Michigan Feto-Infant Mortality Rate, 2014-2018

Prepared by Yan Tian (TianY@michigan.gov), Maternal and Child Health (MCH) 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
February 2020

GRETCHEN WHITMER, GOVERNOR | ROBERT GORDON, DIRECTOR

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This presentation provides updated 2014-2018 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

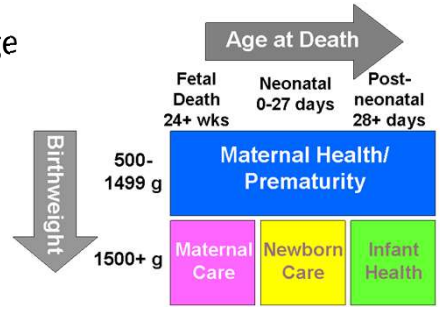
Perinatal Periods of Risk (PPOR) Phase 1:
Michigan Feto-Infant Mortality Rate
2014-2018

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 2014-2018 feto-infant mortality rates for the State of Michigan based on the Perinatal Periods of Risk (PPOR) approach. These slides contain PPOR Phase 1 results.

Perinatal Periods of Risk (PPOR)*

- Analysis is part of a comprehensive evaluation of infant mortality –usually large cities, counties, etc.
- Sorts fetal and infant deaths based on birthweight and age at death into boxes
- Rates are calculated for each period of risk and compared to standard population



* City**M**at**CH,** available at https://www.citymatch.org/perinatal-periods-of-risk-approach/

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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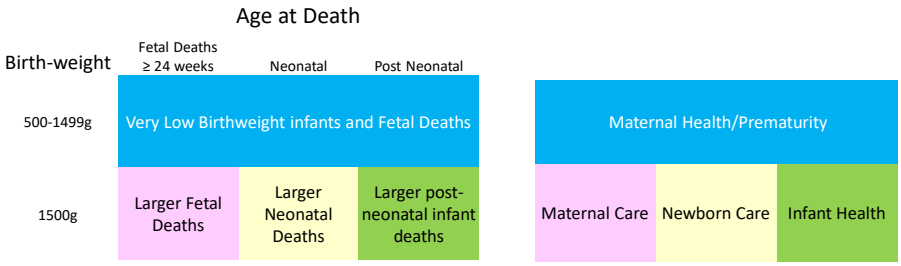
Perinatal Periods of Risk (PPOR) is a comprehensive approach to help communities use data to reduce infant mortality. Designed for use in US cities with high infant mortality rates, PPOR brings community stakeholders together to build consensus and partnership based on local data. It provides a framework and steps that help a community analyze their own local vital records data and then move from data to action. It can be used on its own or with existing infant mortality prevention efforts such as Fetal Infant Mortality Review (FIMR), Healthy Start, and home visiting. PPOR is about impact and results. It builds data capacity, promotes evidence-based decisions, strengthens partnerships, helps leverage resources, and enables systems change. There are six stages within the PPOR framework, and the results included within this presentation focus on stage one only.

Based on birthweight and gestational age, the fetal and infant deaths are divided into four periods of risk: maternal health/prematurity, maternal care, newborn care, and infant health. PPOR analyses require at least sixty fetal and infant deaths within each population group being studied. A feto-infant mortality rate for each period is calculated and compared to the standard population.

Perinatal Periods of Risk (PPOR)*

- The periods of risk were chosen so deaths in the same 'box' had similar problems. So they had similar solutions.



* City**M**at**CH,** available at https://www.citymatch.org/perinatal-periods-of-risk-approach/

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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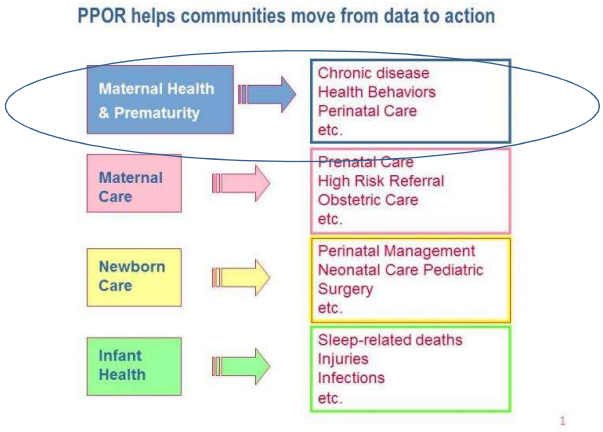
The initial analysis divides fetal and infant deaths into four perinatal periods of risk based on both birth weight and age at death. The periods of risk are useful because causes of death tend to be similar within each, so when a community finds problems in only one or two periods of risk, efforts can be focused on those periods. A feto-infant mortality rate is calculated for each period, to allow the stakeholders to compare populations within their jurisdictions, to examine time trends, and to compare to other cities, or to a reference group.

Perinatal Periods of Risk (PPOR)*



* City**M**at**CH,** available at https://www.citymatch.org/perinatal-periods-of-risk-approach/

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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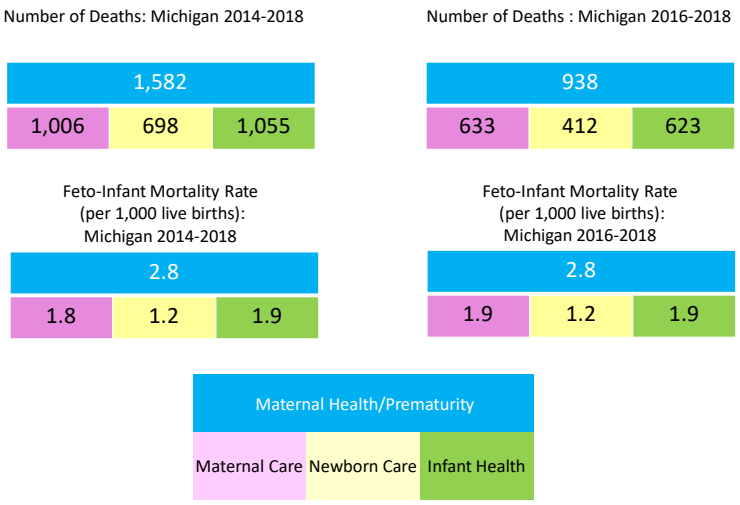
Each period of risk is associated with its own set of risk and prevention factors. The four periods provide a framework that helps communities move from having data to using it, prioritizing limited resources, and using evidence to maximize impact.

Maternal health and prematurity is associated with risk factors such as chronic disease, health behaviors, prenatal care, etc. Maternal care is associated with risk factors such as prenatal care, high risk referral, obstetric care, etc. Newborn care is linked to risk factors such as perinatal management, neonatal care pediatric, surgery, etc. Infant health is related to such risk factors as sleep-related deaths, injuries, infections, etc.

PPOR in Michigan



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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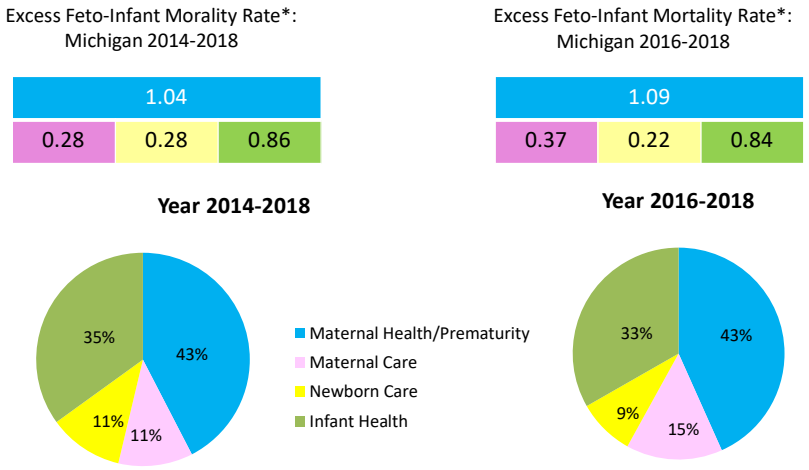
This slide shows the number of feto-infant deaths and feto-infant mortality rates in Michigan from 2014-2018 and from 2016-2018 for each of the four periods.

