NEW YORK CITY DEPARTMENT OF HEALTH AND MENTAL HYGIENE
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Commissioner

Pregnancy-Associated Mortality in New York City, 2021

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Introduction

Since 2001, the New York City (NYC) Department of Health and Mental Hygiene (NYC Health Department) has conducted surveillance of pregnancy-associated deaths to develop five-year pregnancy-associated mortality reports. In 2018, the NYC Health Department began reporting the data annually on its website and on the NYC Open Data source portal. Pregnancy-associated deaths[1] include deaths from any cause during pregnancy or within one year from the end of pregnancy, regardless of the outcome of the pregnancy. Pregnancy-related deaths, a subset of pregnancy-associated deaths, are deaths that occur during pregnancy or within one year from the end of pregnancy that are caused by a pregnancy complication, a chain of events initiated by pregnancy or the aggravation of an unrelated condition by the pregnancy.

Since 2001, the pregnancy-associated mortality ratio in NYC has remained steady, but unjust and avoidable inequities remain. In 2016-2020, Black non-Hispanic women and birthing people were four times more likely to die of a pregnancy-associated cause and six times more likely to die of a pregnancy-related cause compared with white non-Hispanic women and birthing people. Racism drives these disparities. This includes historical and current intentional underinvestment in neighborhoods where Black non-Hispanic women and birthing people live, interpersonal racism that weathers the bodies of Black people earlier than white people, and anti-Blackness in health care.

In January 2018, in response to these inequities, the NYC Health Department convened the NYC Maternal Mortality Review Committee (MMRC, or the Committee) to conduct multidisciplinary reviews of all pregnancy-associated deaths among New York State (NYS) residents who died in New York City, starting with deaths that occurred in 2016. The NYC Health Department uses standards and protocols developed by the Centers for Disease Control and Prevention (CDC) in 46 other states and jurisdictions. In 2020, the NYS Department of Health adopted this same methodology to convene a second MMRC that reviews deaths of NYS residents who die outside of NYC. The NYC Health Department shares the NYC data with the NYS Department of Health, which produces statewide reports.

The MMRC's vision is to make recommendations to reduce preventable maternal mortality by eliminating racial disparities in this outcome. The mission is to gain a holistic understanding of the contributing factors leading to death by reviewing each woman and birthing person's story and to use the information gathered during the review to inform recommendations to prevent future deaths.

Data Summary

In 2021, the pregnancy-associated mortality ratio (PAMR) was 58.4 deaths per 100,000 live births and the pregnancy-related mortality ratio (PRMR) was 30.2 deaths per 100,000 live births. These annual ratios should be interpreted with caution due to the small number of maternal deaths each

[1] These deaths are subdivided into three categories: pregnancy-related, pregnancy-associated but not -related, and unable to determine pregnancy relatedness.

year.[2] There were 99,262 live births and 58 pregnancy-associated deaths of women and birthing people. Thirty of the 58 deaths were pregnancy-related,[3] 13 were pregnancy-associated but not -related,[4] and for 15 deaths the relationship between pregnancy and death could not be determined.[5]

Leading Causes of Pregnancy-Associated Deaths

The leading cause[6] of pregnancy-associated deaths was mental health conditions (n = 21, 36.2%), with 20 deaths due to overdoses. Of the overdose deaths, 16 (80.0%) involved an opioid. Infection (n = 5, 8.6%) and cancer (n = 5, 8.6%) were the second-leading causes, with all infection deaths related to COVID-19. Hemorrhage accounted for 6.9% of the deaths (n = 4).

Timing and Location of Pregnancy-Associated Deaths

One-third (n = 19, 32.7%) of all pregnancy-associated deaths occurred during pregnancy or within one day after end of pregnancy. The remaining two-thirds occurred between two and 365 days postpartum: 3.5% within a week after childbirth, 13.8% between seven and 42 days postpartum, and 50.0% in the late postpartum period (43-365 days). Most deaths took place in a hospital setting, either in the inpatient facility (n = 23, 39.7%) or in the emergency department (n = 16, 27.6%).

Prenatal and Clinical Characteristics of Pregnancy-Associated Deaths

The most common pregnancy outcome among pregnancy-associated deaths was a live birth (n = 37, 63.8%). Of these, 14 (37.8%) were vaginal births, 20 (54.1%) were cesarean births, and for 3 (8.1%) there was no information on the birth method.

