Michigan Feto-Infant Mortality Rate, 2018

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Data source: Michigan resident live birth files (9/5/2019), infant mortality files (1/22/2020), and fetal death files (1/8/2020),
Division for Vital Records and Health Statistics, MDHHS
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Michigan Department of Health & Human Services
GRETCHEN WHITMER, GOVERNOR | ROBERT GORDON, DIRECTOR

This presentation provides updated 2018 feto-infant mortality rates for the State of Michigan.

This presentation was prepared by Yan Tian, Maternal and Child Health Epidemiology Section, Michigan Department of Health and Human Services (MDHHS)

Data source: Michigan resident live birth files (9/5/2019), infant mortality files (1/22/2020), and fetal death files (1/8/2020), Division for Vital Records and Health Statistics, MDHHS

Revised: February 2020

Perinatal Periods of Risk (PPOR) Phase 2:
Michigan Feto-Infant Mortality Rate, 2018

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

The following slides contain updated 2018 feto-infant mortality rates for the State of Michigan using the Perinatal Periods of Risk (PPOR) approach. These slides contain PPOR Phase 2 results.

Phase 2 Steps

- Causal Pathway
- Risk and Preventative Factors
- Impact

Strategy:

- Eliminate factors that are unlikely to be contributing
- Find and target known factors that are likely to be contributing

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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Phase 2 involves performing a systematic set of statistical analyses on health indicators relevant to preconception and prenatal care for both the reference group and the target group identified in Phase I. Overall, the second phase of the PPOR analysis focuses on explaining why the excess mortality occurred between the two groups.

In phase 2, the analytic methods include the following three steps:
1. Identification of causal pathways or biologic mechanisms of excess mortality
2. Estimation of the prevalence of risk and preventive factors by mechanism type
3. Estimation of the impact of these risk and preventive factors.

The analytic method strategy includes

- Eliminating factors from consideration that are unlikely to be contributing.
- Finding and targeting factors that are likely to be contributing.

Causal Pathway

- What causes of death are more common in the population with excess mortality?
- Which appears to be contributing the most to excess mortality?
- Can patterns in mortality disparities help us to understand causes?

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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In order to identify the causal pathway, we need to answer the following three questions:

1. What causes of death are more common in the population with excess mortality?
2. Which appears to be contributing the most to this excess mortality?
3. Can patterns in mortality disparities help us to understand the causes of this excess mortality?

Risk & Preventive Factors

- What are **known** primary risk and preventive factors associated with the causes?
- Which of these factors exhibits disparities?

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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In order to estimate the prevalence of risk and preventive factors by mechanism type, we need to know

1. What are the **known** primary risk and preventive factors associated with the causes?
2. Which of these factors exhibits disparities?

Impact

- Estimate the impact of:
  - Each factor on excess mortality
  - The potential impact of changing the factor

Helps to prioritize among the factors contributing to excess mortality.

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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Estimating the impact of each factor on excess mortality and the potential impact of changing the factor can help to prioritize among the factors contributing to excess mortality.

Cause of Death

- Based on the underlying cause of death as listed on the death certificate.
- Categorized as follows:

Cause of Death	ICD-10 code
Congenital Anomaly	All ‘Q’
Other	All others not listed
Perinatal Conditions	All ‘P’
Sleep-related	‘R95’, ‘R99’ & ‘W84’
Infection	All ‘J’
Injury	All ‘V’ & above excludes ‘W84’

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

Based on the underlying cause of death as listed on the death certificate, the cause of death was categorized as a congenital anomaly (ICD-10 coded as all “Q”), perinatal conditions (ICD-10 coded as all “P”), sleep-related (ICD-10 coded as all “R95”, “R99” & “W84”), an infection (ICD-10 coded as all “J”), an injury (ICD-10 coded as all “V” and above excluding “W84”), or other (ICD-10 coded as all others not listed here).

Infant Mortality by Cause of Death, Michigan, 2018

Cause of Death	Frequency	State	Reference	Excess Rate
Congenital Anomaly	117	1.06	1.00	0.06
Other	52	0.47	0.30	0.17
Perinatal Conditions	165	1.50	0.91	0.59
Sleep-related	128	1.16	0.54	0.62
Infection	16	0.15	0.05	0.09
Injury	29	0.26	0.09	0.18
Total	507	4.61	2.89	1.71

*Infant deaths > 20 weeks of gestation and > 500 grams birthweight.
*Using Michigan 2018 reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

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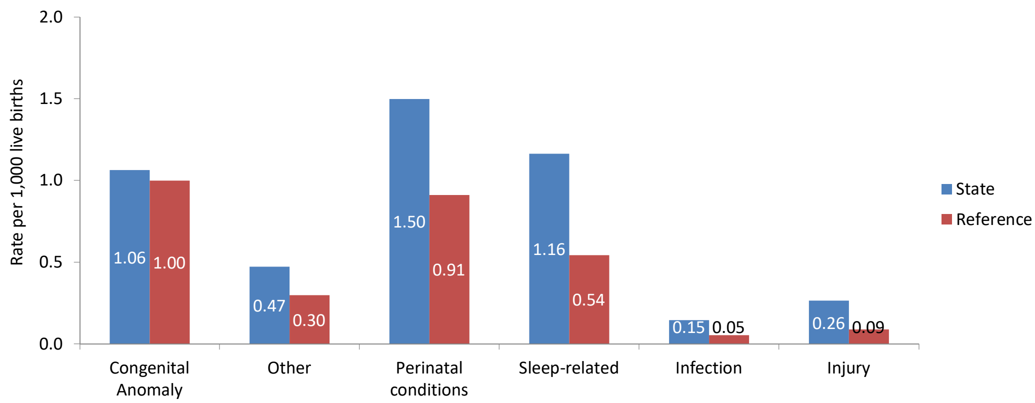
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the 2018 infant mortality rates by cause of death for the State of Michigan. The cause-specific mortality rate (CSMR) is defined as the number of deaths due to a specific cause divided by the number of live births. The excess CSMR is calculated by subtracting the CSMR of the reference group from the CSMR of the target group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery. In this analysis, a death within the target group is defined as an infant death over 20 weeks of gestation and above 500 grams birthweight.

The CSMR for sleep-related causes in the target group is 0.62 deaths per 1,000 live births higher than in the reference group. Put another way, the CSMR of sleep-related causes is roughly 2.15 times (1.16/0.54) higher in the target group than in the reference group. The CSMR for perinatal conditions in the target group is 0.59 deaths per 1,000 live births higher than in the reference group. The CSMR for congenital anomalies in the target group is 0.06 deaths per 1,000 live births higher than in the reference group. The CSMR for other causes in the target group is 0.17 deaths per 1,000 live births higher than in the reference group. The CSMR for infections in the target group is 0.09 deaths per 1,000 live births higher than in the reference group. The CSMR for injuries in the target group is 0.18 deaths per 1,000 live births higher than in the reference group.