From 2014 to 2018, there were 1,582 deaths in the maternal health and prematurity period, 1,006 deaths in the maternal care period, 698 deaths in the newborn care period, and 1,055 deaths in the infant health period. From 2016 to 2018, in Michigan there were 938 deaths in the maternal health and prematurity period, 633 deaths in the maternal care period, 412 deaths in the newborn care period, and 623 deaths in the infant health period.

From 2014 to 2018, the feto-infant mortality rate was 2.8 per 1,000 live births in the maternal health and prematurity period, 1.8 per 1,000 live births in the maternal care period, 1.2 per 1,000 live births in the newborn care period, and 1.9 per 1,000 live births in the infant health period. From 2016 to 2018, in Michigan the feto-infant mortality rate was 2.8 per 1,000 live births in the maternal health and prematurity period, 1.9 per 1,000 live births in the maternal care period, 1.2 per 1,000 live births in the newborn care period, and 1.9 per 1,000 live births in the infant health period.

PPOR in Michigan



* Using Michigan 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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The PPOR reference group is a real population of mothers with near optimal birth outcomes. Here the reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery. It provides a realistic benchmark or target toward which the community can strive. Assuming those outcomes are attainable, the reference group allows estimation of preventable or excess mortality for each period of risk. Periods of risk with the largest excess mortality become the community's focus for further study, to determine which of the known causes are likely to be most influential in that community.

This slide shows the excess feto-infant mortality rate in Michigan from 2014 to 2018 and from 2016 to 2018 for each of the four periods. From 2014 to 2018, the excess feto-infant mortality rate was 1.04 per 1,000 live births in the maternal health and prematurity period, 0.28 per 1,000 live births in the maternal care period, 0.28 per 1,000 live births in the newborn care period, and 0.86 per 1,000 live births in the infant health period. From 2016 to 2018, the excess feto-infant mortality rate was 1.09 per 1,000 live births in the maternal health and prematurity period, 0.37 per 1,000 live births in the maternal care period, 0.22 per 1,000 live births in the newborn care period, and 0.84 per 1,000 live births in the infant health period.

PPOR by Maternal Race/Ethnicity

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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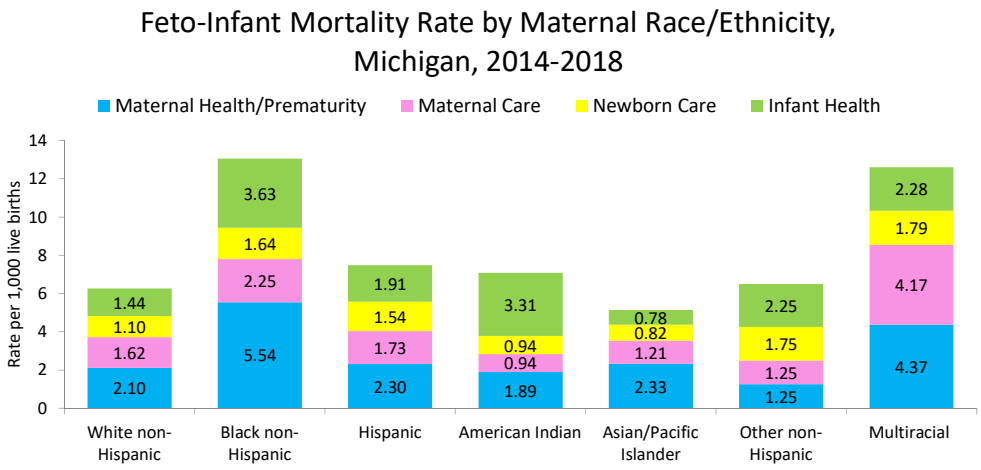
The next several slides contain updated PPOR results by maternal race/ethnicity for the State of Michigan.

Michigan Feto-Infant Mortality Rate by Maternal Race/Ethnicity (rate per 1,000 live births)



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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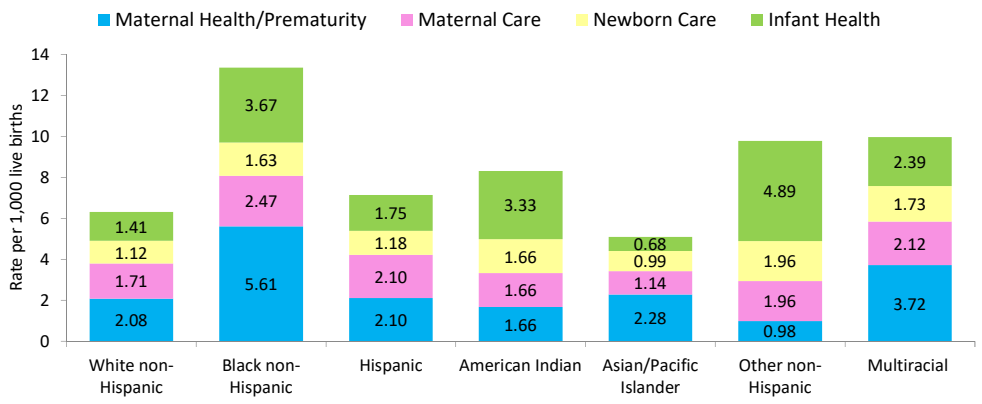
This slide shows the feto-infant mortality rate by maternal race/ethnicity and PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, the feto-infant mortality rate was highest among those Black non-Hispanic women in the maternal health and prematurity period, multiracial women in the maternal care period and in the newborn care period, and Black non-Hispanic women in the infant health period.

Michigan Feto-Infant Mortality Rate by Maternal Race/Ethnicity (rate per 1,000 live births)



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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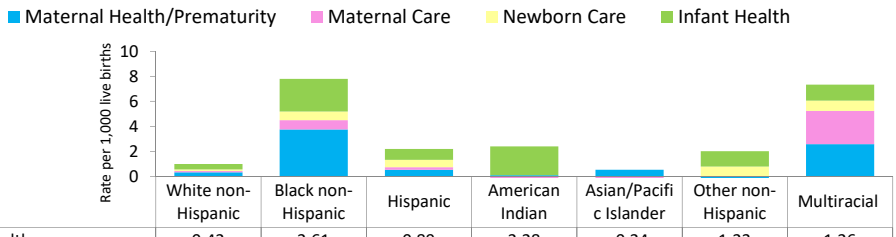
This slide shows the feto-infant mortality rate by maternal race/ethnicity and PPOR period in Michigan from 2016 to 2018.

From 2016 to 2018, the feto-infant mortality rate was highest among Black non-Hispanic women in the maternal health and prematurity and maternal care periods, and other non-Hispanic women in the newborn care and infant health periods.

Michigan Feto-Infant Excess Mortality Rate* by Maternal Race/Ethnicity: 2014-2018 (rate per 1,000 live births)

Feto-Infant Excess Mortality Rate by Maternal Race/Ethnicity, Michigan, 2014-2018



	White non-Hispanic	Black non-Hispanic	Hispanic	American Indian	Asian/Pacific Islander	Other non-Hispanic	Multiracial
Infant Health	0.42	2.61	0.89	2.28	-0.24	1.23	1.26
Newborn Care	0.14	0.68	0.58	-0.02	-0.14	0.78	0.82
Maternal Care	0.11	0.74	0.22	-0.57	-0.30	-0.26	2.66
Maternal Health/Prematurity	0.33	3.77	0.53	0.11	0.55	-0.53	2.59

- Excess mortality = mortality rate (population) – mortality rate (reference group).
- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

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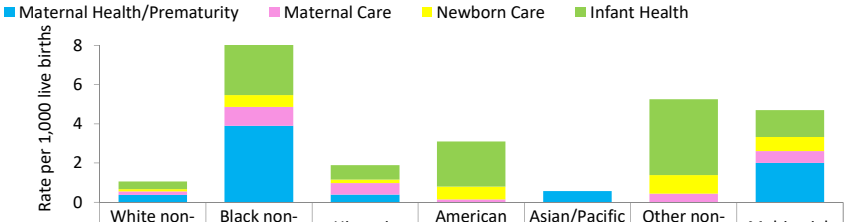
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate by maternal race/ethnicity and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, the feto-infant excess mortality rate was highest among Black non-Hispanic women in the maternal health and prematurity period, multiracial women in the maternal care and newborn care periods, and Black non-Hispanic women in the infant health period.

