Annual Report on Maternal Mortality to
New Hampshire Health and Human Services Oversight Committee

Calendar Year 2012-2015

Maternal and Child Health Section
Bureau of Population Health and Community Services
Division of Public Health Services
Department of Health and Human Services

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NH DIVISION OF
Public Health Services
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We wish to acknowledge and thank past and present members of the Northern New England Perinatal Quality Improvement Network (NNEPQIN) Abstraction Team and the New Hampshire Maternal Mortality Review Panel (MMRP) for their contributions and service to the Maternal Mortality Review Process in New Hampshire.

Special thanks for preparing this report:

Jill Fournier, BSN, RN
Coordinator, Maternal Mortality Review

David Laflamme, PhD, MPH
State Maternal & Child Health Epidemiologist

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I. Executive Summary

Twenty-four New Hampshire (NH) residents are known to have died while they were pregnant or within one year of a pregnancy ("pregnancy-associated") within the four-year period 2012 – 2015. Twenty (83%) of the twenty-four deaths occurred in NH, four (17%) occurred out-of-state. Six (25%) of the twenty-four pregnancy-associated deaths occurred in women who were pregnant at the time of death.

The leading causes of pregnancy-associated deaths in NH residents, 2012 - 2015 were accidental drug overdose and cardiovascular disorders followed by suicide.

The majority of the 24 pregnancy-associated deaths were not "pregnancy-related" (the cause of death was not directly related to the pregnancy). The NH Maternal Mortality Review Panel (MMRP) reviewed the 23 pregnancy-associated deaths that occurred in NH and determined that two were pregnancy-related (1 NH resident). The MMRP was not able to review the four deaths of NH residents that occurred out-of-state because cross-border data sharing was inhibited by differing privacy laws. National and regional efforts are underway to address these challenges. Preliminary information indicates at least one of these deaths was reviewed by the panel of a neighboring state. Three in-state deaths of NH residents remain under investigation by the MMRP.

Seventy-one percent of the women were single at the time of death. Eighteen women (75%) had at least one documented risk factor (obesity, tobacco use, substance use, and/or at least one mental health disorder).

Actionable recommendations in this report include: enhance communication and "hand-offs" between Emergency Department (ED) staff and Obstetricians, Primary Care Providers, and other specialty providers regardless of the facility providing care; increasing awareness among ED/Urgent care staff regarding the special needs of pregnant women; and promoting "best practice" in the clinical setting. An additional 3 pregnancy-associated deaths of non-residents who died in New Hampshire were reviewed by the panel and the findings contributed to these recommendations.

The pregnancy-related maternal mortality ratio for NH residents, 2012 – 2015 was 2.0 per 100,000 live births. This statistic may be updated in a future report as the cross-border data sharing issues are worked out and information is gained regarding outstanding cases.

Executive Summary Table			
2012-2015	**In-state deaths**		**Out-of-state deaths**
	Non-Residents	**NH Residents**	
Pregnancy-associated (total)	3	20	4
A. Pregnancy-associated, but not pregnancy-related	2	16	0
B. Pregnancy-related	1	1	0
C. Unknown if pregnancy-related	0	0	4
D. Case still under investigation	0	3	0

II. Introduction

RSA 132:30 established a maternal mortality review panel (MMRP) to conduct comprehensive, multidisciplinary reviews of maternal deaths in New Hampshire for the purpose of identifying factors associated with the deaths and to make recommendations for system changes to improve services for women in the state.

RSA 132:30 IV provides that "The commissioner may delegate to the Northern New England Perinatal Quality Improvement Network (NNEPQIN) the functions of collecting, analyzing, and disseminating maternal mortality information, organizing and convening meetings of the panel, and other substantive and administrative tasks as may be incident to these activities. The activities of NNEPQIN and its employees or agents shall be subject to the same confidentiality provisions as those that apply to the panel."

This is the annual report on Maternal Mortality as required under RSA 132:30 V.