Infant Mortality by Cause of Death, Michigan, 2018



*Infant deaths > 20 weeks of gestation and > 500 grams birthweight.
*Using Michigan 2018 reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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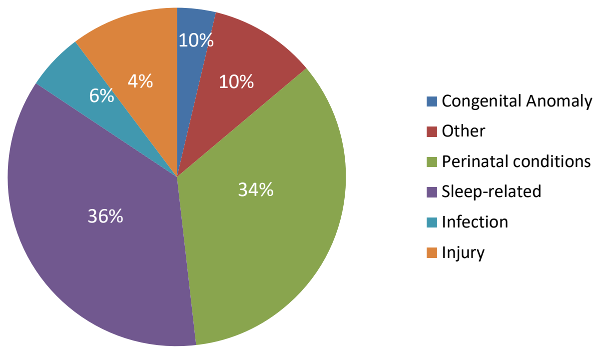
This slide shows the 2018 infant mortality rates by cause of death for the State of Michigan. The cause-specific mortality rate (CSMR) is defined as the number of deaths due to a specific cause divided by the number of live births. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery. In this analysis, a death within the target group is defined as an infant death over 20 weeks of gestation and above 500 grams birthweight.

In the target group, the CSMR for perinatal conditions (1.50 deaths per 1,000 live births) was higher than that of the other identified causes, followed by sleep-related causes (1.16 deaths per 1,000 live births) and congenital anomalies (1.06 deaths per 1,000 live births). In the reference group, the CSMR for congenital anomalies (1.00 deaths per 1,000 live births) was higher than that of the other identified causes, followed by perinatal conditions (0.91 deaths per 1,000 live births), and sleep-related causes (0.54 deaths per 1,000 live births).

Excess Cause-Specific Infant Mortality, Michigan, 2018



*Infant deaths > 20 weeks of gestation and > 500 grams birthweight.
*Using Michigan 2018 reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the 2018 excess cause-specific infant mortality rates for the State of Michigan. The cause-specific mortality rate (CSMR) is defined as the number of deaths due to a specific cause divided by the number of live births. The excess CSMR is calculated by subtracting the CSMR of the reference group from the CSMR of the target group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery. In this analysis, a death within the target group is defined as an infant death over 20 weeks of gestation and above 500 grams birthweight.

The CSMR for sleep-related causes accounted for 36 percent of the excess infant mortality; perinatal conditions accounted for 34 percent; injuries accounted for 10 percent; other causes accounted for 10 percent; infections accounted for 6 percent; and congenital anomalies accounted for 4 percent.

Infant Mortality during the Maternal Health/Prematurity Period by Cause of Death, Michigan, 2018

Cause of Death	Frequency	State	Reference	Excess Rate
Congenital Anomaly	23	0.21	0.26	-0.05
Other	14	0.13	0.04	0.09
Perinatal Conditions	122	1.11	0.56	0.55
Sleep-related	7	0.06	0.02	0.05
Infection	3	0.03	0.02	0.01
Injury	2	0.02	0.00	0.02
Total	171	1.55	0.89	0.66

*Infant deaths > 20 weeks of gestation and > 500 grams birthweight.
*Using Michigan 2018 reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the 2018 infant mortality rates by cause of death during the maternal health and prematurity period for the State of Michigan. The maternal health and prematurity period is defined as the period of infant deaths of birthweight between 500 grams and 1,499 grams and fetal deaths with gestational ages of 24 weeks or more and birthweights of 500 grams or more. The cause-specific mortality rate (CSMR) is defined as the number of deaths due to a specific cause divided by the number of live births. The excess CSMR is calculated by subtracting the CSMR of the reference group from the CSMR of the target group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery. In this analysis, a death within the target group is defined as an infant death over 20 weeks of gestation and above 500 grams birthweight.

During the maternal health and prematurity period, the CSMR for perinatal conditions in the target group is 0.55 deaths per 1,000 live births higher than in the reference group. Put another way, the CSMR for perinatal conditions is roughly 1.98 times (1.11/0.56) higher in the target group than in the reference group. The CSMR for congenital anomalies in the target group is 0.05 deaths per 1,000 live births lower than in the reference group. The CSMR for other causes in the target group is 0.09 deaths per 1,000 live births higher than in the reference group. The CSMR for sleep-related causes in the target group is 0.05 deaths per 1,000 live births higher than in the reference group. The CSMR for infections in the target group is 0.01 deaths per 1,000 live births higher than in the reference group. The CSMR for injuries in the target group is 0.02 deaths per 1,000 live births higher than in the reference group.

Classification of Perinatal causes

Cause	ICD-10
Newborn affected by maternal complications of pregnancy	P01
Newborn affected by complications of placenta, cord and membranes	P02
Disorders related to short gestation and low birth weight, not elsewhere classified	P07
Intrauterine hypoxia and birth asphyxia	P20-P21
Respiratory Distress of newborn	P22
Bacterial Sepsis of newborn	P36

- Based on Classification of Perinatal cause of death, NCHS, http://www.cdc.gov/nchs/data/hestat/infantmort/infantmort.htm#footnotes3

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slides shows the classification of perinatal causes based on the National Center for Health Statistics (NCHS) classification of perinatal cause of death. (http://www.cdc.gov/nchs/data/hestat/infantmort/infantmort.htm#footnotes3)

If the “P01” ICD-10 code is noted, the cause is classified as newborn affected by maternal complications of pregnancy. If the “P02” ICD-10 code is noted, the cause is classified as newborn affected by complications of placenta, cord and membranes . If the “P07” ICD-10 code is noted, the cause is classified as a disorder related to short gestation and low birth weight, not elsewhere classified. If the “P20” or “P21” ICD-10 codes are noted, the cause is classified as intrauterine hypoxia and birth asphyxia. If the “P22” ICD-10 code is noted, the cause is classified as respiratory distress of the newborn. Finally, if the “P36” ICD-10 code is noted, the cause is classified as bacterial sepsis of the newborn.

Infant Mortality during the Maternal Health/Prematurity Period by Perinatal Cause of Death, Michigan, 2018

	Frequency	State	Reference	Excess Rate
Newborn affected by maternal complications of pregnancy	2	0.02	0.00	0.02
Newborn affected by complications of placenta, cord and membranes	4	0.04	0.02	0.02
Disorders related to short gestation and low birth weight, not elsewhere classified	45	0.41	0.21	0.20
Intrauterine hypoxia and birth asphyxia	3	0.03	0.04	-0.01
Respiratory Distress of newborn	9	0.08	0.05	0.03
Bacterial Sepsis of newborn	8	0.07	0.04	0.04
All Others	51	0.46	0.21	0.25

*Infant deaths > 20 weeks of gestation and > 500 grams birthweight.
*Using Michigan 2018 reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

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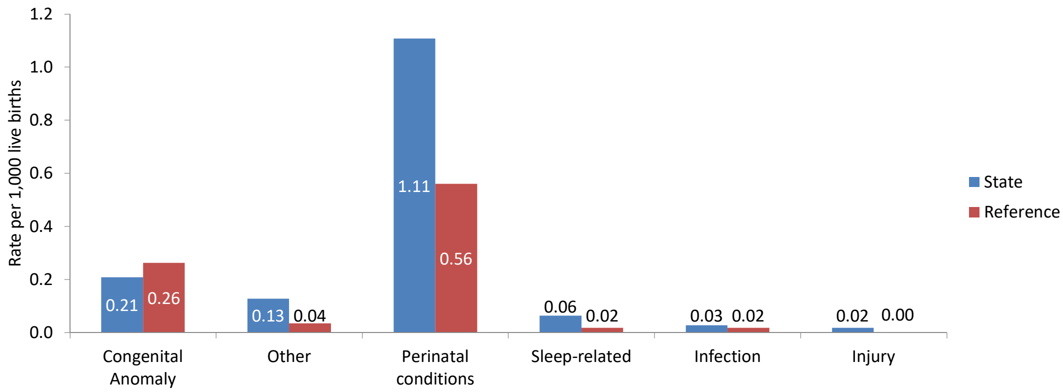
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the 2018 infant mortality rates by perinatal causes during the maternal health and prematurity period for the State of Michigan. The cause-specific mortality rate (CSMR) is defined as the number of deaths due to a specific cause divided by the number of live births. The excess CSMR is calculated by subtracting the CSMR of the reference group from the CSMR of the target group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery. In this analysis, a death within the target group is defined as an infant death over 20 weeks of gestation and above 500 grams birthweight.