Michigan Feto-Infant Excess Mortality Rate* by Maternal Race/Ethnicity: 2016-2018 (rate per 1,000 live births)

Feto-Infant Excess Mortality Rate by Maternal Race/Ethnicity, Michigan, 2016-2018



	White non-Hispanic	Black non-Hispanic	Hispanic	American Indian	Asian/Pacific Islander	Other non-Hispanic	Multiracial
Infant Health	0.39	2.65	0.73	2.30	-0.34	3.87	1.37
Newborn Care	0.10	0.61	0.17	0.65	-0.02	0.95	0.72
Maternal Care	0.19	0.95	0.58	0.14	-0.38	0.44	0.61
Maternal Health/Prematurity	0.37	3.90	0.39	-0.05	0.57	-0.73	2.01

- Excess mortality = mortality rate (population) – mortality rate (reference group).
- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

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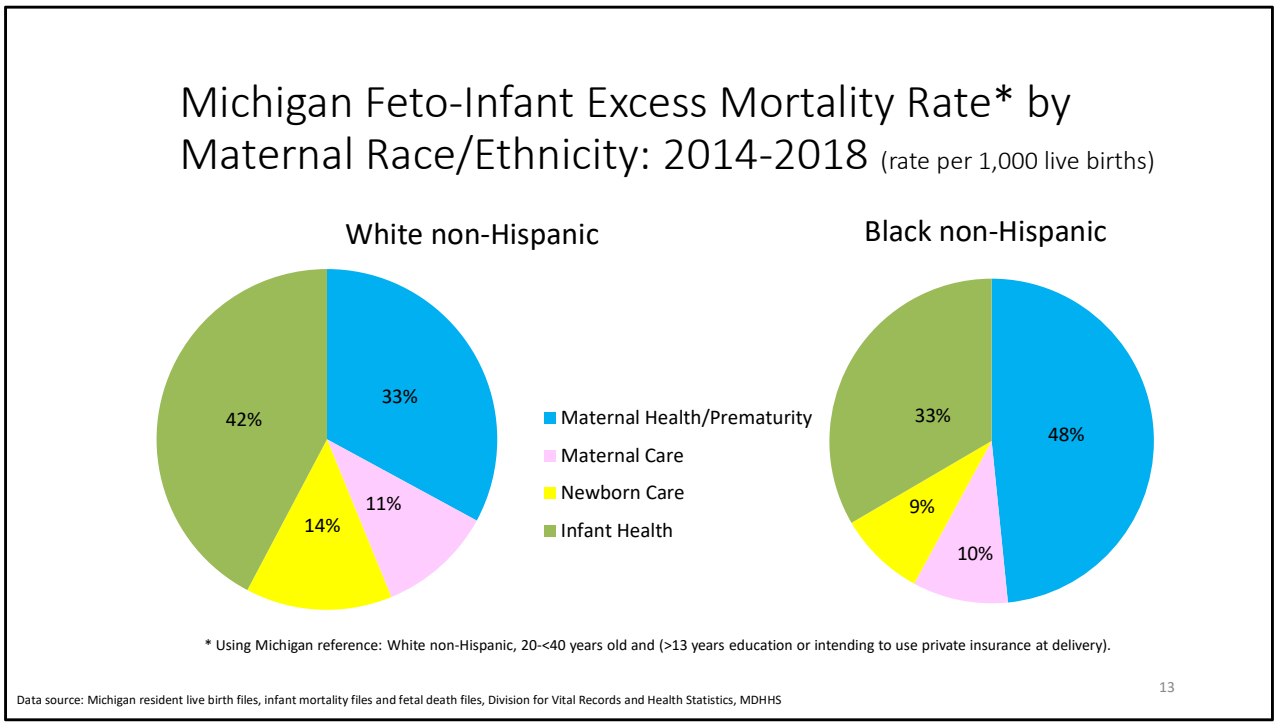
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate by maternal race/ethnicity and PPOR period in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, the feto-infant excess mortality rate was highest among Black, non-Hispanic women in the maternal health and prematurity and maternal care periods, and Other, non-Hispanic women in the newborn care and infant health periods.



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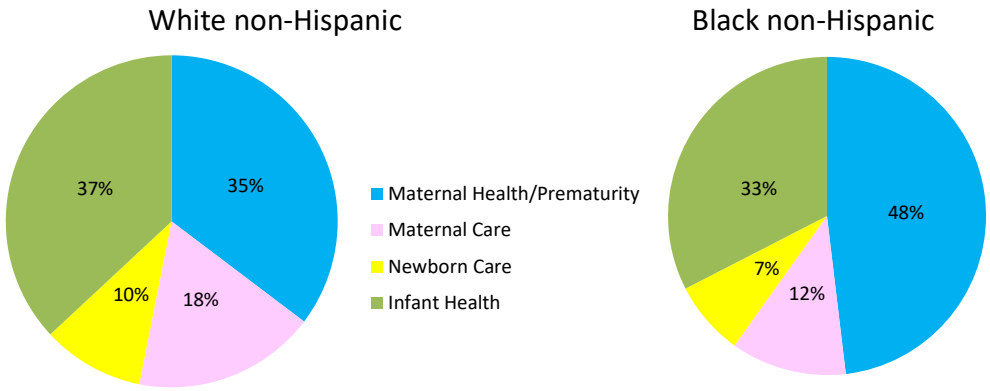
From 2014 to 2018, among White non-Hispanic women, the infant health period accounted for 42 percent of the feto-infant excess mortality; the maternal health and prematurity period accounted for 33 percent; the newborn care period accounted for 14 percent; and the maternal care period accounted for 11 percent.

From 2014 to 2018, among Black non-Hispanic women, the maternal health and prematurity period accounted for 48 percent of the feto-infant excess mortality; the infant health period accounted for 33 percent; the newborn care period accounted for 9 percent; and the maternal care period accounted for 10 percent.

Michigan Feto-Infant Excess Mortality Rate* by Maternal Race/Ethnicity: 2016-2018 (rate per 1,000 live births)



* Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

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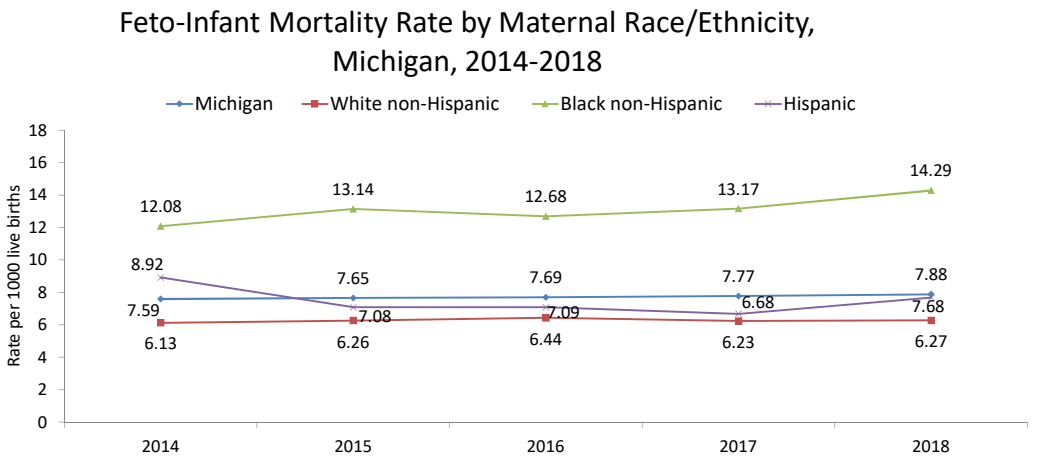
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate by maternal race/ethnicity and PPOR period in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, among White non-Hispanic women, the infant health period accounted for 37 percent of the feto-infant excess mortality; the maternal health and prematurity period accounted for 35 percent; the newborn care period accounted for 10 percent; and the maternal care period accounted for 18 percent.

