern	1	7.7	5.0	5	23.8	25.5	6	26.1	31.5	12	21.1	20.5
Southwestern	3	23.1	15.1	3	14.3	15.5	6	26.1	31.5	12	21.1	20.5

Homicides

The rate of pregnancy-associated deaths caused by homicides increased across the three-year period by nearly two times for all cases. The rate increased from 4.0 in 2018 to 8.5 in 2020. This increase was most significant among Black women. In 2018, the rate of homicide pregnancy-associated deaths was 4.8 compared to 29.0 in 2020. Homicide deaths were most prevalent among those aged 29 years old or younger. The fatal agent most often used was firearms.

Table 2.3: Homicide Pregnancy-Associated Deaths, 2018-2020: Selected Characteristics.

	2018 (*n* = 4)			2019 (*n* = 3)			2020 (*n* = 8)			Total (*n* = 15)		
Pregnancy-Associated Rate	**4.0**			**3.1**			**8.5**			**5.2**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Race												
White	2	50.0	4.9	1	33.3	1.7	2	25.0	3.4	5	33.3	3.3
Black	1	25.0	4.8	2	66.7	9.4	6	75.0	29.0	9	60.0	14.4
Other	1	25.0	5.9	0	0.0	0.0	0	0.0	0.0	1	6.7	2.0
Cause of Death												
Firearm	4	100.0	4.0	2	66.7	2.1	7	87.5	7.4	13	86.7	4.5
Sharp Instrument	0	0.0	0.0	1	33.3	1.0	1	12.5	1.1	2	13.3	0.7

	2018 (*n* = 4)			2019 (*n* = 3)			2020 (*n* = 8)			Total (*n* = 15)		
Pregnancy-Associated Rate	**4.0**			**3.1**			**8.5**			**5.2**		
	No.	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Age												
19 and under	1	25.0	26.0	1	33.3	27.4	1	12.5	28.5	3	20.0	27.3
20-24	2	50.0	11.7	1	33.3	6.1	2	25.0	12.8	5	33.3	10.2
25-29	0	0.0	0.0	0	0.0	0.0	1	12.5	3.9	1	6.7	1.2
30-34	1	25.0	3.3	1	33.3	3.4	3	37.5	10.1	5	33.3	5.5
35-39	0	0.0	0.0	0	0.0	0.0	1	12.5	6.2	1	6.7	2.0
40 and over	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Education												
Less than High School	0	0.0	0.0	2	66.7	2.1	1	12.5	1.1	3	20.0	1.1
High School Diploma	4	100.0	4.0	0	0.0	0.0	4	50.0	4.2	8	53.3	2.7
More than High School	0	0.0	0.0	1	33.3	1.0	3	37.5	3.2	4	26.7	1.4
Interval Between End of Pregnancy and Death												
Pregnant at the Time of Death	2	50.0	2.0	1	33.3	1.0	6	75.0	6.3	9	60.0	3.1
0-42 days	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
43-365 days	2	50.0	2.0	2	66.7	2.1	2	25.0	2.1	6	40.0	2.1
Health Planning Region												
Central	1	25.0	5.2	0	0.0	0.0	2	25.0	10.5	3	20.0	5.0
Eastern	1	25.0	5.3	2	66.7	10.5	3	37.5	16.0	6	40.0	10.5
Northern	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Northwestern	1	25.0	4.9	1	33.3	5.1	1	12.5	5.5	3	20.0	5.2
Southwestern	1	25.0	4.8	0	0.0	0.0	2	25.0	10.7	3	20.0	5.5

Suicides

From 2018 to 2020, the rate of pregnancy-associated deaths caused by suicide increased significantly ($p<0.01$), from 1.0 in 2018 to 7.4 in 2020. This increase was most pronounced amongst White decedents. In 2020, the rate for suicide pregnancy-associated deaths for White women was 8.5,

compared to 0.0 in 2018, although these rates must be interpreted with caution given the low total number of suicides (zero suicides amongst white women in 2018 versus five in 2020). Suicides were more likely to occur 43 to 365 days past the end of pregnancy. The fatal agent primarily used in these cases was poison. Additionally, the Southwestern and Eastern Health Planning Regions had the highest rates of suicides.