During the maternal health and prematurity period, the CSMR for disorders related to short gestation and low birth weight (not elsewhere classified) in the target group is 0.20 deaths per 1,000 live births higher than in the reference group. The CSMR for newborns affected by complications of placenta, cord and membranes in the target group is 0.02 deaths per 1,000 live births higher than in the reference group. The CSMR for respiratory distress of the newborn in the target group is 0.03 deaths per 1,000 live births higher than in the reference group. The CSMR for intrauterine hypoxia and birth asphyxia in the target group is 0.01 deaths per 1,000 live births lower than in the reference group.

Infant Mortality during the Maternal Health/Prematurity Period by Cause of Death, Michigan, 2018



*Infant deaths > 20 weeks of gestation and > 500 grams birthweight.
*Using Michigan 2018 reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

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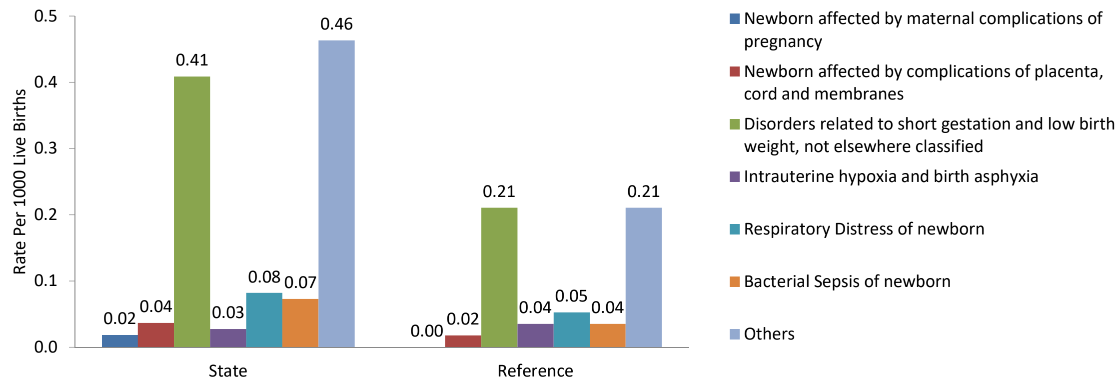
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the 2018 infant mortality rates by cause of death during the maternal health and prematurity period for the State of Michigan. The cause-specific mortality rate (CSMR) is defined as the number of deaths due to a specific cause divided by the number of live births. The excess CSMR is calculated by subtracting the CSMR of the reference group from the CSMR of the target group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery. In this analysis, a death within the target group is defined as an infant death over 20 weeks of gestation and above 500 grams birthweight.

During the maternal health and prematurity period, for the target group, the CSMR for perinatal conditions (1.11 deaths per 1,000 live births) was higher than that of other identified causes, followed by the CSMR for congenital anomalies (0.21 deaths per 1,000 live births), and the CSMR for other causes (0.13 deaths per 1,000 live births). During the maternal health and prematurity period, for the reference group, the CSMR for perinatal conditions (0.56 deaths per 1,000 live births) was higher than that of other identified causes, followed by the CSMR for congenital anomalies (0.26 deaths per 1,000 live births), and the CSMR for other causes (0.04 deaths per 1,000 live births).

Infant Mortality during the Maternal Health/Prematurity Period by Perinatal Cause of Death, Michigan, 2018



*Infant deaths > 20 weeks of gestation and > 500 grams birthweight
*Using Michigan 2018 reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

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Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the 2018 infant mortality rates by perinatal causes during the maternal health and prematurity period for the State of Michigan. The cause-specific mortality rate (CSMR) is defined as the number of deaths due to a specific cause divided by the number of live births. The excess CSMR is calculated by subtracting the CSMR of the reference group from the CSMR of the target group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery. In this analysis, a death within the target group is defined as an infant death over 20 weeks of gestation and above 500 grams birthweight.

During the maternal health and prematurity period, for the target group, the CSMR for disorders related to short gestation and low birth weight (not elsewhere classified) [0.41 deaths per 1,000 live births] was higher than that of other identified causes, followed by the CSMR for newborns affected by others (0.30 deaths per 1,000 live births), the CSMR for respiratory distress of the newborn (0.08 deaths per 1,000 live births), and the CSMR for bacterial sepsis of the newborn (0.07 deaths per 1,000 live births). During the maternal health and prematurity period, for the reference group, the CSMR for disorders related to short gestation and low birth weight (not elsewhere classified) [0.21 deaths per 1,000 live births] was higher than that of other identified causes, followed by the CSMR for respiratory distress of the newborn (0.05 deaths per 1,000 live births).

PPOR Phase 2: Kitagawa Analysis

Identify causal pathways or biologic mechanisms for excess mortality

Michigan Department of Health & Human Services

GRETCHEN WHITMER, GOVERNOR | ROBERT GORDON, DIRECTOR

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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The next several slides contain updated PPOR Phase 2 results for the State of Michigan. These slides focus on the use of Kitagawa analyses to identify causal pathways or biologic mechanisms for excess mortality,

PPOR Phase 2:
Identify causal pathways or biologic mechanisms for excess mortality

Cause of very low birthweight fetal and infant deaths is

- Multifactorial
- Complex
- Inconsistent
- Reporting varies by facility

ICD-10 Cause of Death Codes may not capture all deaths related to prematurity and low birth weight.

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the PPOR Phase 2 analysis to identify causal pathways or biologic mechanisms for excess mortality for the State of Michigan.

Analyses for the maternal health and prematurity periods approach this step differently from the other PPOR periods because the underlying causes of death for fetal and infant deaths born weighing less than 1,500 grams are usually multifactorial, complex, and inconsistent. Furthermore, reporting varies by the perinatal capability of the hospital reporting and the clinical training of the certifier.

PPOR Phase 2:
Identify causal pathways or biologic mechanisms for excess mortality

KITAGAWA ANALYSIS

A more useful alternative is using Kitagawa's formula* to algebraically partition excess mortality into two portions:

1. **birthweight distribution**
2. **birthweight specific mortality**

*Kitagawa, E.M. (1955). Components of a difference between two rates. *J Am Stat Assoc.*, 50(272), 1168-1194.