From 2016 to 2018, among Black non-Hispanic women, the maternal health and prematurity period accounted for 48 percent of the feto-infant excess mortality; the infant health period accounted for 32 percent; the newborn care period accounted for 8 percent; and the maternal care period accounted for 12 percent.

Michigan Feto-Infant Mortality Rate Trend by Maternal Race/Ethnicity: 2014-2018 (rate per 1,000 live births)



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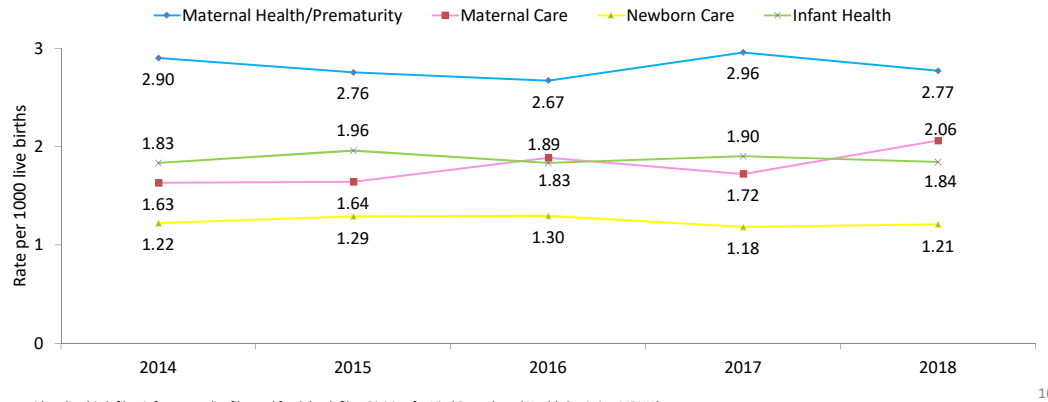
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate trend by maternal race/ethnicity in Michigan from 2014 to 2018.

From 2014 to 2018, the feto-infant mortality rate among Black non-Hispanic women was higher than that among other racial/ethnic groups. The feto-infant mortality rate among White non-Hispanic women was stable over time. The feto-infant mortality rate among Hispanic women declined from 2014 to 2017 but increased from 2017 to 2018.

Michigan Feto-Infant Mortality Rate Trend by PPOR Period: 2014-2018 (rate per 1,000 live births)



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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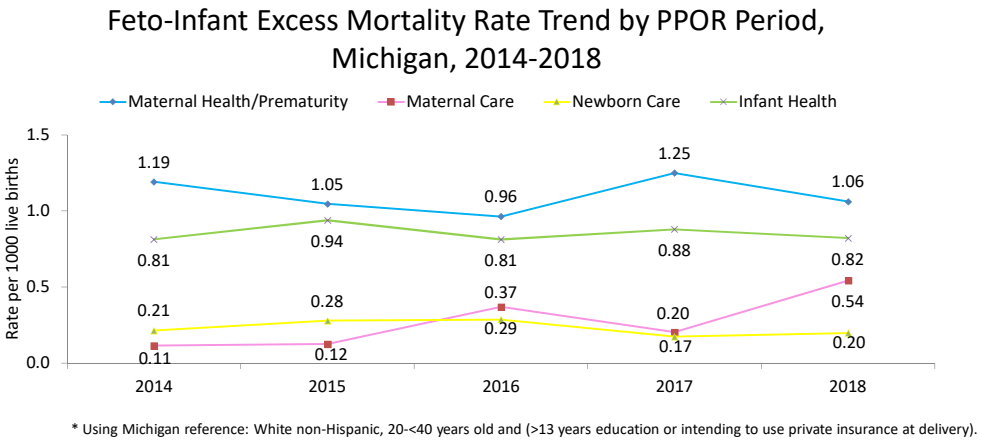
This slide shows the feto-infant mortality rate trend by PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, the feto-infant mortality rate in the maternal health and prematurity period was higher when compared to all other periods. The feto-infant mortality rate in the newborn care period has been stable over time. The feto-infant mortality rate in the infant health period has been on a slow increase over time. The feto-infant mortality rate in the maternal care period went up from 2014 to 2016, however, it declined from 2016 to 2017, and then increased again in 2018.

Michigan Feto-Infant Excess Mortality Rate* Trend by PPOR Period: 2014-2018 (rate per 1,000 live births)



* Using Michigan 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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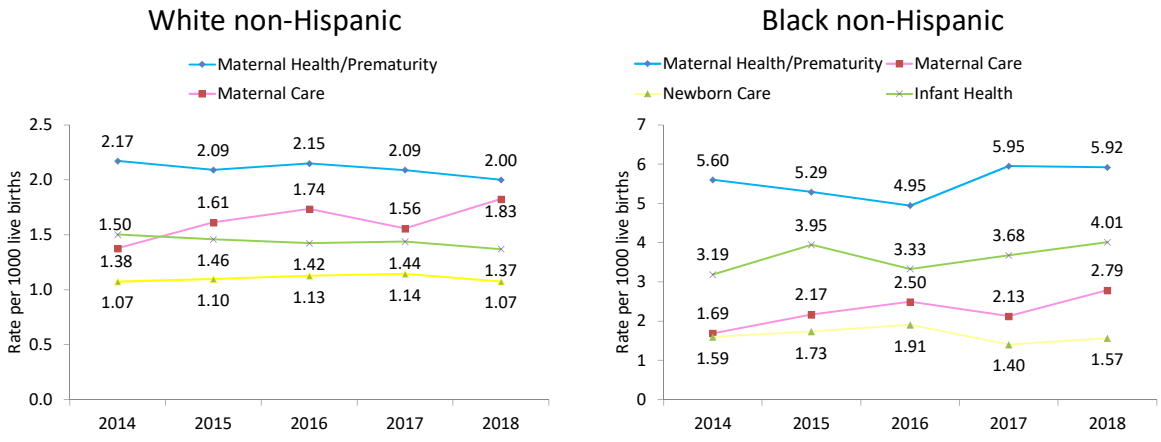
This slide shows the feto-infant mortality rate trend by PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, the feto-infant excess mortality rate in the maternal health and prematurity period decreased from 2014 to 2016, went up from 2016 to 2017, and then declined again in 2018. The excess rate in the newborn care period has been stable over time. The excess mortality rate in the infant health period has been on a slow increase over time. The excess mortality rate in the maternal care period increased from 2014 to 2016, declined from 2016 to 2017, and then increased again in 2018.