III. Definition of Maternal Death

NH Administrative Rule He-P 3013.02 defines maternal death as any of the following:

- **Pregnancy-associated** death means the death of a woman while pregnant or within one year of the end of pregnancy, irrespective of cause.
    - **Pregnancy-associated, but not pregnancy-related** death means the death of a woman while pregnant or within one year of the end of pregnancy due to a cause unrelated to pregnancy. For example, the death of a woman from a motor vehicle collision.
    - **Pregnancy-related** death means the death of a woman while pregnant or within one year of the end of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by her pregnancy or its management, but not from accidental or incidental causes. For example, the death of a woman from postpartum hemorrhage or amniotic fluid embolism.

III. Methods

Case Finding

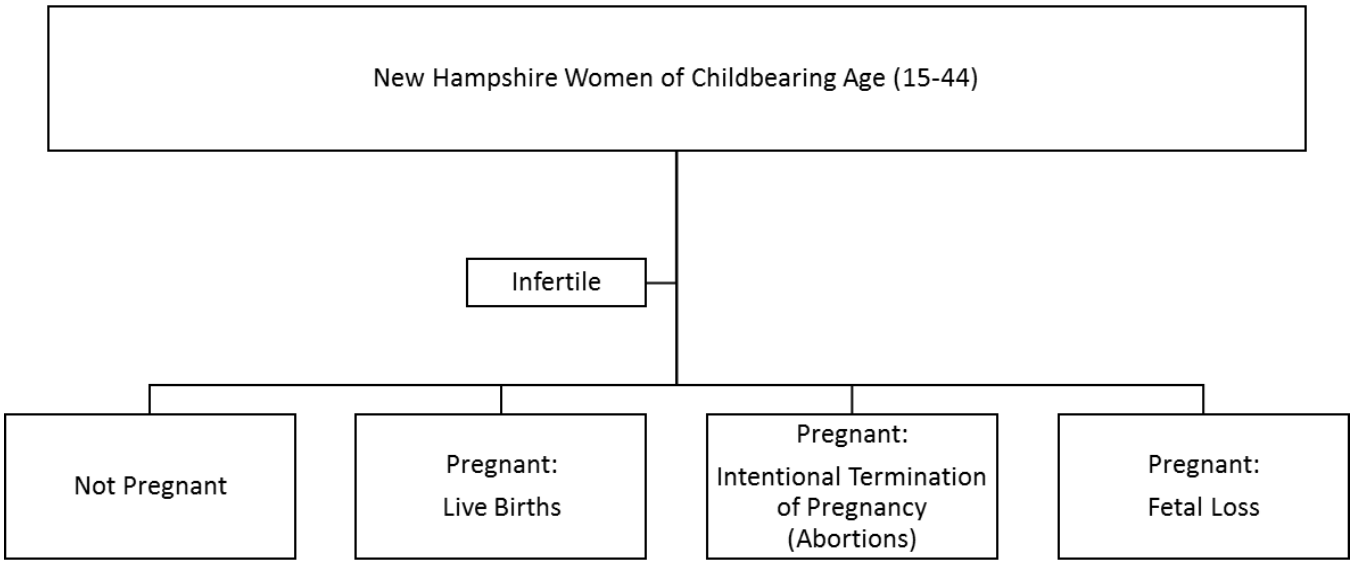
Maternal deaths in New Hampshire are identified and reported to the New Hampshire Department of Health and Human Services through the following sources:

- Direct report from a hospital, non-emergency walk-in care center, ambulatory surgical center, or birthing center
- Field on death certificate indicating pregnancy within one year of death

- Data linkage between death certificate and maternal information on certificate of live birth
- Case finding from a panel member and reported to the department
- Medical examiner's report
- Other source such as a medical provider, family member, or media outlet

As is the case across the country, maternal deaths are most likely underreported[1]. In particular, the death of a women with a pregnancy that did not end in a live birth may be missed because population-wide data sources for this information are limited. See Figure 1.

Figure 1



Note: The box size is not intended to represent the size of the population in each category.