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the Kitagawa analysis for identifying causal pathways or biologic mechanisms for excess mortality. **KITAGAWA ANALYSIS** is a more useful alternative because it uses the Kitagawa formula to algebraically partition excess mortality into two portions: **birthweight distribution** and **birthweight specific mortality.**

In Phase 2 of the analysis, where excess mortality is concentrated in the Maternal Health/Prematurity period, teams may want to use the Kitagawa method to explore whether excess deaths are due to birth weight-specific mortality (the mortality rate of infants born in a specific birth weight range) or to birth weight distribution (the frequency of low and very low birth weight births). Kitagawa quantifies the relative contribution of the birth weight-specific mortality rate and the birth weight distribution to the total change in feto-infant mortality rates, where both may be changing simultaneously.

KITAGAWA'S FORMULA

$$MR_1 - MR_2 = \sum_1^n \left(\left(\frac{(P_{1n}+P_{2n})}{2} \times (M_{1n} - M_{2n}) \right) + \left(\frac{(M_{1n}+M_{2n})}{2} \times (P_{1n} - P_{2n}) \right) \right)$$

{Overall difference} = {Birthweight-specific mortality} + {Frequency of lower birthweights}

where: n= Number of birthweight categories (birthweight "strata")

MR_1=Overall feto-infant mortality rate for high (target) mortality group

MR_2=Overall feto-infant mortality rate for the reference group

P_{1n}=Proportion of births for a specific birthweight category for the high mortality group

P_{2n}=Proportion of births for a specific birthweight category for the reference group

M_{1n}=Birthweight specific mortality rate for high mortality group

M_{2n}=Birthweight specific mortality rate for the reference group

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Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows Kitagawa's formula. This partitioning is helpful because the factors and services that generally affect birthweight distribution are different from the factors and services that affect birthweight-specific mortality rates.

Partitioning excess deaths using the Kitagawa method can help states, counties, urban areas, tribes or regions to focus their intervention efforts. Teams that find a high frequency of very low birth weight births contributing to excess mortality may choose to examine risk factors associated with very low birth weight/preterm birth. Teams that find larger excess mortality due to higher birth weight-specific mortality may choose to examine aspects of their perinatal care system that may be contributing to higher birth weight-specific infant mortality rates.

Kitagawa Analyses, Michigan, 2014-2018

Table 1: Target Population

Birthweight	# Live Births	# Infant Deaths	# Fetal Deaths (24+ weeks)
0-499	1,189	1,055	232
500-749	1,394	537	198
750-999	1,565	179	161
1,000-1,249	1,861	126	144
1,250-1,499	2,379	102	124
1,500-1,999	9,588	239	247
2,000-2,499	30,131	326	245
2,500+	514,354	1,197	502
Unknown	184	32	79
Total	562,645	3,793	1,932

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the 2014-2018 Kitagawa analysis results in the target population for the State of Michigan.

There are nine birth weight categories (in grams): 0-499; 500-749; 750-999; 1,000-1,249; 1,250-1,499; 1,500-1,999; 2,000-2,499; 2,500+; and unknown. For each birthweight category, we list the number of live births, the number of infant deaths, and the number of fetal deaths (24+ weeks of gestation) for the target population. For this Kitagawa analysis, the 0-499 grams and unknown birthweight categories were excluded.

Kitagawa Analyses, Michigan, 2014-2018

Table 2: Reference Population

Birthweight	# Live Births	# Infant Deaths	# Fetal Deaths (24+ weeks)
0-499	297	274	89
500-749	441	173	69
750-999	538	60	52
1,000-1,249	712	40	42
1,250-1,499	917	38	42
1,500-1,999	3,740	90	86
2,000-2,499	11,599	100	100
2,500+	272,840	390	252
Unknown	80	10	25
Total	291,164	1,175	757

Reference population: Michigan White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery) 2014-2018.

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Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the 2014-2018 Kitagawa analysis results in the reference population for the State of Michigan. The reference population is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery.

There are nine birth weight categories (in grams) : 0-499; 500-749; 750-999; 1,000-1,249; 1,250-1,499; 1,500-1,999; 2,000-2,499; 2,500+; unknown. For each birthweight category, we list the number of live births, the number of infant deaths and the number of fetal deaths (24+ weeks of gestation) for the reference population. For this Kitagawa analysis, the 0-499 grams and unknown birthweight categories were excluded.

Feto-Infant Mortality:

Birthweight Distribution and Birthweight-Specific Mortality

Table 3: Birthweight Distribution & Birthweight-Specific Mortality
Population Group 1 =**Target Population**

Birthweight	# Live Births & Fetal Deaths	# Feto-Infant Deaths	Birthweight Distribution	Feto-Infant Mortality Rates
500-749	1,592	735	0.3%	461.7
750-999	1,726	340	0.3%	197.0
1,000-1,249	2,005	270	0.4%	134.7
1,250-1,499	2,503	226	0.4%	90.3
1,500-1,999	9,835	486	1.7%	49.4
2,000-2,499	30,376	571	5.4%	18.8
2,500+	514,856	1,699	91.5%	3.3
Total	562,893	4,327	100.0%	**7.7**

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the birth-weight-specific mortality rates, the frequency of low birth-weight, the birth-weight distribution, and the feto-infant mortality rates in the target population. In the target population, the number of live births, fetal deaths, and feto-infant deaths were entered, and the birthweight distribution and birth-weight-specific mortality rates were calculated.

- For the 500-749 grams birthweight category, birthweight accounted for 0.3 percent and the feto-infant mortality rate was 461.7 deaths per 1,000 live births and fetal deaths.
- For the 750-999 grams birthweight category, birthweight accounted for 0.3 percent and the feto-infant mortality rate was 197.0 deaths per 1,000 live births and fetal deaths.
- For the 1,000-1,249 grams birthweight category, birthweight accounted for 0.4 percent and the feto-infant mortality rate was 134.7 deaths per 1,000 live births and fetal deaths.
- For the 1,250-1,499 grams birthweight category, birthweight accounted for 0.4 percent and the feto-infant mortality rate was 90.3 deaths per 1,000 live births and fetal deaths.
- For the 1,500-1,999 grams birthweight category, birthweight accounted for 1.7 percent and the feto-infant mortality rate was 49.4 deaths per 1,000 live births and fetal deaths.
- For the 2,000-2,499 grams birthweight category, birthweight accounted for 5.4 percent and the feto-infant mortality rate was 18.8 deaths per 1,000 live births and fetal deaths.
- For the 2,500+ grams birthweight category, birthweight accounted for 91.5 percent and the feto-infant mortality rate was 3.3 deaths per 1,000 live births and fetal deaths.

For the whole target population, the feto-infant mortality rate was 7.7 deaths per 1,000 live births and fetal deaths.

Feto-Infant Mortality:

Birthweight Distribution and Birthweight-Specific Mortality

Table 4: Birthweight Distribution & Birthweight-Specific Mortality
Population Group 2 =**Reference Population**

Birthweight	# Live Births & Fetal Deaths	# Feto-Infant Deaths	Birthweight Distribution	Feto-Infant Mortality Rates
500-749	510	242	0.2%	474.5
750-999	590	112	0.2%	189.8
1,000-1,249	754	82	0.3%	108.8
1,250-1,499	959	80	0.3%	83.4
1,500-1,999	3,826	176	1.3%	46.0
2,000-2,499	11,699	200	4.0%	17.1
2,500+	273,092	642	93.7%	2.4
Total	291,430	1,534	100.0%	**5.3**

Reference population: Michigan White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery, 2014-2018).