Michigan Feto-Infant Mortality Rate Trend by PPOR Period and Maternal Race/Ethnicity: 2014-2018 (rate per 1,000 live births)



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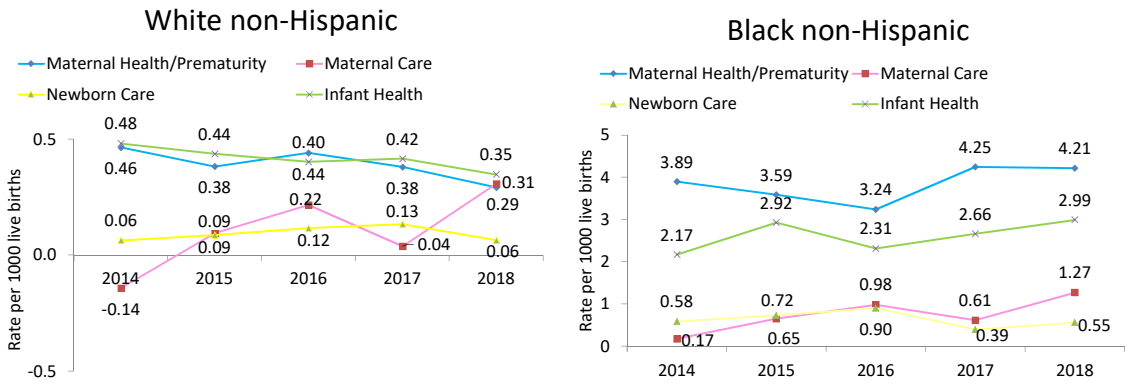
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate trend by PPOR period and maternal race/ethnicity in Michigan from 2014 to 2018.

From 2014 to 2018, among White non-Hispanic women, the feto-infant mortality rate in the maternal health and prematurity period was higher when compared to all other periods. The feto-infant mortality rate in the newborn care period had been stable over time. The feto-infant mortality rate in the infant health period has been on a slow decline. The feto-infant mortality rate in the maternal care period went up from 2014 to 2016, declined from 2016 to 2017, and then increased again in 2018.

From 2014 to 2018, among Black non-Hispanic women, the feto-infant mortality rate in the maternal health and prematurity period was higher when compared to all other periods. The rate in the newborn care period has increased from 2014 to 2016, declined from 2016 to 2017, and then increased again in 2018. The feto-infant mortality rate in the infant health period went up from 2014 to 2015, declined from 2015 to 2016, and then increased again in both 2017 and 2018. The feto-infant mortality rate in the maternal care period increased from 2014 to 2016, declined in 2017, and then increased again in 2018.

Michigan Feto-Infant Excess Mortality Rate* Trend by PPOR Period and Race/Ethnicity: 2014-2018 (rate per 1,000 live births)



- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).
- Excess mortality rates less than 0 mean mortality rates are lower in the population compared to the reference group.

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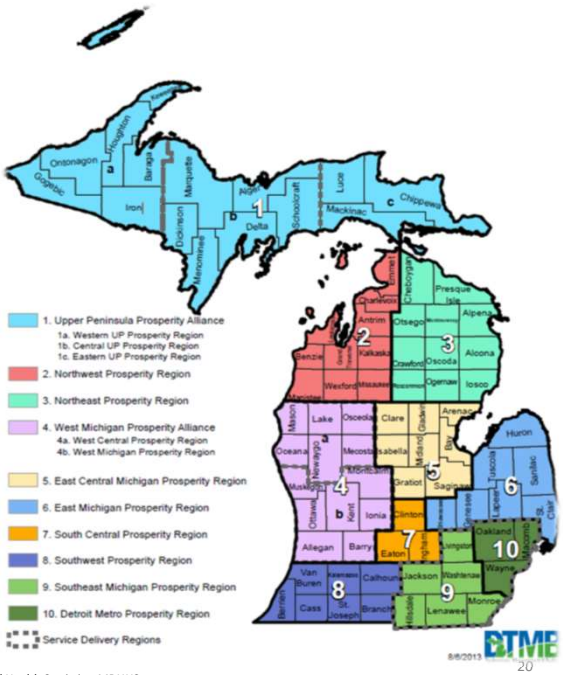
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate trend by PPOR period and maternal race/ethnicity in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, among White non-Hispanic women, the feto-infant excess mortality rate in the maternal health and prematurity period has been on a slow decline since 2014. The excess mortality rate in the newborn care period increased from 2014 to 2017, and then decreased in 2018. The excess mortality rate in the infant health period has been on a slow decline since 2014. The excess mortality rate in the maternal care period increased from 2014 to 2016, decreased in 2017, and then increased again in 2018.

From 2014 to 2018, among Black non-Hispanic women, the feto-infant mortality excess rate in the maternal health and prematurity period was higher when compared to all other periods. The excess mortality rate in the newborn care period increased from 2014 to 2016, declined in 2017, and then increased again in 2018. The excess mortality rate in the infant health period increased from 2014 to 2015, declined in 2016, and then increased again from 2016 through 2018. The excess mortality rate in the maternal care period increased from 2014 to 2016, declined in 2017, and then increased again in 2018.

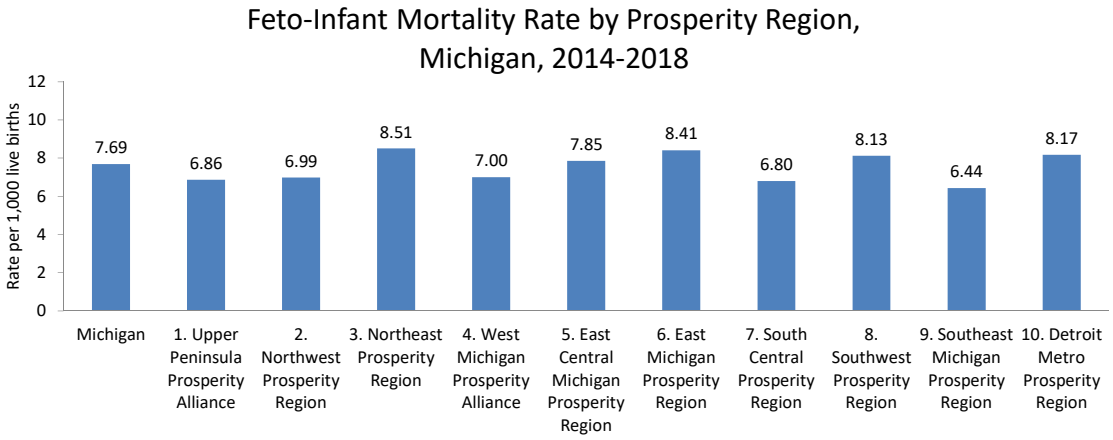
PPOR by Prosperity Region of Residence



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

The next several slides contain updated PPOR by prosperity region of residence at birth for the State of Michigan.

Michigan Feto-Infant Mortality Rate by Prosperity Region: 2014-2018 (rate per 1,000 live births)



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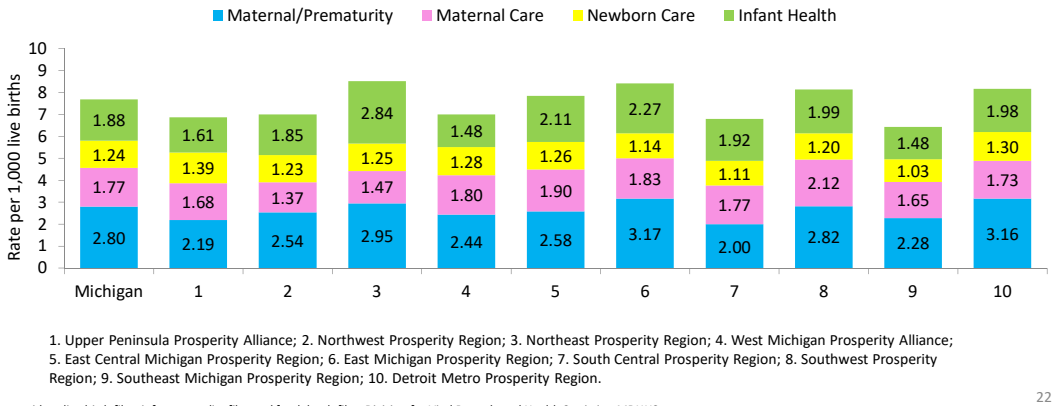
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate by prosperity region of residence in Michigan from 2014 to 2018.