Table 2.4: Suicide Pregnancy-Associated Deaths, 2018-2020: Selected Characteristics

	2018 (*n* = 1)			2019 (*n* = 0)			2020 (*n* = 7)			Total (*n* = 8)		
Pregnancy-Associated Rate	**1.0**			**0.0**			**7.4**			**4.2**		
	No.	**%**	**Rate***	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
Race												
White	0	0.0	0.0	0	0.0	0.0	5	71.4	8.5	5	62.5	2.8
Black	1	100.0	4.8	0	0.0	0.0	1	14.3	4.8	2	25.0	3.2
Other	0	0.0	0.0	0	0.0	0.0	1	14.3	6.4	1	12.5	2.1
Fatal Agent												
Firearm	1	100.0	1.0	0	0.0	0.0	0	0.0	0.0	1	12.5	0.3
Poison	0	0.0	0.0	0	0.0	0.0	7	100.0	7.4	7	87.5	2.5
Age												
19 and under	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
20-24	0	0.0	0.0	0	0.0	0.0	1	14.3	6.4	1	12.5	2.0
25-29	1	100.0	3.6	0	0.0	0.0	2	28.6	7.8	3	37.5	3.7
30-34	0	0.0	0.0	0	0.0	0.0	2	28.6	6.7	2	25.0	2.2
35-39	0	0.0	0.0	0	0.0	0.0	2	28.6	12.3	2	25.0	4.0
40 and over	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Education												
Less than High School	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
High School Diploma	0	0.0	0.0	0	0.0	0.0	3	42.9	3.2	3	37.5	1.1
More than High School	1	100.0	1.0	0	0.0	0.0	4	57.1	4.2	5	62.5	1.7
Interval Between End of Pregnancy and Death												
Pregnant at the Time of Death	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0

	2018 (*n* = 1)			2019 (*n* = 0)			2020 (*n* = 7)			Total (*n* = 8)		
Pregnancy-Associated Rate	**1.0**			**0.0**			**7.4**			**4.2**		
	No.	**%**	**Rate***	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**	**No.**	**%**	**Rate**
0-42 days	0	0.0	0.0	0	0.0	0.0	1	14.3	1.1	1	12.5	0.4
43-365 days	1	100.0	1.0	0	0.0	0.0	6	85.7	6.3	7	87.5	2.4
Health Planning Region												
Central	1	100.0	5.2	0	0.0	0.0	0	0.0	0.0	1	12.5	2.7
Eastern	0	0.0	0.0	0	0.0	0.0	2	28.3	10.2	2	25.0	5.2
Northern	0	0.0	0.0	0	0.0	0.0	1	14.3	5.5	1	12.5	1.5
Northwestern	0	0.0	0.0	0	0.0	0.0	1	14.3	5.3	1	12.5	1.2
Southwestern	0	0.0	0.0	0	0.0	0.0	3	42.9	16.0	3	37.5	7.0

Conclusion

Analysis of the Virginia Pregnancy Associated Surveillance System data for 2018 through 2020 reveals that the pregnancy-associated death rate in Virginia has more than doubled, from 37.1 in 2018 to 86.6 in 2020. The most pronounced increase occurred in 2020, which coincides with the beginning of the COVID-19 pandemic. Similar to the rest of the United States, Virginia experienced (and continues to experience at the time of this publication) a substantial increase beyond the expected number of deaths based on pre-pandemic data. Amongst pregnancy-associated deaths in Virginia, the data suggests that COVID-19 infections were not the driving cause of this increase as there were only 5 deaths that occurred with COVID-19 as the immediate or underlying cause of death, representing only 6.1% of all deaths in 2020. Instead, the rise in mortality is likely attributable to increases in suicides, homicides, and other natural causes of death, such as deaths from hemorrhages and cancers. Of all the manners of pregnancy-associated deaths, the most pronounced increase in rates occurred among suicide, natural, and homicide deaths. The suicide pregnancy-associated death rate increased seven times, from 1.0 in 2018 to 7.4 in 2020. The rates for natural deaths and homicides more than doubled (17.1 vs. 44.4, and 4.0 vs. 8.5, respectively).