Case Review

Maternal mortality review is a two-step process in New Hampshire. The Northern New England Perinatal Quality Improvement Network (NNEPQIN) multidisciplinary abstraction team in collaboration with the Division of Public Health Services, Maternal and Child Health (MCH) Perinatal Program Coordinator reviews each case, analyzes the data, and makes specific recommendations related to each case and in according with RSA 132:30. All information that may identify the patient, clinicians, or

[1] Theron, I. *Underreporting of Maternal Deaths on the Death Certificates and the Magnitude of the Problem of Maternal Mortality*. American Journal of Public Health. 2005 March; 95(3): 478–482.

institutions is removed by the MCH perinatal program coordinator prior to being presented to the Maternal Mortality Review Panel.

The Maternal Mortality Review Panel meets on a semi-annual basis to review a summary of each maternal death including specific recommendations made by the NNEPQIN Abstraction Team. After each case is presented, the entire panel discusses the appropriateness of care and deliberates until consensus on the following questions is reached:

- Was the maternal death pregnancy-associated, but not pregnancy-related or was it pregnancy associated and pregnancy-related?
- How preventable was the death?
- What public health and/or clinical strategies might prevent future deaths?

Limitations

A complete set of medical records was not always available to NH DHHS and the NNEPQIN Abstraction Team when care was provided in multiple facilities or when care was provided out-of-state.

Pregnancy-associated deaths that are the result of an alleged homicide are not reviewed until the criminal case is closed which may lead to long delays in the maternal mortality process. Deaths from other causes may also require an additional data collection period and review if the initial review determines it necessary.

At the time of this report in early October 2016, the 2015 NH vital records death file was incomplete due to missing records from NH residents (of all ages) who died out-of-state. An analysis of historical counts of NH women of childbearing age who died outside of NH suggests that the potential for missed maternal deaths is very small. In 2014, approximately one NH woman of childbearing age died outside of NH each month. All but one month of 2015 death data appears to be complete.

The deaths of women with pregnancies that did not end in a live birth may not have been accurately classified on the death record and are likely underrepresented in the pregnancy-associated deaths described in this report. For this reason, information on the causes of death for all women of childbearing age is also presented.

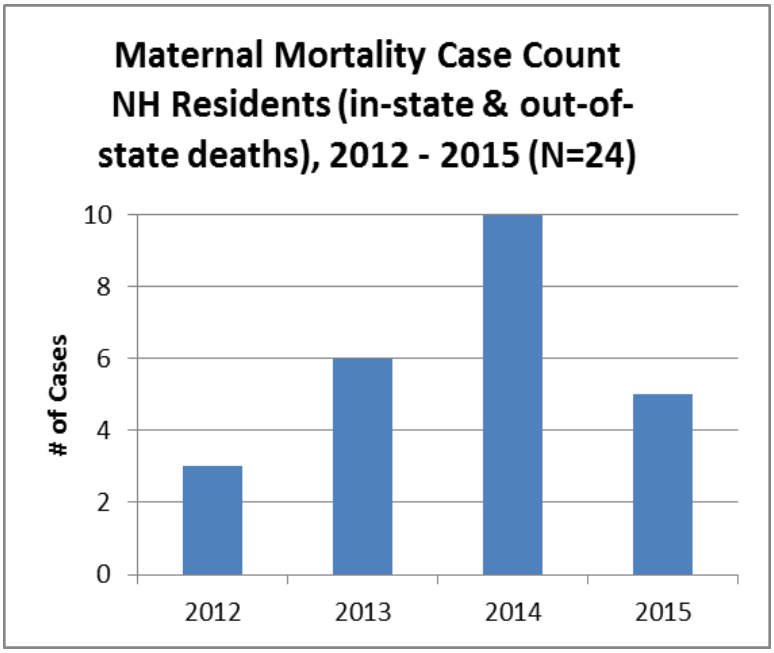
V. Overview of all Pregnancy-Associated Maternal Deaths in New Hampshire Residents, 2012-2015

Twenty-four New Hampshire residents died while they were pregnant or within one year of a pregnancy (pregnancy-associated) within the four-year period 2012 – 2015. Twenty of the twenty-four deaths occurred in NH, four occurred out-of-state. In addition, three out-of-state residents died in NH within one year of pregnancy during this same time period. These three cases were reviewed by NNEPQIN

and the MMRP; however, because they were out-of-state residents who died in NH, they are only included in the Recommendations Section of this document. See Figure 2.