Among those with a live birth outcome who had a linked birth certificate (n = 34), which recorded the method of birth, parity, trimester of prenatal care initiation, prepregnancy weight and height, and insurance type, 32.4% had no previous live births and 64.6% had at least one previous live birth. The percent who had initiated prenatal care within the first trimester was 52.9%, and 85.3% had initiated prenatal care by the end of the second trimester. The body mass index distribution was 35.3% below 24.9 BMI, 35.3% between 25 and 29.9 BMI, and 29.4% at 30 BMI or higher. The percent listed as having Medicaid coverage was 79.4%.

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[2] It is recommended to review a minimum of five years of data to obtain more reliable mortality ratios, and to then compare trends over five-year intervals.

[3] Pregnancy-related death: The death of a person during pregnancy or within one year from the end of pregnancy that is due to a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy. Pregnancy-related deaths are a subset of pregnancy-associated deaths.

[4] Pregnancy-associated but not -related death: The death of a person during pregnancy or within one year from the end of pregnancy due to a cause not related to the pregnancy.

[5] Death where Committee was unable to determine relation to pregnancy.

[6] The underlying cause of death refers to the disease or injury that initiated the chain of events leading to the death or the circumstances of the accident or violence that produced the fatal injury.

Table 1. Causes, Timing, Location and Pregnancy Outcomes of Deaths, NYC, 2021

	Pregnancy-associated deaths n (%)	Pregnancy-related deaths n (%)
Total	58 (100.0)	30 (100.0)
Causes of death[a]		
Mental health conditions[b]	21 (36.2)	12 (40.0)
Infection	5 (8.6)	3 (10.0)
COVID-19	5	3
Cancer[c]	5 (8.6)	-
Hemorrhage	4 (6.9)	4 (13.3)
Seizure disorders	3 (5.2)	1 (3.3)
Cardiovascular conditions[d]	2 (3.5)	1 (3.3)
Embolism	2 (3.5)	2 (6.7)
Homicide[e]	2 (3.5)	1 (3.3)
Amniotic fluid embolism	2 (3.5)	2 (6.7)
Blood disorders	2 (3.5)	1 (3.3)
Metabolic or endocrine conditions	2 (3.5)	-
Other[f]	8 (13.8)	3 (10.0)
Timing of death		
During pregnancy	12 (20.7)	5 (16.7)
0-1 day after end of pregnancy	7 (12.1)	6 (20.0)
2-6 days after end of pregnancy	2 (3.5)	2 (6.7)
7-42 days after end of pregnancy	8 (13.8)	4 (13.3)
43 days-1 year after end of pregnancy	29 (50.0)	13 (43.3)
Location of death		
Hospital – inpatient	23 (39.7)	14 (46.7)
Hospital – emergency department	16 (27.6)	7 (23.3)
Home or other	19 (32.8)	9 (30.0)
Pregnancy outcome		
Live birth	37 (63.8)	22 (37.9)
Vaginal	14	8
Cesarean	20	13
Unknown	3	1
Undelivered	9 (15.5)	3 (5.2)
Spontaneous termination (STOP)	6 (10.3)	2 (3.4)
Stillbirth (> 20 weeks gestation)	4 (6.9)	2 (3.4)
Other[g]	2 (3.4)	1 (1.7)

Percent may not total 100 due to rounding.

[a] Cause of death cannot be further disaggregated by race and ethnicity due to confidentiality reasons. This information is available for a larger number of deaths in the latest NYC Health Department five-year pregnancy-associated mortality report.

[b] Among the 21 pregnancy-associated deaths due to mental health conditions, 20 were due to overdose. Sixteen of the 20 overdose deaths involved an opioid.

[c] Among the 5 pregnancy-associated deaths due to cancer, 3 were due to lung cancer and 2 were due to breast cancer.

[d] Among the 2 pregnancy-associated deaths due to cardiovascular conditions, 1 was due to cardiomyopathy.

[e] Among the 2 pregnancy-associated deaths due to homicide, both were due to intimate partner violence.

[f] Other cause of death includes autoimmune disease, cerebrovascular accidents, preeclampsia and eclampsia, pulmonary conditions, renal diseases, unintentional injury, and unknown causes of death.
[g] Other pregnancy outcome includes ectopic pregnancy and induced termination (ITOP).