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Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the birth-weight-specific mortality rates, the frequency of low birth-weight, the birth-weight distribution, and the feto-infant mortality rates in the reference population. In the reference population, the number of live births, fetal deaths, and feto-infant deaths were entered, and the birthweight distribution and birth-weight-specific mortality rates were calculated.

- For the 500-749 grams birthweight category, birthweight accounted for 0.2 percent and the feto-infant mortality rate was 474.5 deaths per 1,000 live births and fetal deaths.
- For the 750-999 grams birthweight category, birthweight accounted for 0.2 percent and the feto-infant mortality rate was 189.8 deaths per 1,000 live births and fetal deaths.
- For the 1,000-1,249 grams birthweight category, birthweight accounted for 0.3 percent and the feto-infant mortality rate was 108.8 deaths per 1,000 live births and fetal deaths.
- For the 1,250-1,499 grams birthweight category, birthweight accounted for 0.3 percent and the feto-infant mortality rate was 83.4 deaths per 1,000 live births and fetal deaths.
- For the 1,500-1,999 grams birthweight category, birthweight accounted for 1.3 percent and the feto-infant mortality rate was 46.0 deaths per 1,000 live births and fetal deaths.
- For the 2,000-2,499 grams birthweight category, birthweight accounted for 4.0 percent and the feto-infant mortality rate was 17.1 deaths per 1,000 live births and fetal deaths.
- For the 2,500+ grams birthweight category, birthweight accounted for 93.7 percent and the feto-infant mortality rate was 2.4 deaths per 1,000 live births and fetal deaths.

For the whole reference population, the feto-infant mortality rate was 5.3 deaths per 1,000 live births and fetal deaths.

Feto-Infant Mortality:

Birthweight Distribution and Birthweight-Specific Mortality

Table 5: Excess Mortality - Effects of the Birthweight Distribution and of the Birthweight-Specific Mortality

	Actual Contribution to the Difference in Excess Mortality Rates			Percentage Contribution to the Difference in Excess Mortality Rates		
Birthweight	**Birthweight Distribution**	**Feto-Infant Mortality Rates**	**Total**	**Birthweight Distribution**	**Feto-Infant Mortality Rates**	**Total**
500-749	0.50	-0.03	0.48	20.8%	-1.2%	19.6%
750-999	0.20	0.02	0.22	8.3%	0.8%	9.1%
1,000-1,249	0.12	0.08	0.20	4.9%	3.3%	8.2%
1,250-1,499	0.10	0.03	0.13	4.1%	1.1%	5.2%
1,500-1,999	0.21	0.05	0.26	8.6%	2.2%	10.7%
2,000-2,499	0.25	0.08	0.33	10.2%	3.3%	13.5%
2,500+	-0.06	0.88	0.82	-2.6%	36.3%	**33.6%**
Total	1.32	1.11	**2.42**	54.4%	45.6%	100.0%
MH/Prem.	0.93	0.10	**1.02**	38.2%	3.9%	**42.1%**

Reference population: Michigan White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery, 2014-2018).

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the birth weight-specific components for the absolute difference in overall feto-infant mortality rates between the target and reference populations due to birth weight distribution and feto-infant mortality rates, and birth weight-specific components for the absolute difference in overall feto-infant mortality rates between populations due to birth weight distribution and feto-infant mortality rates. The reference population is White non-Hispanic Michigan women, over 20 years and less than 40 years old, with at least 13 years education or are intending to use private insurance at delivery.

In the left side of Table 5, the Kitagawa formula was applied to estimate the effects of the two components contributing to the overall difference of 2.42 deaths per 1,000 live births and fetal deaths.

- The contribution of 500-749 grams births and fetal deaths to the overall excess mortality rate was 0.48 deaths per 1,000 live births and fetal deaths.
- The contribution of 750-999 grams births and fetal deaths to the overall excess mortality rate was 0.22 deaths per 1,000 live births and fetal deaths.
- The contribution of 1,000-1,249 grams births and fetal deaths to the overall excess mortality rate was 0.20 deaths per 1,000 live births and fetal deaths.
- The contribution of 1,250-1,499 grams births and fetal deaths to the overall excess mortality rate was 0.13 deaths per 1,000 live births and fetal deaths.
- The contribution of 1,500-1,999 grams births and fetal deaths to the overall excess mortality rate was 0.26 deaths per 1,000 live births and fetal deaths.

- The contribution of 2,000-2,499 grams births and fetal deaths to the overall excess mortality rate was 0.33 deaths per 1,000 live births and fetal deaths.
- The contribution of 2,500+ grams births and fetal deaths to the overall excess mortality rate was 0.82 deaths per 1,000 live births and fetal deaths.

The first “Total” column represents the contribution of births and fetal deaths of each birth-weight class to the overall excess mortality rate. According to Table 5, the birth-weight distribution for the 2500+ gram birth-weight class served as the largest contributor (0.82) to the overall excess. The second largest contribution was among the 500-749 gram birth-weight class (0.48). The overall VLBW contribution is the sum of the totals from the birth-weight classes of less than 1500 grams, that is, 0.48+ 0.22 + 0.20 +0.13= 1.02.

In the right side of Table 5, the Kitagawa formula was then applied to estimate the percentage of excess mortality due to birth-weight distribution (VLBW Births) and the percentage of excess due to high birth-weight-specific mortality rates (Perinatal Care).
- The contribution of 500-749 grams births and fetal deaths to the overall excess mortality rate was 19.6 percent.
- The contribution of 750-999 grams births and fetal deaths to the overall excess mortality rate was 9.1 percent.
- The contribution of 1,000-1,249 grams births and fetal deaths to the overall excess mortality rate was 8.2 percent.
- The contribution of 1,250-1,499 grams births and fetal deaths to the overall excess mortality rate was 5.2 percent.
- The contribution of 1,500-1,999 grams births and fetal deaths to the overall excess mortality rate was 10.7 percent.
- The contribution of 2,000-2,499 grams births and fetal deaths to the overall excess mortality rate was 13.5 percent.
- The contribution of 2,500+ grams births and fetal deaths to the overall excess mortality rate was 33.6 percent.

Of the overall excess of 2.42, the majority (54.4 percent) can be attributed to the birth-weight distribution in the target group. The high rate of live births and fetal deaths in the 500-749 gram birth-weight class for the birthweight distribution column alone contributed 20.8 percent to the overall excess. Consequently, in addressing excess deaths in the Maternal Health/Prematurity category, attention should be directed toward reducing the percentage of very low birth-weight. In other words, the VLBW births path should be examined further.

Feto-Infant Mortality:

Birthweight Distribution and Birthweight-Specific Mortality

1. The birth-weight-specific mortality rates and frequency of low birth-weight, the birth-weight distribution and feto-infant mortality rates were calculated for both the target group and the reference group.
   Table 3 & 4: The birth-weight-specific mortality rates are less stable: in the lowest four birth-weight classes, the target and reference group both have survival advantage (i.e., the feto-infant mortality rate in the target group is less than the reference group despite an overall higher feto-infant mortality rate in the target group). The survival advantage for the reference group is very pronounced in the highest three birth-weight classes with the mortality rate for the reference group at normal birth-weight (2.4 per 1000 live births) being 1.4 times lower compared to the target group (3.3 per 1000 live births). The absolute difference in the overall feto-infant mortality rates is 2.4 (i.e., *MR1* – *MR2* = 7.7 – 5.3 = 2.4).