Since most states report on all known pregnancy-associated deaths, those statistics are presented in this report for comparability. In addition, we present some information on the causes of death for all women of childbearing age to balance the deficiencies that may be introduced by underreporting.

Figure 2



Pregnancy Status at Time of Death for Pregnancy-Associated Deaths

Six (25%) of the twenty-four pregnancy-associated deaths occurred in women who were pregnant at the time of death.

Table 1. Pregnancy Status at Time of Death for Pregnancy-Associated Deaths in NH Residents (in-state & out-of-state deaths), 2012 – 2015 (N=24)

	Number	Percent
Pregnancy Status		
Not Pregnant	18	75.0
Pregnant	6	25.0

Cause and/or Manner of Pregnancy-Associated Deaths

Accidental drug overdose (n=5) and cardiovascular disorders (n=5) were the leading causes of death among all NH residents who died within one year of pregnancy during the four-year period 2012 - 2015. Suicide was the third leading cause of death (n=4).

Table 2. Cause/Manner of Pregnancy-Associated Maternal Deaths in NH Residents (in-state & out-of-state deaths), 2012 – 2015 (N=24)

Cause/Manner of Death	Number	Percent
Accidental Drug Overdose	5	20.8
Cardiovascular	5	20.8
Suicide	4	16.7
Cancer	2	8.3
Infection, non-obstetric	2	8.3
Motor Vehicle Accident (MVA)	2	8.3
Other	3	12.5
Unknown	1	4.2

Demographic Characteristics for Pregnancy-Associated Deaths

The average age at the time of death was 29 years old, with a range of 20 – 43 years. Ninety-two percent (n=22) of the women were white. None of the twenty-four women were of Hispanic origin. Seventy-one percent (n=17) were single, 21% (n=5) were married, and 8% (n=2) were divorced. Education level was known for 79% (n=19) of the women with 25% (n= 6) of those women having completed high school/GED and 37.5% (n=9) receiving post-secondary education. See Table 3 on the next page.

Table 3. Demographic Characteristics for Pregnancy-Associated Deaths in NH Residents (in-state & out-of-state deaths), 2012 – 2015 (N=24)		
	Number	**Percent**
Age at Death		
Under 20	0	0
20-24	6	25.0
25-29	5	20.8
30-37	11	45.8
38 and above	2	8.3
Average Age 29		
Race		
White	22	91.7
Other	2	8.3
Ethnicity		
Hispanic	0	0
Non-Hispanic	24	100
Marital Status		
Single	17	70.8
Married	5	20.8
Divorced	2	8.3
Education		
Less than high school/GED	4	16.7
Completed high school/GED	6	25.0
More than high school	9	37.5
Unknown	5	20.8

Documented Risk Factors for Pregnancy-Associated Deaths

Seventy-one percent (n=17) were single at the time of death. Eighteen women (75%) had at least one documented risk factor (obesity, tobacco use, substance use, and/or mental health disorder). Body Mass Index (BMI) is usually a good indication of body fatness in a person. A high BMI (overweight or obese) may place a person at greater risk for many health problems including heart disease, hypertension (high blood pressure), stroke, type 2 diabetes, and certain types of cancer. Fourteen women (58%) had a documented BMI. Twenty-five percent (n=6) were in the obese category. Twenty-five percent (n=6) of women with a pregnancy-associated death had a known history of tobacco use and thirty-eight percent (n=9) had a known history of substance use. Thirty-three percent (n=8) had a known history of at least one mental health condition. See Table 4.