Significant racial disparities continue to be identified among pregnancy-associated deaths in the state of Virginia. Overall, from 2018 to 2020, Black women had higher rates of pregnancy-associated deaths when compared to their White counterparts (80.5 vs. 53.9, respectively). This disparity is more pronounced when looking specifically at cases with homicides and natural causes of deaths. For natural causes of death, Black women had rates of death 2.4 times higher than their White counterparts (55.8 vs. 22.8, respectively). For homicides, Black women had rates of death over four times higher than their White counterparts (14.4 vs. 3.3, respectively). A different pattern is seen, however, when focusing on accidental causes of deaths. For accidental causes of death, White women were found to have higher rates of death than their Black counterparts (25.0 vs. 15.9, respectively). It is important to note that approximately 88% of all accidental pregnancy-associated deaths were caused by fatal drug overdoses.

Analysis of the various causes of natural deaths reveal additional differences by race. Approximately 30% of the pregnancy-associated deaths from 2018 to 2020 were from natural causes. Over half of the natural deaths were caused by cardiac conditions, infections, or hemorrhages. Black women had a higher proportion of deaths caused by cardiac conditions compared to their White counterparts. While White women had higher proportions of deaths caused by hemorrhage and infections when compared to their Black counterparts. Other race women were found to have the highest proportion of deaths from infections when compared to White and Black women.

Next Steps

In accordance with the Code of Virginia, § 32.1-283.8., the Virginia Maternal Mortality Review Team will continue to conduct thorough reviews of these pregnancy-associated deaths to determine the contributors to mortality, whether or not the death was preventable and the pregnancy-relatedness of the death. Additionally, the Team will develop and disseminate recommendations for the prevention of future deaths.

Glossary

Accident – The manner of death used when there is no evidence of intent; and unintentional, sudden, and unexpected death.

Cause of Death – The disease, injury, or poison that results in a physiological derangement or biochemical disturbance that is incompatible with life. The result of post-mortem examination, including autopsy and toxicological findings, combined with information about the medical history of the decedent, serves to establish the cause of death.

Fatal Agent – The means, fatal agency or item causing death, present at the time of injury or death. This is specific to homicides, suicides, and accidental deaths.

Homicide – The manner of death in which death results from the intentional harm of one person by another.

Manner of Death – The general category of the circumstances of the event which causes the death. The categories are accident, homicide, natural, suicide, and undetermined.

Motor Vehicle Collision Related Death – A death involving a motor vehicle. Motor vehicles include automobiles, vans, motorcycles, trucks, aircraft, and trains. The decedent is usually a driver of, a passenger in, or a pedestrian who is struck by a motor vehicle. The death of a bicyclist that is struck by a motor vehicle is considered to be a motor vehicle related death.

Natural – The manner of death used when a disease alone causes death. If death is hastened by an injury, the manner of death is not considered natural.

Pregnancy-Associated Death – The death of a woman while pregnant or within one year of pregnancy regardless of the outcome of the pregnancy or the cause of death.

Pregnancy-Associated Rate – Calculated by dividing the number of pregnancy-associated deaths by the number of live births for the same time period and multiplying by 100,000. The rate provides the number of deaths for every 100,000 live births to women who were residents of the state at the time of their deaths. Rates for race, age, and Health Planning Region (HPR) are category specific. Rates for manner and cause of death are overall rates/100,000 live births.

Pregnancy-Related Death – The death of a woman during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy.

Suicide – The manner of death in which death results from the purposeful attempt to end one's life.

Undetermined – The manner of death for deaths in which there is insufficient information to assign another manner. An undetermined death may have an undetermined cause of death and an unknown manner, an undetermined cause of death and a known manner, or a determined cause of death and an unknown manner.

Virginia's Pregnancy-Associated Mortality Surveillance System (PAMSS) – This surveillance system allows for the identification and monitoring of patterns and trends related to pregnancy-associated deaths in Virginia, provides a snapshot of how, when and to whom these deaths occur, and helps inform policy decisions of public health importance.

Appendix A: Virginia Maternal Mortality Review Team Membership

William Gormley, MD, PhD, Co-Chair
Office of the Chief Medical Examiner
Virginia Department of Health

Vanessa Walker-Harris, MD, Co-Chair
Office of Family Health Services
Virginia Department of Health

James Brown
Law Enforcement

Sharon Sheffield, MD
Medical Society of Virginia

Janet Chalker, MPH, RD
Virginia Academy of Nutrition and Dietetics

Beth Uzzle, CNM, PhD
American College of Nurse-Midwives, Virginia Chapter

Allison R. Durica, MD
American College of Obstetricians and Gynecologists, Virginia Section