2. The Kitagawa formula was then applied to estimate the percentage of excess mortality due to birth-weight distribution (VLBW Births) and the percentage of excess due to high birth-weight-specific mortality rates (Perinatal Care). The “Total” column represents the contribution of births and fetal deaths of each birth-weight class to the overall excess mortality rate.
   Table 5: 33.6 percent of excess mortality is among normal birthweight babies (2,500-6,499 grams); 24.2 percent of excess mortality is among low birthweight babies(1,500-2,499 grams); 42.1 percent of excess mortality is among very low birthweight babies (500-1,499 grams).

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the summary results of the Kitagawa analysis.

Feto-Infant Mortality:

Birthweight Distribution and Birthweight-Specific Mortality

- Partitioning excess deaths using the Kitagawa method can help states, counties, urban areas, tribes or regions to focus their intervention efforts. Jurisdictions that find a high frequency of **very low birth weight** births contributing to excess mortality may choose to examine **risk factors** associated with very low birth weight. Jurisdictions that find larger excess mortality due to higher **birth weight-specific mortality** may choose to examine aspects of their **perinatal care system** that may be contributing to higher birth weight-specific infant mortality rates.

- The majority (54.4 percent) of the overall excess of 2.42 deaths per 1,000 live births and fetal deaths in Michigan, 2014-2018, can be attributed to the **birth-weight distribution** in the target group. The high rate of live births and fetal deaths in the **500-749 grams** birth-weight class for the birthweight distribution column alone contributed **20.8 percent** to the overall excess. Consequently, in addressing excess deaths in the Maternal Health/Prematurity category, attention should be directed toward **reducing the percentage of very low birth-weight**. In other words, the VLBW births path should be examined further to identify risk factors associated with very low birth weight.

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Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows additional summary results of the Kitagawa analysis.

PPOR Phase 2:

Population Attributable Risk (PAR) or Fraction (PARF)

Estimate the impact of the risk and preventive factors

MDHHS
Michigan Department of Health & Human Services
GRETCHEN WHITMER, GOVERNOR | ROBERT GORDON, DIRECTOR

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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The next slides contain updated PPOR Phase 2 results for the State of Michigan. These results focus on the population attributable risk or fraction in order to estimate the impact of the risk and preventive factors.

PPOR Phase 2

Estimate the impact of the risk and preventive factors

- It might be tempting to pick the risk factor with the biggest disparity.
- But instead we ideally address risk factors with the biggest potential impact.
- Estimating the impact of each factor on excess mortality, and the potential impact of changing the factor, can help prioritize among the factors likely to be contributing to excess mortality.

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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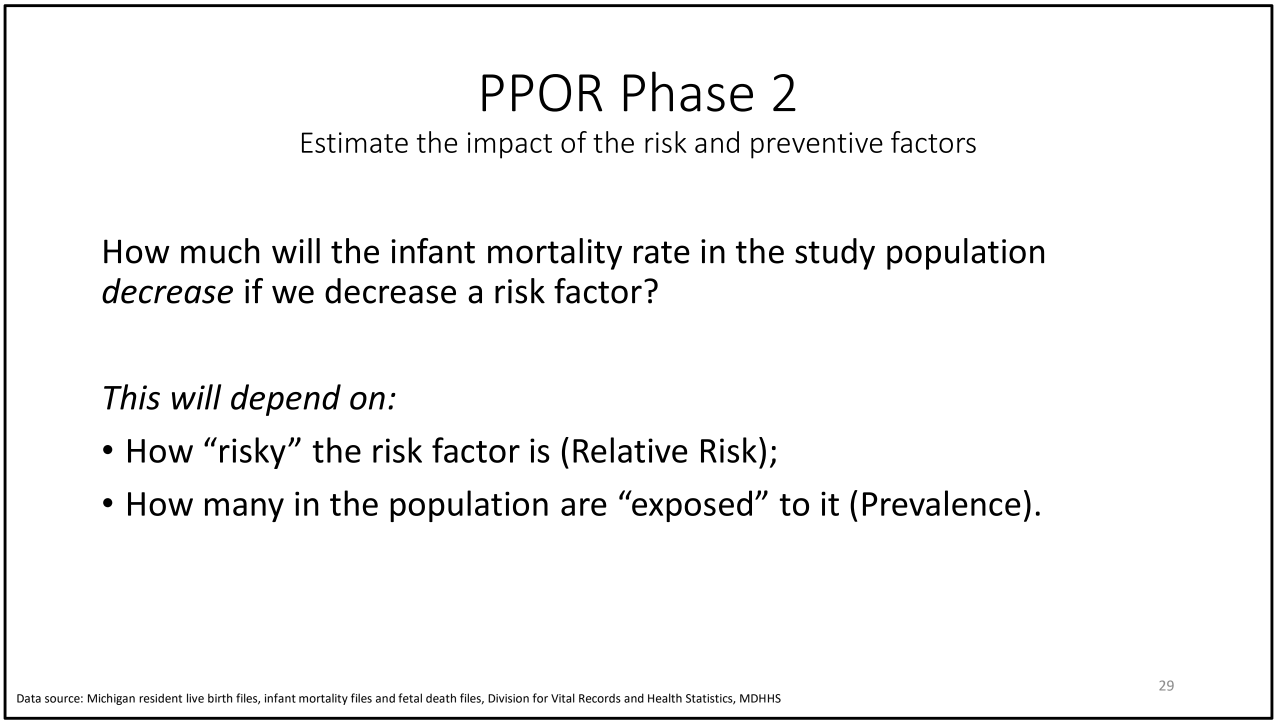
This slide focuses on the estimation of the impact of the risk and preventive factors for PPOR Phase 2 for the State of Michigan.

It might be tempting to pick the risk factor with the biggest disparity. But instead we ideally address risk factors with the biggest potential impact. Estimating the impact of each factor on excess mortality, and the potential impact of changing the factor, can help prioritize among the factors that are likely to be contributing to the excess mortality.



This slide focuses on the estimation of the impact of the risk and preventive factors for PPOR Phase 2 for the State of Michigan.

How much will the infant mortality rate in the study population *decrease* if we decrease a risk factor?
This will depend on: How "risky" the risk factor is (Relative Risk) and how many in the population are "exposed" to it (Prevalence).

PPOR Phase 2

Estimate the impact of the risk and preventive factors

Population Attributable Risk Fraction

- Compares rate for the whole population to the rate for those WITHOUT the risk factor.
- Based on rate difference or (equivalently) on relative risk and prevalence of the exposure for the whole population.
- Interpretation: *"Percent of the population that would be prevented from the poor outcome if the risk factor were eliminated from the entire population."*
- Relevant to estimating overall impact and cost.

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide focuses on the estimation of the impact of the risk and preventive factors for PPOR Phase 2 for the State of Michigan.

The **Population Attributable Risk Fraction** compares the rate for the whole population to the rate for those WITHOUT the risk factor. It is based on the rate difference or (equivalently) on relative risk and prevalence of the exposure for the whole population. It is interpreted as the "p*ercent of the population that would be prevented from the poor outcome if the risk factor were eliminated from the entire population."* This calculation is relevant to estimating overall impact and cost.