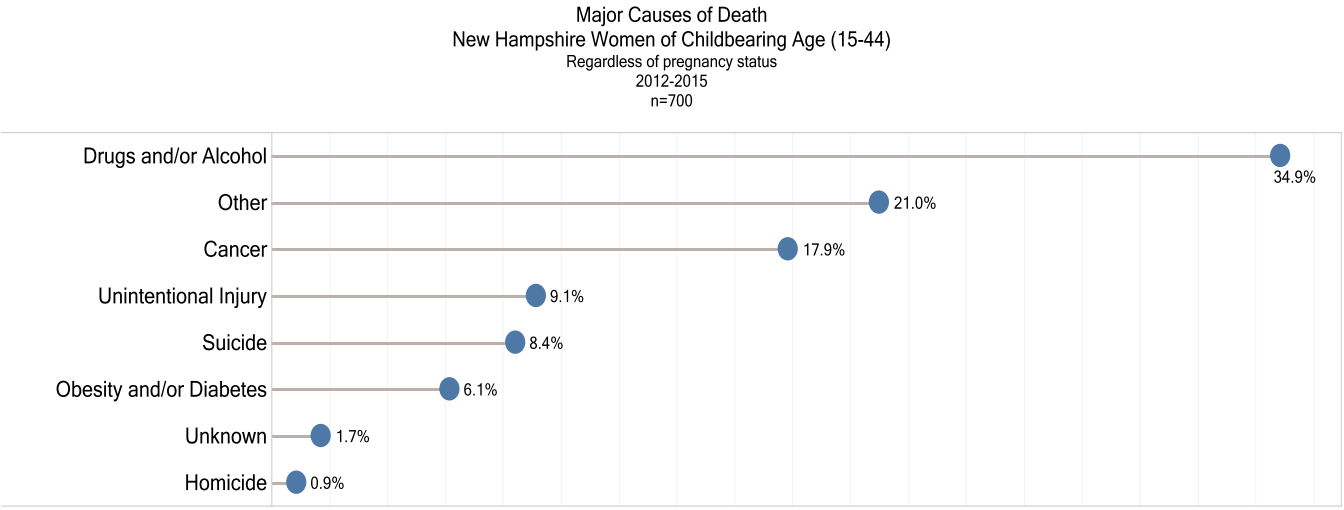
Table 4. Documented Risk Factors for Pregnancy-Associated Deaths for NH residents (in-state & out-of-state deaths), 2012 – 2015 (N=24)		
	Number	**Percent**
BMI		
Underweight (<18.5)	1	4.2
Normal Weight (18.5 - 24.9)	7	29.2
Overweight (25 – 29.9)	0	0
Obese (30+)	6	25.0
Unknown	10	41.7
Tobacco Use		
Yes	6	25.0
Denied	12	50.0
Unknown	6	25.0
Substance Use		
Yes	9	37.5
Denied	9	37.5
Unknown	6	25.0
Mental Health Condition		
Yes	8	33.3
No	10	41.7
Unknown	6	25.0

Deaths among all women of childbearing age (15-44)

Figure 3 shows the estimated proportion of deaths from major causes among all New Hampshire women of childbearing age, regardless of pregnancy status within one year of death. Many of the deaths classified as "Other" appear to include factors associated with the other categories shown on the graph (e.g. drugs and/or alcohol, obesity, cancer), however not enough information was present on the death record to definitively put them into a single category.

Drugs and/or alcohol were by far the leading cause of death. At least half of the deaths due to drugs and/or alcohol involved more than one substance ("polysubstance"). About 10% were solely classified as due to alcohol, and 16% solely to Fentanyl. Both of these substances were also frequently found in the polysubstance sub-category.

Figure 3



VI. Pregnancy Related Maternal Deaths in New Hampshire Residents (in-state & out-of-state deaths), 2012-2015

The MMRP reviews the circumstances of each maternal mortality death then comes to a consensus when categorizing the death either as pregnancy-associated, not pregnancy-related or pregnancy related. The one pregnancy related death was due to a cardiovascular disorder.