Table 2. Number of Previous Live Births, Trimester of Prenatal Care Initiation, and Prepregnancy Body Mass Index and Insurance Type Among Deaths That Resulted in a Live Birth, NYC, 2021

	Pregnancy-associated deaths n (%)	Pregnancy-related deaths n (%)
Total	34 (100.0)	21 (100.0)
Number of previous live births		
None	11 (32.4)	6 (28.6)
One	6 (17.6)	4 (19.0)
Two	10 (29.4)	6 (28.6)
Three or more	6 (17.6)	4 (19.0)
Unknown	1 (2.9)	1 (4.8)
Trimester of prenatal care initiation		
First trimester	18 (52.9)	11 (52.4)
Second trimester	11 (32.4)	8 (38.1)
Third trimester	2 (5.9)	1 (4.8)
No prenatal care	2 (5.9)	-
Unknown	1 (2.9)	1 (4.8)
Prepregnancy body mass index (BMI)		
BMI < 18.5	2 (5.9)	1 (4.8)
BMI 18.5-24.9	10 (29.4)	8 (38.1)
BMI 25-29.9	12 (35.3)	6 (28.6)
BMI ≥ 30	10 (29.4)	6 (28.6)
Insurance type		
Medicaid	27 (79.4)	16 (76.2)
Private	6 (17.6)	4 (19.0)
Other insurance[a]	1 (2.9)	1 (4.8)

Percent may not total 100 due to rounding.

[a] Other insurance type includes other government type, self-pay, and unknown.

Demographic Characteristics

In 2021, the percentage of pregnancy-associated deaths among Black non-Hispanic (39.7%) and Hispanic (36.2%) women and birthing people was higher than the demographics' representation among live births, at 17.7% and 28.9%, respectively.[7] Conversely, white non-Hispanic women and birthing people and Asian or Pacific Islander women and birthing people accounted for 36.3% and 15.0% of live births in NYC during this period, yet their representations in pregnancy-associated deaths were notably lower, at 8.6% and 12.1%, respectively. By borough, 25.9% of the pregnancy-associated deaths occurred to women and birthing people residing in Brooklyn and in Bronx, 17.2% to those residing in Manhattan, 13.8% to those residing in Queens, and 5.2% to those residing in Staten Island. The remaining 12.1% resided outside of NYC in the rest of the state.

[7] Li W, Onyebeke C, Castro A, et al. Summary of Vital Statistics, 2021. Bureau of Vital Statistics. NYC Health Department. https://www.nyc.gov/assets/doh/downloads/pdf/vs/2021sum.pdf

Table 3. Demographic Characteristics of Deaths, NYC, 2021

	Pregnancy-associated deaths n (%)	Pregnancy-related deaths n (%)
Total	58 (100.0)	30 (100.0)
Race and ethnicity[a]		
Black non-Hispanic	23 (39.7)	11 (36.7)
White non-Hispanic	5 (8.6)	3 (10.0)
Hispanic	21 (36.2)	11 (36.7)
Asian or Pacific Islander	7 (12.1)	5 (16.7)
Other or unknown	2 (3.4)	-
Borough of residence[b]		
Brooklyn	15 (25.9)	8 (26.7)
Bronx	15 (25.9)	6 (20.0)
Queens	8 (13.8)	6 (20.0)
Manhattan	10 (17.2)	5 (16.7)
Staten Island	3 (5.2)	1 (3.3)
Non-NYC	7 (12.1)	4 (13.3)
Age at death (years)		
< 25	9 (15.5)	5 (16.7)
25-29	14 (24.1)	7 (23.3)
30-34	12 (20.7)	6 (20.0)
35-39	14 (24.1)	7 (23.3)
40+	9 (15.5)	5 (16.7)
Education[c]		
Less than high school	15 (25.9)	8 (26.7)
High school or GED	19 (32.8)	8 (26.7)
At least some college	24 (41.4)	14 (46.7)
Nativity[d]		
U.S.-born	34 (58.6)	19 (63.3)
Non-U.S.-born	20 (34.5)	9 (30.0)
Unknown	4 (6.9)	2 (6.7)

Percent may not sum to 100 due to rounding.

[a] White, Black, and Asian or Pacific Islander race categories exclude Hispanic ethnicity. Hispanic includes Latino of any race. We used race and ethnicity data from the birth or fetal death records, when available, and from death records when a birth record or fetal death record was unavailable.

[b] Borough of residence is based on the borough of residence at the time of death as listed on the death certificate. If this information was missing, the borough of residence listed on the birth or fetal death certificate was used to fill the missing value.

[c] Education is based on the total years of education completed at the time of death as self-reported on the birth or fetal death certificate. If there was no corresponding birth or fetal death certificate, or the data were missing, information recorded on the death certificate was used to fill the missing value.

[d] Maternal nativity is primarily derived from data recorded on the birth or fetal death certificate. If there was no corresponding birth or fetal death certificate, or these data were missing, information recorded on the death certificate was used to fill the missing value.