PPOR Phase 2

Estimate the impact of the risk and preventive factors

Population Attributable Risk (PAR) or Fraction (PARF)

- Account for both the magnitude of association and the prevalence of risk in the population.
- Address the question: What if the whole population had the lower risk that the low-risk group now enjoys?
- Are relevant to estimating overall impact and cost.
- Helpful for quantifying importance of factors on a population rather than individual scale.
- Not just attributable fraction among exposed but for entire population.

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide focuses on the estimation of the impact of the risk and preventive factors for PPOR Phase 2 for the State of Michigan.

The **Population Attributable Risk (PAR) or Fraction (PARF)** accounts for both the magnitude of the association and the prevalence of risk in the population. PAR or PARF addresses the question: What if the whole population had the lower risk that the low-risk group now enjoys? These indicators are relevant to estimating the overall impact and cost. The PAR or PARF represents the proportion of the infant deaths in the whole population that may be preventable if a cause of mortality were eliminated. The PAR or PARF is helpful for quantifying importance of factors on a population rather than individual scale and is not just attributable fraction among exposed, but for entire population.

PPOR Phase 2

Estimate the impact of the risk and preventive factors

Population Attributable Risk (PAR) or Fraction (PARF)

	"Disease"	Not "Disease"	All
Exposed	a	b	n_1
Unexposed	c	d	n_2
All	a+c	b+d	n_0

$P_1=a/n_1$ (rate of disease in high risk group)
$P_2=c/n_2$ (rate of disease in low risk group)
$P_0=(a+c)/n_0$ (rate of disease in whole population)

PAR $= p_0 - p_2 = (p_1 - p_2)*n_1/n_0$
PARF $= (p_0 - p_2)/p_0$ *(x100 to get percent)*
PARF $= p_0*(RR-1)/(1+ p_0*(RR-1))$ (use if relative risk is available)

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide focuses on the estimation of the impact of the risk and preventive factors for PPOR Phase 2 for the State of Michigan.

Population Attributable Risk (PAR) or Fraction (PARF)

$p_1=a/n_1$ (rate of disease in high risk group)
$p_2=c/n_2$ (rate of disease in low risk group)
$p_0=(a+c)/n_0$ (rate of disease in whole population)

PAR $= p_0 - p_2 = (p_1 - p_2)*n_1/n_0$
PARF $= (p_0 - p_2)/p_0$ *(x100 to get percent)*
PARF $= p_0*(RR-1)/(1+ p_0*(RR-1))$ (use if relative risk is available)

Infant Mortality Population Attributable Risk Fraction, Michigan, 2018

	P	RR	AR	ARF	PAR	PARF
Very Low Birthweight (<1,500 grams)	0.014	80.35	0.2464	0.9876	0.0034	52.47%
Infant admitted to Neonatal Intensive Care Unit	0.076	6.91	0.0263	0.8552	0.0020	30.88%
Preterm Birth (<37 weeks)	0.100	4.66	0.0176	0.7856	0.0018	26.87%
Pre-Pregnancy BMI Obese	0.310	2.09	0.0055	0.5210	0.0017	25.22%
Delivery payment: Medicaid	0.412	1.66	0.0034	0.3979	0.0014	21.41%
Kotelchuck Index Inadequate	0.135	1.80	0.0047	0.4446	0.0006	9.78%
Moderately Low Birthweight (1500 -< 2,500 grams)	0.071	2.21	0.0073	0.5477	0.0005	7.92%
Maternal Education < High School Diploma	0.109	1.59	0.0035	0.3719	0.0004	6.07%
Prenatal Care Began during the 2nd Trimester	0.190	1.28	0.0017	0.2216	0.0003	5.12%
No Prenatal Care	0.014	4.67	0.0214	0.7858	0.0003	4.78%
Maternal Smoking	0.168	1.29	0.0017	0.2241	0.0003	4.62%
Others in Household Smoke	0.117	1.41	0.0024	0.2917	0.0003	4.60%
Kotelchuck Index Adequate Plus	0.421	1.07	0.0005	0.0677	0.0002	2.97%
Maternal Age <20 years	0.046	1.61	0.0039	0.3794	0.0002	2.75%
Prenatal Care Began during the 3rd Trimester	0.044	1.25	0.0015	0.1997	0.0001	1.09%
Maternal Age ≥ 40 years	0.026	1.19	0.0012	0.1609	0.0000	0.49%

*P: Prevalence; RR: Relative Risk; AR: Attributable Risk; ARF: Attributable Risk Fraction; PAR: Population Attributable Risk; PARF: Population Attributable Risk Fraction.

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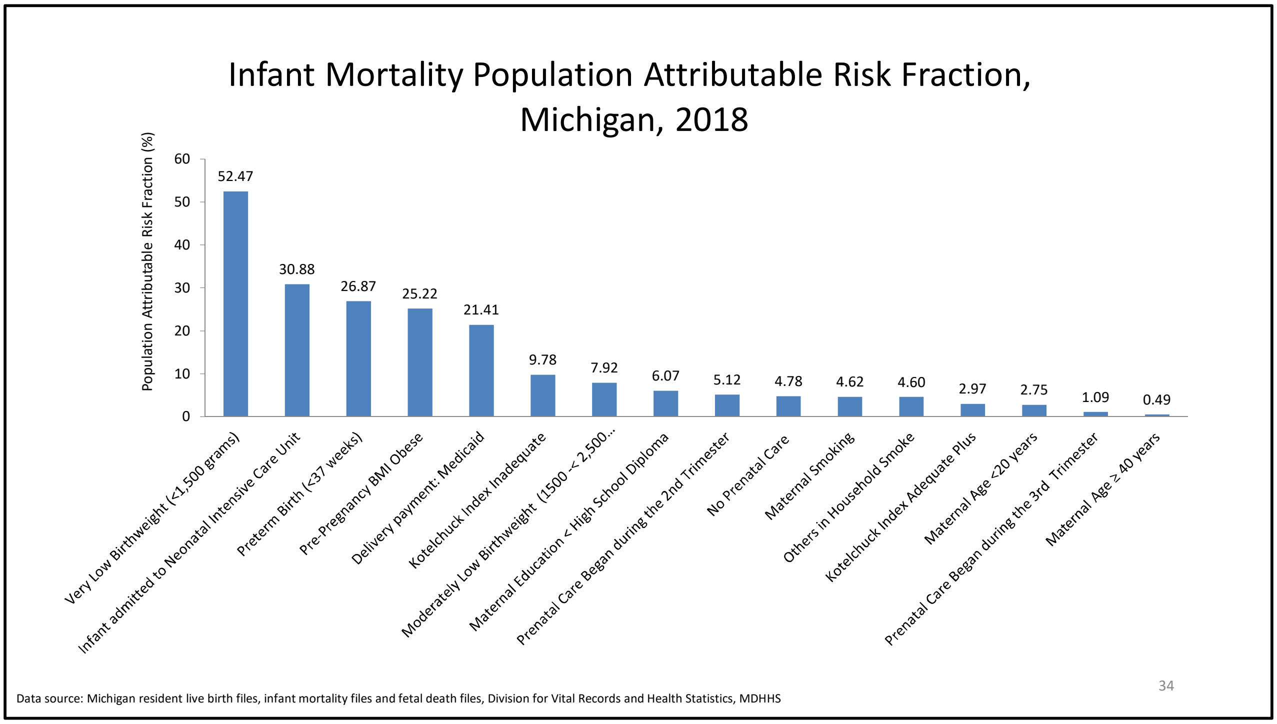
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the 2018 infant mortality population attributable risk fractions (PARF) for the state of Michigan. These PARFs are unadjusted and multiple factors could be involved.