The feto-infant mortality rate in the northeast prosperity region was higher than that in other regions at 8.51 deaths per 1,000 live births, followed by the east Michigan prosperity region (8.41 deaths per 1,000 live births) and the Detroit metro prosperity region (8.17 deaths per 1,000 live births). The feto-infant mortality rate in the southeast Michigan prosperity region was the lowest at 6.44 deaths per 1,000 live births.

Michigan Feto-Infant Mortality Rate by Prosperity Region: 2014-2018 (rate per 1,000 live births)



1. Upper Peninsula Prosperity Alliance; 2. Northwest Prosperity Region; 3. Northeast Prosperity Region; 4. West Michigan Prosperity Alliance; 5. East Central Michigan Prosperity Region; 6. East Michigan Prosperity Region; 7. South Central Prosperity Region; 8. Southwest Prosperity Region; 9. Southeast Michigan Prosperity Region; 10. Detroit Metro Prosperity Region.

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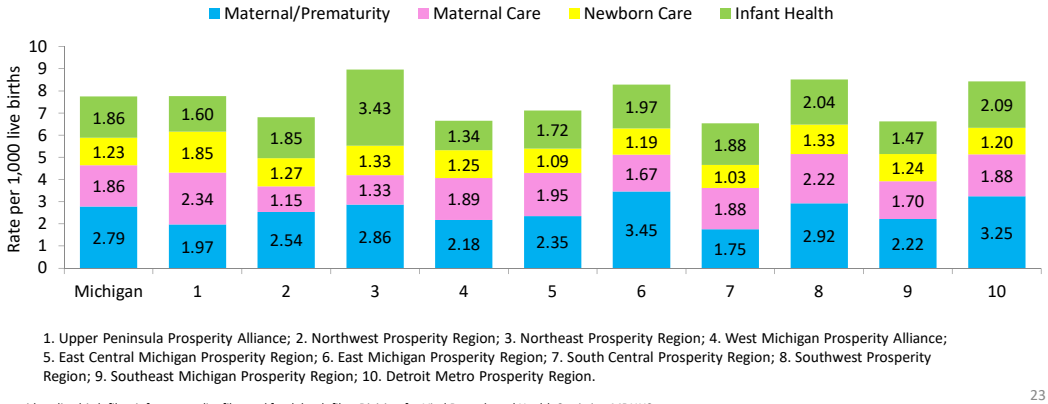
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate by prosperity region of residence and PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, the feto-infant mortality rate was highest in the Detroit metro prosperity region (#10) for the maternal health and prematurity period, in the east central Michigan prosperity region (#5) for the maternal care period, in the upper peninsula prosperity alliance (#1) for the newborn care period, and in the northeast prosperity region (#3) for the infant health period.

Michigan Feto-Infant Mortality Rate by Prosperity Region: 2016-2018 (rate per 1,000 live births)



1. Upper Peninsula Prosperity Alliance; 2. Northwest Prosperity Region; 3. Northeast Prosperity Region; 4. West Michigan Prosperity Alliance; 5. East Central Michigan Prosperity Region; 6. East Michigan Prosperity Region; 7. South Central Prosperity Region; 8. Southwest Prosperity Region; 9. Southeast Michigan Prosperity Region; 10. Detroit Metro Prosperity Region.

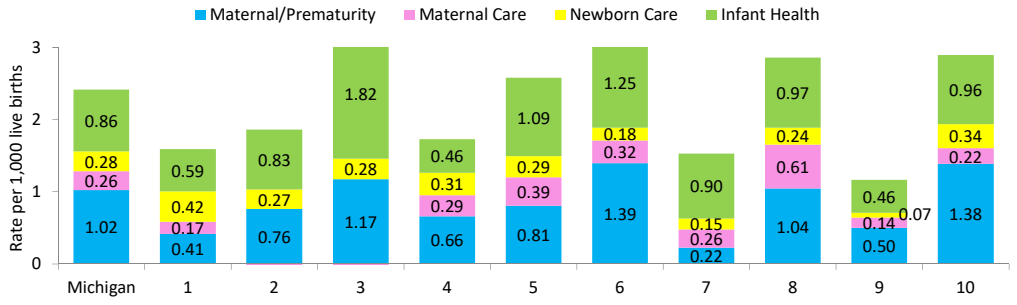
23

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 feto-infant mortality rate by prosperity region of residence and PPOR period in Michigan from 2016 to 2018.

From 2016 to 2018, the feto-infant mortality rate was highest in the east Michigan prosperity region (#6) for the maternal health and prematurity period, in the upper peninsula prosperity alliance (#1) for the maternal care and newborn care periods, and in the northeast prosperity region (#3) for the infant health period.

Michigan Feto-Infant Excess Mortality Rate* by Prosperity Region: 2014-2018 (rate per 1,000 live births)



1. Upper Peninsula Prosperity Alliance; 2. Northwest Prosperity Region; 3. Northeast Prosperity Region; 4. West Michigan Prosperity Alliance; 5. East Central Michigan Prosperity Region; 6. East Michigan Prosperity Region; 7. South Central Prosperity Region; 8. Southwest Prosperity Region; 9. Southeast Michigan Prosperity Region; 10. Detroit Metro Prosperity Region.

* Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

24

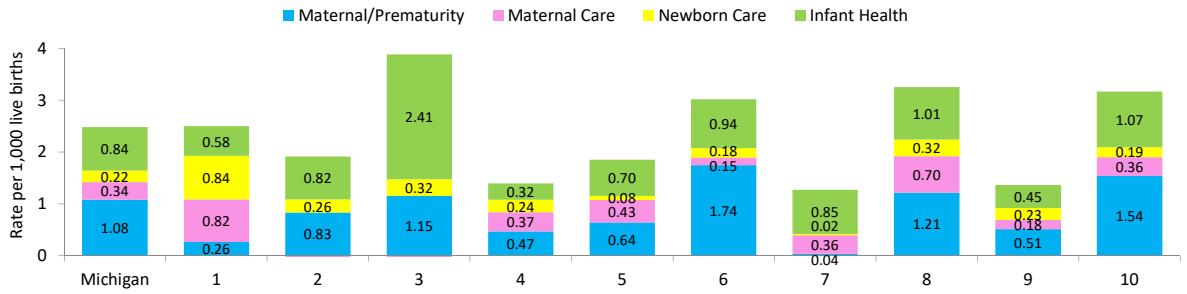
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality excess rate by prosperity region of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, the feto-infant excess mortality rate was highest in the east Michigan prosperity region (#6) for the maternal health and prematurity period, in the southwest prosperity region (#8) for the maternal care period, in the upper peninsula prosperity alliance (#1) for the newborn care period, and in the northeast prosperity region (#3) for the infant health period.

Michigan Feto-Infant Excess Mortality Rate* by Prosperity Region: 2016-2018 (rate per 1,000 live births)

Feto-Infant Excess Mortality Rate by Prosperity Region and PPOR Period, Michigan, 2016-2018



1. Upper Peninsula Prosperity Alliance; 2. Northwest Prosperity Region; 3. Northeast Prosperity Region; 4. West Michigan Prosperity Alliance; 5. East Central Michigan Prosperity Region; 6. East Michigan Prosperity Region; 7. South Central Prosperity Region; 8. Southwest Prosperity Region; 9. Southeast Michigan Prosperity Region; 10. Detroit Metro Prosperity Region.

* Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).