Table 5. Pregnancy Associated Deaths in NH residents (in-state & out-of-state deaths), 2012 – 2015 (N=24)

	Number	Percent
Pregnancy-associated, not pregnancy-related	16	66.7
Pregnancy-associated, pregnancy-related	1	4.2
Unknown (4 deaths occurred out-of-state, 3 NH deaths still under investigation)	7	29.2

VII. Summary of NNEPQIN and MMRP Activities for CY 2015 - Spring 2016

The following meetings occurred in 2015 and the spring of 2016:

January 28, 2015:	NNEPQIN Review of 6 cases
June 30, 2015:	MMRP review of 6 cases
December 8, 2015:	NNEPQIN review of 11 cases
March 8, 2016:	MMRP review of 11 cases

VIII. Recommendations

Emergency Department (ED) Settings:

- Enhance communication and "hand offs" between Emergency Department (ED)/Urgent Care staff and Obstetricians, Primary Care Providers, and other specialty providers regardless of the facility providing care

- Increase awareness among ED/Urgent care staff regarding the special needs of pregnant women

Screening & Counseling Women of childbearing age:

- Promote the best practice of routinely screening and counseling on the adverse effects of tobacco, alcohol, and substance use, especially during pregnancy

- Promote the best practice of counseling women childbearing age on the adverse effects of being overweight, especially during pregnancy

- Promote the best practice of promoting life planning including the use of effective long acting reversible contraceptives (LARCs) for women who do not want to become pregnant

Prenatal and Post-Partum Care:

- Promote the best practice of early entry into prenatal care and routine post-partum care.

- Promote the best practice of routinely screening for risk factors including depression; tobacco, alcohol, and substance use; and domestic violence using evidenced-based tools

- Promote the best practice of routinely monitoring pre-existing and chronic health conditions during pregnancy (diabetes, hypertension, mental health)

- Promote the best practice of making referrals to home visiting programs as appropriate

Existing Campaigns:

- Promote NH "Anyone, Anytime Opioid Campaign"

IX. Pregnancy-Associated Maternal Mortality Ratio

Twenty-four NH residents died while they were pregnant or within one year of pregnancy (pregnancy-associated) in the four-year period 2012 – 2015. Twenty of these deaths occurred in NH, four occurred out-of-state. See Table 6.

Table 6. Pregnancy-Associated Maternal Mortality Ratios of NH Residents (in-state & out-of-state deaths), 2012-2015	
Number of Pregnancy-Associated Deaths	24
Maternal Mortality Ratio: NH Residents	2.0† per 100,000 live births
†This is a preliminary pregnancy-related maternal mortality ratio due to 7 deaths that remained uncategorized at the time of this report (4 deaths occurred out-of-state and could not be reviewed due to insufficient information and 3 deaths remain under review). This ratio is based on one pregnancy-related death among 17 NH resident deaths that occurred in NH and were completely reviewed by the panel. This preliminary statistic should not be compared to other finalized statistics. It will be updated as more information becomes available.	

X. Maternal Morbidity

Severe maternal morbidity is far more common than maternal mortality. Identifying women who experience severe maternal morbidity and reviewing their care has the potential to influence the delivery of health services by improving the understanding of the primary etiologies and contributing factors of these morbid events.[2] A report on severe maternal morbidity in New Hampshire is scheduled for 2017.

XI. Conclusion

The New Hampshire Maternal Mortality Review process focuses on all pregnancy-associated deaths that occurred in the state (in-state & out-of-state residents) and provides insight not only into maternal deaths related to pregnancy but also on all maternal deaths that occurred within one year of pregnancy. It is also important to review pregnancy-associated deaths in all NH residents including deaths those that occurred out-of-state because a fair number of women seek care in our border states. Identifying risk factors associated with deaths and recommending system changes that improve services to women in NH will have a positive impact on decreasing pregnancy-associated deaths in NH residents.

[2] W.M. Callagham, M.D., M.P.H., et al: "Facility-Based Identification of Women With Severe Maternal Morbidity," Obstetrics & Gynecology, 2014;123(5)