- The estimated percent of infant deaths within the population would be reduced by 52.47 percent with eliminating all very low birthweight (<1,500 grams) births.
- The estimated percent of infant deaths within the population would be reduced by 30.88 percent with eliminating all Neonatal Intensive Care Unit infant admission.
- The estimated percent of infant deaths within the population would be reduced by 26.87 percent with eliminating all preterm birth (<37 weeks).
- The estimated percent of infant deaths within the population would be reduced by 25.22 percent with eliminating all obese pre-pregnancy BMI.
- The estimated percent of infant deaths within the population would be reduced by 21.41 percent with eliminating all intending to use Medicaid as payment source at delivery.
- The estimated percent of infant deaths within the population would be reduced by 9.78 percent with eliminating all inadequate Kotelchuck Index.
- The estimated percent of infant deaths within the population would be reduced by 7.92 percent with eliminating all moderately low birthweight (1500-<2500 grams).
- The estimated percent of infant deaths within the population would be reduced by 6.07 percent with eliminating all maternal education less than high school diploma.
- The estimated percent of infant deaths within the population would be reduced by 5.12 percent with eliminating all prenatal care began during the 2nd trimester.

- The estimated percent of infant deaths within the population would be reduced by 4.78 percent with eliminating all no prenatal care.
- The estimated percent of infant deaths within the population would be reduced by 4.62 percent with eliminating all maternal smoking.
- The estimated percent of infant deaths within the population would be reduced by 4.60 percent with eliminating all second-hand smoking in the same household.
- The estimated percent of infant deaths within the population would be reduced by 2.97 percent with eliminating all adequate plus Kotelchuck Index.
- The estimated percent of infant deaths within the population would be reduced by 2.75 percent with eliminating all maternal age less than 20 years.
- The estimated percent of infant deaths within the population would be reduced by 1.09 percent with eliminating all prenatal care began during the 3rd trimester. .
- The estimated percent of infant deaths within the population would be reduced by 0.49 percent with eliminating all maternal age 40 years and over.

*P: Prevalence; RR: Relative Risk; AR: Attributable Risk; ARF: Attributable Risk Fraction; PAR: Population Attributable Risk. PARF (Population Attributable Risk Fraction).



This slide shows the 2018 infant mortality population attributable risk fraction for the state of Michigan. Infant deaths would be greatly reduced by eliminating all preterm birth, very low birthweight, intending to use Medicaid as delivery payment, infants admitted to neonatal intensive care unit, obese pre-pregnancy BMI, and so on.

- The estimated percent of infant deaths within the population would be reduced by 52.47 percent with eliminating all very low birthweight (<1,500 grams) births.
- The estimated percent of infant deaths within the population would be reduced by 30.88 percent with eliminating all Neonatal Intensive Care Unit infant admission.
- The estimated percent of infant deaths within the population would be reduced by 26.87 percent with eliminating all preterm birth (<37 weeks).
- The estimated percent of infant deaths within the population would be reduced by 25.22 percent with eliminating all obese pre-pregnancy BMI.
- The estimated percent of infant deaths within the population would be reduced by 21.41 percent with eliminating all intending to use Medicaid as payment source at delivery.
- The estimated percent of infant deaths within the population would be reduced by 9.78 percent with eliminating all inadequate Kotelchuck Index.
- The estimated percent of infant deaths within the population would be reduced by 7.92 percent with eliminating all moderately low birthweight (1500-<2500 grams).
- The estimated percent of infant deaths within the population would be reduced by 6.07 percent with eliminating all maternal education less than high school diploma.

- The estimated percent of infant deaths within the population would be reduced by 5.12 percent with eliminating all prenatal care began during the 2nd trimester.
- The estimated percent of infant deaths within the population would be reduced by 4.78 percent with eliminating all no prenatal care.
- The estimated percent of infant deaths within the population would be reduced by 4.62 percent with eliminating all maternal smoking.
- The estimated percent of infant deaths within the population would be reduced by 4.60 percent with eliminating all second-hand smoking in the same household.
- The estimated percent of infant deaths within the population would be reduced by 2.97 percent with eliminating all adequate plus Kotelchuck Index.
- The estimated percent of infant deaths within the population would be reduced by 2.75 percent with eliminating all maternal age less than 20 years.
- The estimated percent of infant deaths within the population would be reduced by 1.09 percent with eliminating all prenatal care began during the 3rd trimester. .
- The estimated percent of infant deaths within the population would be reduced by 0.49 percent with eliminating all maternal age 40 years and over.

Infant Mortality Population Attributable Risk Fraction, Michigan, 2018

PARF of Race/Ethnicity Disparity

	# Live Birth	# Infant Death	# Survive	If ideal # Infant Death	If ideal # Survive	PARF
White non-Hispanic (reference)	74453	341	74,112	341	74,112	0.00%
Black non-Hispanic	20440	296	20,144	101	20,339	**49.00%**
Hispanic	7421	43	7,378	37	7,384	**7.79%**
Asian/Pacific Islander	4385	18	4,367	22	4,363	**-9.40%**

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the 2018 infant mortality population attributable risk fractions for the state of Michigan.

The estimated percent of infant deaths within the population that would be reduced by 49.00 percent if Black non-Hispanic women were exposed to the same risk of infant mortality as White non-Hispanic women.

The estimated percent of infant deaths within the population that would be reduced by 7.79 percent if Hispanic women were exposed to the same risk of infant mortality as White non-Hispanic women.

The estimated percent of infant deaths within the population that would be increased 9.40 percent if Asian/Pacific Islander women were exposed to the same risk of infant mortality as White non-Hispanic women.

Infant Mortality Population Attributable Risk Fraction, Michigan, 2018

- Population attributable risk fraction compares the rate for the whole population to the rate for those without the risk factor. It is based on the **rate difference** or on relative risk and **prevalence** of the exposure for the whole population.

- The 2018 infant mortality population attributable risk fraction in Michigan shows that Infant deaths would be greatly reduced by focusing on prevention of very low birthweight births, maternal obesity, and preterm birth.

- The estimated percent of infant deaths within the population would be reduced by 49.00 percent if Black non-Hispanic women were exposed to the same risk of infant mortality as White non-Hispanic women.

Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

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This slide shows the summary of the 2018 infant mortality population attributable risk fraction for the state of Michigan.

- Population attributable risk fraction compares the rate for the whole population to the rate for those without the risk factor. It is based on the **rate difference** or on relative risk and **prevalence** of the exposure for the whole population.

- The 2018 infant mortality population attributable risk fraction in Michigan shows that Infant deaths would be greatly reduced by focusing on prevention of very low birthweight births, maternal obesity, and preterm birth.

- The estimated percent of infant deaths within the population that would be reduced by 49.00 percent if Black non-Hispanic women were exposed to the same risk of infant mortality as White non-Hispanic women.