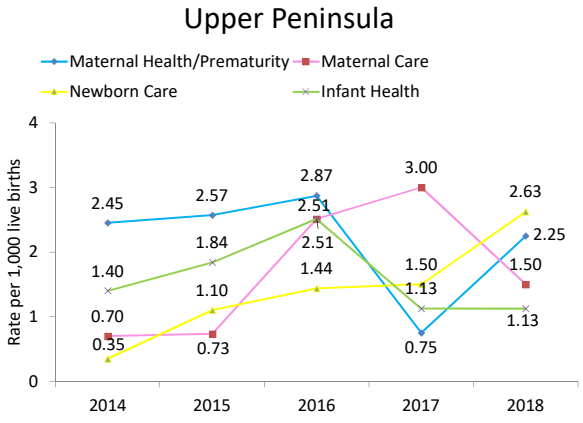
25

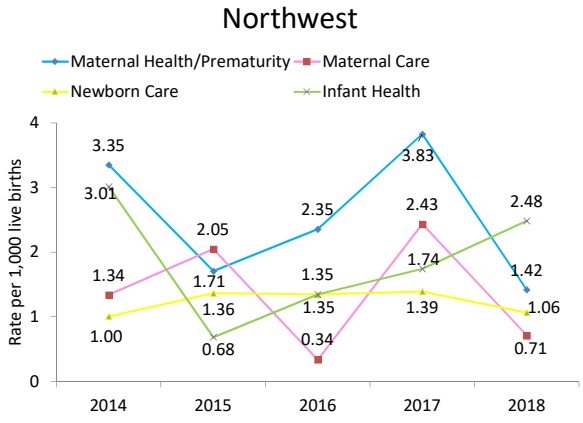
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality excess rate by prosperity region of residence and PPOR period in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, the feto-infant excess mortality rate was highest in the east Michigan prosperity region (#6) for the maternal health and prematurity period, in the upper peninsula prosperity alliance (#1) for the maternal care and newborn care periods, and in the northeast prosperity region (#3) for the infant health period.

Michigan Feto-Infant Mortality Rate Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)





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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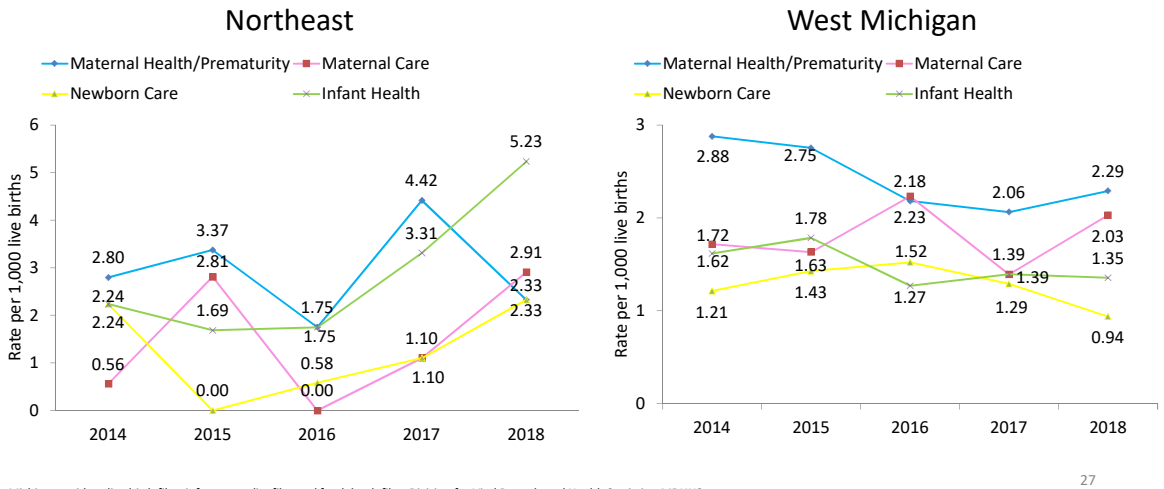
This slide shows the feto-infant mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, in the upper peninsula prosperity alliance region, the feto-infant mortality rate in the maternal health and prematurity period increased from 2014 to 2016, declined in 2017, and then increased again in 2018. The feto-infant mortality rate in the newborn care period increased over time from 2014 to 2018. The feto-infant mortality rate in the infant health period increased from 2014 to 2016, and then declined from 2016 to 2018. The feto-infant mortality rate in the maternal care period increased from 2014 to 2017 and then declined in 2018.

From 2014 to 2018, in the northwest prosperity region, the feto-infant mortality rate in the maternal health and prematurity period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018. The feto-infant mortality rate in the newborn care period increased from 2014 to 2017, and then decreased in 2018. The feto-infant mortality rate in the infant health period decreased from 2014 to 2015, and then increased from 2015 to 2018. The feto-infant mortality rate in the maternal care period increased from 2014 to 2015, decreased in 2016, increased again in 2017, and then decreased again in 2018.

Michigan Feto-Infant Mortality Rate Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



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

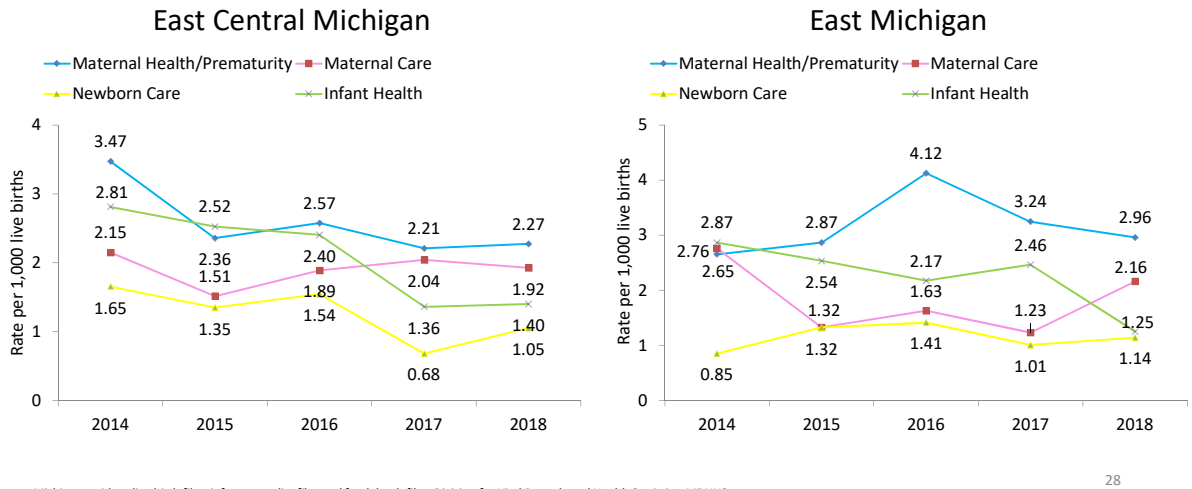
27

This slide shows the feto-infant mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, in the northeast prosperity region, the feto-infant mortality rate in the maternal health and prematurity period increased from 2014 to 2015, declined in 2016, increased in 2017, and then decreased again in 2018 . The feto-infant mortality rate in the newborn care period decreased from 2014 to 2015, and then increased from 2015 to 2018. The feto-infant mortality rate in the infant health period decreased from 2014 to 2016, and then increased from 2016 to 2018. The feto-infant mortality rate in the maternal care period increased from 2014 to 2015, decreased in 2016, and increased again from 2016 to 2018.

From 2014 to 2018, in the west Michigan prosperity alliance, the feto-infant mortality rate in the maternal health and prematurity period decreased from 2014 to 2018. The feto-infant mortality rate in the newborn care period increased slowly from 2014 to 2016, and then decreased from 2016 to 2018. The feto-infant mortality rate in the infant health period increased from 2014 to 2015, declined in 2016, and then increased again from 2016 to 2018. The feto-infant mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, decreased in 2017, and then increased again in 2018.