Nancy P. Fowler
Office of Family Violence
Virginia Department of Social Services

Estelle Kendall, MSN
Department of Medical Assistance Services

Renee Robinson, MD
Office of the Chief Medical Examiner

Susan M. Lanni, MD, FACOG
VCU Division of Maternal Fetal Medicine
American College of Obstetricians and Gynecologists, Virginia Section

Arthur Ollendorf, MD
Virginia Neonatal Perinatal Collaborative

Tiffany Carter
March of Dimes, Virginia

Collette McEachin, JD
Commonwealth's Attorney

Bryan Boyd
Emergency Medical Services

Tammi Mckinley, MPA, CPM, LM
Virginia Midwives Alliance

Sandra Sojka, PhD
VCU Department of Pharmacy

Donna Schminkey, CNM, PhD
Association of Women's Health, Obstetric and Neonatal Nursing, Virginia Chapter

Amanda Stehura
Virginia Department of Behavioral Health and Developmental Services

Shannon Pursell
Virginia Neonatal Perinatal Collaborative

Shannon Walsh, MD
Virginia College of Emergency Room Physicians

Kristie Burnette, RN, MN, CPHQ, CPPS
Virginia Hospital and Healthcare Association

Jonathan Yglesias
Virginia Sexual and Domestic Violence Action Alliance

Pamela Hanks
Health Start, Virginia Department of Health

Lisa Linthicum, MSW
Local Department of Social Services

Heather Board
Virginia Department of Health

Support Staff to Team
Melanie J. Rouse, PhD, MSHP
Manager, Maternal Mortality Programs

Ryan Diduk-Smith, PhD, MPH
Director, Division of Death Prevention

Appendix B: Code of Virginia, § 32.1-283.8.

§ 32.1-283.8. Maternal Mortality Review Team; duties; membership; confidentiality; penalties; report; etc.

A. As used in this section, "maternal death" means the death of a woman who was pregnant at the time of death or within one year prior to the time of death, regardless of the outcome of the pregnancy, including any death determined to be a natural death, unnatural death, or violent death or for which no cause of death was determined.

B. There is hereby created the Maternal Mortality Review Team (the Team), which shall develop and implement procedures to ensure that certain maternal deaths occurring in the Commonwealth are analyzed in a systematic way. The Team shall review every maternal death in the Commonwealth. The Team shall not initiate a maternal death review until the conclusion of any law-enforcement investigation or criminal prosecution. The Team shall (i) develop and revise as necessary operating procedures for maternal death reviews, including identification of cases to be reviewed and procedures for coordinating among the agencies and professionals involved; (ii) improve the identification of and data collection and record keeping related to causes of maternal deaths; (iii) recommend components of programs to increase awareness and prevention of and education about maternal deaths; and (iv) recommend training to improve the review of maternal deaths. Such operating procedures shall be exempt from the Administrative Process Act (§ 2.2-4000 et seq.) pursuant to subdivision B 17 of § 2.2-4002.

C. The Team shall consist of the following persons or their designees: the Chief Medical Examiner, the Director of the Office of Family Health of the Department of Health, the State Registrar of Vital Records, and the Commissioner of Behavioral Health and Developmental Services. In addition, the Governor shall appoint one representative of each of the following entities: local law enforcement, local fire departments, local emergency medical services providers, local departments of social services, community services boards, attorneys for the Commonwealth, the Medical Society of Virginia, the Virginia Hospital and Healthcare Association, the Virginia College of Emergency Physicians, the Virginia Section of the American College of Obstetricians and Gynecologists, the Virginia Affiliate of the American College of Nurse-Midwives, the Virginia Chapter of the Association of Women's Health, Obstetric and Neonatal Nurses, the Virginia Neonatal Perinatal Collaborative, the Virginia Midwives Alliance, and the Virginia Academy of Nutrition and Dietetics. The Chief Medical Examiner and the Director of the Office of Family Health of the Department of Health shall serve as co-chairs of the Team and may appoint additional members of the Team as may be needed to complete maternal death reviews pursuant to this section.

After the initial staggering of terms, members other than the Chief Medical Examiner, the Director of the Office of Family Health of the Department of Health, the State Registrar of Vital Records, the Commissioner of Behavioral Health and Developmental Services, and the Director of the Department of Criminal Justice Services shall be appointed for a term of three years. Appointments to fill vacancies, other than by expiration of a term, shall be for the unexpired terms. Vacancies shall be filled in the same manner as the original appointments. All members may be reappointed. The Chief Medical Examiner, the Director of the Office of Family Health of the Department of Health, the State Registrar of Vital Records, the Commissioner of Behavioral Health and Developmental Services, and the Director of the Department of Criminal Justice Services shall serve terms coincident with their terms of office.