Social and Emotional Stressors

Among pregnancy-associated deaths, some women and birthing people experienced homelessness and multiple social and emotional stressors. Overall, 25.9% experienced homelessness, either before, during or after pregnancy. The most common social and emotional stressors included recent trauma (63.8%), unemployment (41.4%) and domestic violence (32.8%). Involvement with Child Protective Services, a history of substance use, or childhood trauma was present in 31.0% of these cases.

Table 4. Social and Emotional Stressors[a] Among Deaths, NYC, 2021

	Pregnancy-associated deaths	
	n	**%**
Total	58	100
Ever experienced homelessness[b]	15	25.9
Prior to pregnancy	11	-
During pregnancy	9	-
After pregnancy	5	-
Social or emotional stressors[c]		
Recent trauma	37	63.8
Unemployment	24	41.4
History of domestic violence	19	32.8
Child Protective Services involvement	18	31.0
History of substance use	18	31.0
History of childhood trauma	18	31.0
History of psychiatric hospitalizations or treatment	16	27.6
History of treatment for substance use	12	20.7
Prior suicide attempts	4	6.9

[a] Social and emotional stressors determined through review of available medical and social service records.
[b] The timing of the deaths is not mutually exclusive. Women and birthing people may have experienced homelessness at different times in their lives in relation to pregnancy.
[c] Women and birthing people may have faced more than one social or emotional stressor.

Maternal Mortality Review Committee Determinations

The MMRC conducted in-depth reviews of all pregnancy-associated deaths, thoroughly examining each case to determine preventability. For preventable deaths, the MMRC identified key contributing factors and specific and feasible recommendations to prevent future deaths. For all pregnancy-associated deaths, the MMRC determined whether discrimination,[8] obesity,[9] substance use disorder[10] or other mental health conditions contributed to the death.

[8] The MMRC determines whether discrimination contributed to the death, and not just whether the individual was exposed to discrimination. Discrimination is defined as treating someone less or more favorably based on the group, class, or category they belong to resulting from biases, prejudices, and stereotyping.
[9] The MMRC determines whether obesity contributed to the death, and not just whether the person was obese. The Committee may determine that obesity contributed to the death when the condition directly compromised an individual's health or health care.
[10] The MMRC determines whether substance use disorder contributed to the death, and not just whether the individual had a substance use disorder. Substance use disorder is characterized by recurrent use of alcohol and/or drugs causing clinically and functionally significant impairment, such as health problems or disability.

A death is considered preventable if the MMRC determines that there was at least some chance of death being averted by one or more reasonable changes to factors at any of five levels: system, facility, provider, community, and patient/family. In 2021, out of 58 pregnancy-associated deaths, the MMRC determined that 74.1% (43 out of all 58 deaths) had a good or some chance of being prevented.

For all 58 deaths, the MMRC considered whether discrimination, obesity, substance use disorder and mental health contributed to the death and directly compromised the person's health or health care. The MMRC determined that discrimination, obesity, substance use disorder, and mental health conditions other than substance use disorder contributed to 69.0%,13.8%, 39.7% and 48.3% of deaths, respectively.

Table 5. Preventability and Committee Determinations on Circumstances Contributing to Pregnancy-Associated Deaths, New York City, 2021

	Pregnancy-associated deaths	
	n	%
Total	58	100.0
Preventability		
Preventable	43	74.1
Good chance	21	
Some chance	22	
Not preventable	11	19.0
Unable to determine	4	6.9
Circumstances contributing to the death		
Discrimination		
Yes or probably	40	69.0
No	14	24.1
Unknown	4	6.9
Obesity		
Yes or probably	8	13.8
No	49	84.5
Unknown	1	1.7
Substance use disorder		
Yes or probably	23	39.7
No	34	58.6
Unknown	1	1.7
Mental health conditions other than substance use disorder		
Yes or probably	28	48.3
No	26	44.8
Unknown	4	6.9

Maternal Mortality Review Committee Recommendations

Based on the review of deaths that occurred in 2021, the MMRC made specific, actionable recommendations to prevent future deaths. At the end of the year, the MMRC prioritized the recommendations based on ability to reduce inequities in maternal mortality, cause of death, key contributing factors, impact, and feasibility. The below 20 recommendations were prioritized by the MMRC in its review of the 58 deaths and are a blueprint for action for all stakeholders working to reduce maternal mortality.

Policymakers and Government

1. New York State (NYS) government should immediately decriminalize all substance use and expand treatment and harm reduction services.
2. NYS governmental agencies should invest resources in making free doula care, supportive housing, peer supports and community-based centers for harm reduction accessible to all women and birthing people, with a primary focus on those in historically and purposefully underserved communities, and provide financial incentives to hospitals to facilitate referrals

for women and birthing people to organizations that can provide holistic support and resources for mental health, substance use and intimate partner violence (IPV).

3. Federal and state lawmakers should reform mandated-reporting laws for health care providers to prioritize support for families and minimize harm. NYS should immediately remove health care providers from the list of mandated reporters.
4. The Office of Children and Family Services (OCFS), in partnership with parents impacted by NYC Administration for Children's Services (ACS) involvement, should create clear transparent guidelines for ACS to use when assessing and responding to referrals involving women and birthing people. Guidelines should include a duty to consider and mitigate the impact of interventions on the health of parents and ensure that interventions are conducted in ways that best preserve opportunities for family reunification.
5. OCFS should direct ACS and hospital systems to stop the practice of notifying Child Protective Services (CPS) because of a history of CPS case or open CPS case at birth.
6. NYS governmental agencies should fund the creation of centers for parents, newborns and children, pregnant people, and postpartum people with mental health and substance use and misuse needs, or those without care for their children during and after childbirth, that begins with respite center care (independent of ACS) and segues into long-term supportive housing that includes customized, individual patient-specific evaluation, drug use or misuse treatment, and easy access to psychological care, as well as peer supports, parenting supports, and necessary resources.
7. NYS government should fund hospitals to create accessible co-response teams to help acknowledge signs of mental health conditions in family members or partners of women and birthing people and address conditions from a mental health perspective instead of a police or security perspective.

Health Departments

8. The NYC Health Department should make naloxone kits available to hospitals, so providers can hand patients, family members or companions a naloxone kit upon discharge.
9. The NYC Health Department should share data on ACS involvement in pregnancy-associated deaths with City Council and the NYS Department of Health to support the creation of an oversight committee to investigate the connection between ACS involvement and maternal death and to explore avenues for legal accountability for harm to pregnant people and parents.

Hospital Systems

10. Hospital systems and government agencies should invest in community-based centers for support for postpartum people experiencing mental health challenges and their families, including family counseling, and hospitals should refer to them.

Regulatory Agencies and Professional Organizations

11. The American College of Obstetricians and Gynecologists (ACOG), anesthesia societies, the American College of Nurse-Midwives, the Association of Women's Health, Obstetric and Neonatal Nurses, and substance use treatment organizations should provide specific guidance to providers as well as patient-facing educational materials on postpartum pain management for pregnant women and birthing people with substance use disorders.
12. Medical organizations should train primary care providers on the increased risk of infections in the immediate postpartum period and the need to refer patients more urgently to higher levels of care.

Facilities[11]

13. All birthing facilities should ensure that perinatal care providers have adequate training and resources to recognize, refer and assess maternal mental health conditions, substance use disorders and IPV in the perinatal period that includes a plan of safe care.
14. Facilities should ensure an integrated model of behavioral health care involving a team responsible for screening, referral and follow-up during the prenatal and postpartum periods.
15. Hospitals should provide education to non-obstetric providers on the risk-benefit analysis around the impact of medications in pregnancy, with shared decision-making with the patient.
16. Hospitals should ensure they have care coordination specialists who at discharge arrange and manage outpatient appointments and referrals to community resources, as well as community health workers who aid in navigation for patients with multiple chronic conditions, including special needs.

Clinicians[12]

17. Providers should follow recommendations of ACOG related to postpartum follow-up for high-risk pregnancies, including mental health and substance use disorder.
18. Obstetricians and gynecologists should utilize best-practice algorithms for recognition and referral for patients with high-risk asthma conditions during intra- and postpartum periods.
19. Specialists should address and make referrals for chronic conditions outside their field of expertise.
20. Hospital and outpatient social workers should make a holistic review of support services needed to support the pregnant person throughout their pregnancy and postpartum period and make efforts to make referrals and warm handoffs to community-based providers.

NYC Health Department Update

Last year, the NYC Health Department continued to conduct maternal mortality surveillance, and chaired and supported the functioning of the MMRC. The NYC Health Department convened 11 meetings throughout the year, enabling the MMRC to complete its review of all pregnancy-associated deaths in 2021 by January 2024. The NYC Health Department will report the 2021 cohort of deaths on the NYC Open Data platform and post this report to the NYC Health Department's website by September 30, 2024. Staff continued to participate in the NYS MMRC Steering Committee, and all 2021 NYC data were made available to the NYS Department of Health for a statewide report. The NYC Health Department completed a new five-year pregnancy-associated mortality report (for 2016-2020) and will present and circulate it at a public event on September 25, 2024.

[11] A physical location where direct care is provided, ranging from small clinics and urgent care centers to hospitals with trauma centers.
[12] An individual with training and expertise who provides care, treatment or advice.