D. Upon the request of the Chief Medical Examiner in his capacity as a co-chair of the Team, made after the conclusion of any law-enforcement investigation or prosecution, the Chief Medical Examiner or his designee may inspect and copy information and records regarding a maternal death, including (i) any report of the circumstances of the maternal death maintained by any state or local law-enforcement agency or medical examiner, and (ii) information or records about the woman maintained by any social services agency or court. Information, records, or reports maintained by any attorney for the Commonwealth shall be made available for inspection and copying by the Chief Medical Examiner or his designee pursuant to procedures that shall be developed by the Chief Medical Examiner and the Commonwealth's Attorneys' Services Council established by § 2.2-2617. Any presentence report prepared pursuant to § 19.2-299 for any person convicted of a crime that led to the death of the woman shall be made available for inspection and copying by the Chief Medical Examiner or his designee. In addition, the Chief Medical Examiner or his designee may inspect and copy from any health care provider in the Commonwealth, on behalf of the Team, (a) without obtaining consent, subject to any limitations on disclosure under applicable federal and state law, the health and mental health records of the woman and those prenatal medical records relating to any child born to the woman and (b) upon obtaining consent, from each adult regarding his records.

E. All information and records obtained or created by the Team or on behalf of the Team regarding a review shall be confidential and excluded from the Virginia Freedom of Information Act (§ 2.2-3700 et seq.) pursuant to subdivision 7 of § 2.2-3705.5. All such information and records shall be used by the Team only in the exercise of its proper purpose and function and shall not be disclosed. In preparing information and records for review by the Team, the Department shall remove any individually identifiable information or information identifying a health care provider, as those terms are defined in 45 C.F.R. § 160.103. Such information shall not be subject to subpoena, subpoena duces tecum, or discovery, be admissible in any civil or criminal proceeding, or be used as evidence in any disciplinary proceeding or regulatory or licensure action of the Department of Health Professions or any health regulatory board. If available from other sources, however, such information and records shall not be immune from subpoena, discovery, or introduction into evidence when obtained through such other sources solely because the information and records were presented to the Team during a maternal death review. The findings of the Team may be disclosed or published in statistical or other form, but shall not identify any individual. Upon conclusion of the maternal death review, all information and records concerning the woman and the woman's family shall be shredded or otherwise destroyed by the Office of the Chief Medical Examiner in order to ensure confidentiality.

The portions of meetings in which individual maternal deaths are discussed by the Team shall be closed pursuant to subdivision A 21 of § 2.2-3711. In addition to the requirements of § 2.2-3712, all Team members and other persons attending closed Team meetings, including any persons presenting information or records on specific maternal deaths to the Team during closed meetings, shall execute a sworn statement to (i) honor the confidentiality of the information, records, discussions, and opinions disclosed during meetings at which the Team reviews a specific maternal death and (ii) not use any such information, records, discussions, or opinions disclosed during meetings at which the Team reviews a specific maternal death for any purpose other than the exercise of the proper purpose and function of the Team. Violations of this subsection are punishable as a Class 3 misdemeanor.

F. Upon notification of a maternal death, any state or local government agency maintaining records on the woman or the woman's family that are periodically purged shall retain such records for the longer of 12 months or until such time as the Team has completed its review of the case.

G. The Team shall compile triennial statistical data, which shall be made available to the Governor and the General Assembly. Any statistical compilations prepared by the Team shall be public record and shall not contain any personal identifying information.

H. Members of the Team, as well as their agents and employees, shall be immune from civil liability for any act or omission made in connection with participation in a review by the Team, unless such act or omission was the result of gross negligence or willful misconduct. Any organization, institution, or person furnishing information, data, testimony, reports, or records to the Team as part of such review shall be immune from civil liability for any act or omission in furnishing such information, unless such act or omission was the result of gross negligence or willful misconduct.

2019, c. 834.
The chapters of the acts of assembly referenced in the historical citation at the end of this section may not constitute a comprehensive list of such chapters and may exclude chapters whose provisions have expired.