Michigan Feto-Infant Mortality Rate Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



28

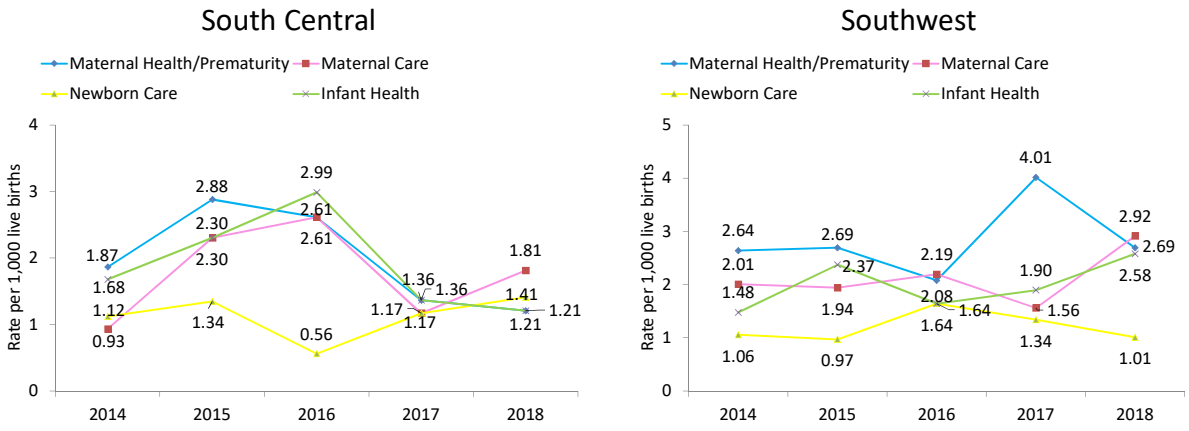
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, in the east central Michigan prosperity region, the feto-infant mortality rate in the maternal health and prematurity period decreased from 2014 to 2015 , increased in 2016, decreased again in 2017, and then increased again in 2018. The feto-infant mortality rate in the newborn care period decreased in 2015, increased in 2016, decreased in 2017, and increased again in 2018. The feto-infant mortality rate in the infant health period has been on a slow decline since 2014. The feto-infant mortality rate in the maternal care period declined from 2014 to 2015, increased from 2015 to 2017, and decreased again in 2018.

From 2014 to 2018, in the east Michigan prosperity alliance, the feto-infant mortality rate in the maternal health and prematurity period increased from 2014 to 2016, and then decreased from 2015 to 2018. The feto-infant mortality rate in the newborn care period increased from 2014 to 2016, and then decreased from 2016 to 2018. The feto-infant mortality rate in the infant health period decreased from 2014 to 2016, increased in 2017, and then decreased again in 2018. The feto-infant mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, decreased in 2017, and then increased again in 2018.

Michigan Feto-Infant Mortality Rate Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



29

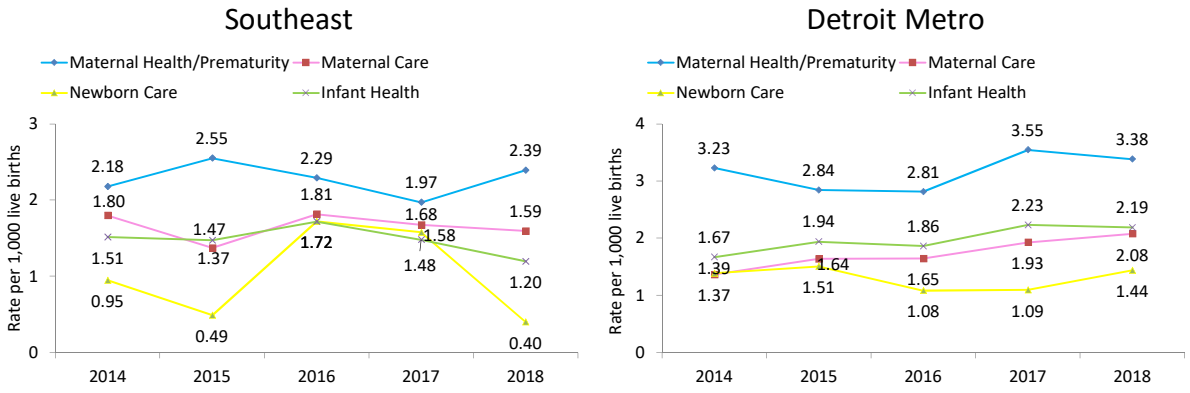
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, in the south central Michigan prosperity region, the feto-infant mortality rate in the maternal health and prematurity period increased from 2014 to 2015, and then decreased from 2015 to 2018. The feto-infant mortality rate in the newborn care period increased from 2014 to 2015, decreased in 2016, and then increased again from 2016 to 2018. The feto-infant mortality rate in the infant health period increased from 2014 to 2016, and then decreased from 2016 to 2018. The feto-infant mortality rate in the maternal care period increased from 2014 to 2016, declined in 2017, and then increased again in 2018.

From 2014 to 2018, in the southwest Michigan prosperity alliance, the feto-infant mortality rate in the maternal health and prematurity period increased from 2014 to 2015, decreased in 2016, increased again in 2017, and then decreased again in 2018. The feto-infant mortality rate in the newborn care period decreased from 2014 to 2015, increased in 2016, and then decreased again from 2016 to 2018. The feto-infant mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, and then increased again from 2016 to 2018. The feto-infant mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased again in 2018 .

Michigan Feto-Infant Mortality Rate Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



30

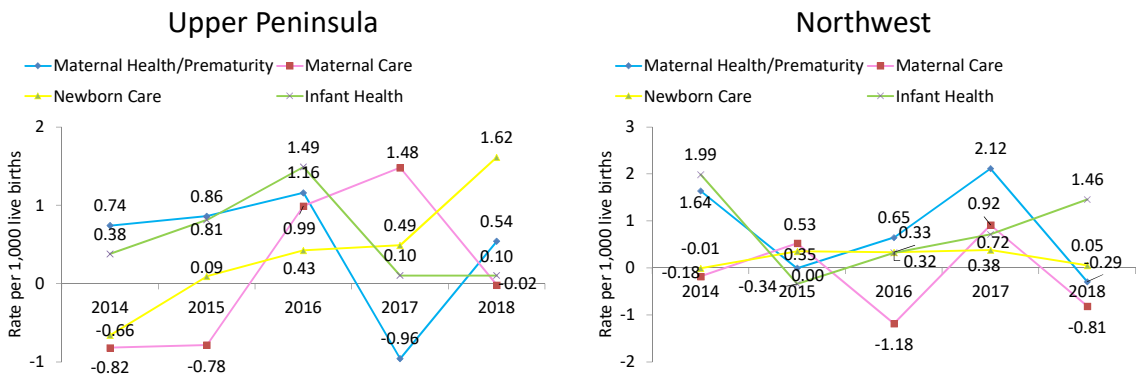
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, in the southeast prosperity region, the feto-infant mortality rate in the maternal health and prematurity period increased from 2014 to 2015, decreased from 2015 to 2017, and then increased again in 2018. The feto-infant mortality rate in the newborn care period decreased from 2014 to 2015, increased in 2016, and then decreased again from 2016 to 2018. The feto-infant mortality rate in the infant health period has been on a slow decline since 2014. The feto-infant mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, and then decreased again from 2016 to 2018.

From 2014 to 2018, in the Detroit metro prosperity region, the feto-infant mortality rate in the maternal health and prematurity period decreased from 2014 to 2016, and then increased from 2016 to 2018. The feto-infant mortality rate in the newborn care period increased from 2014 to 2015, decreased from 2016 to 2017, and then increased again in 2018. The feto-infant mortality rate in the infant health period has been on a slow increase since 2014. The feto-infant mortality rate in the maternal care period has increased since 2014.

Michigan Feto-Infant Excess Mortality Rate* Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).
- Excess mortality rates less than 0 mean mortality rates are lower in the population compared to the reference group.

31

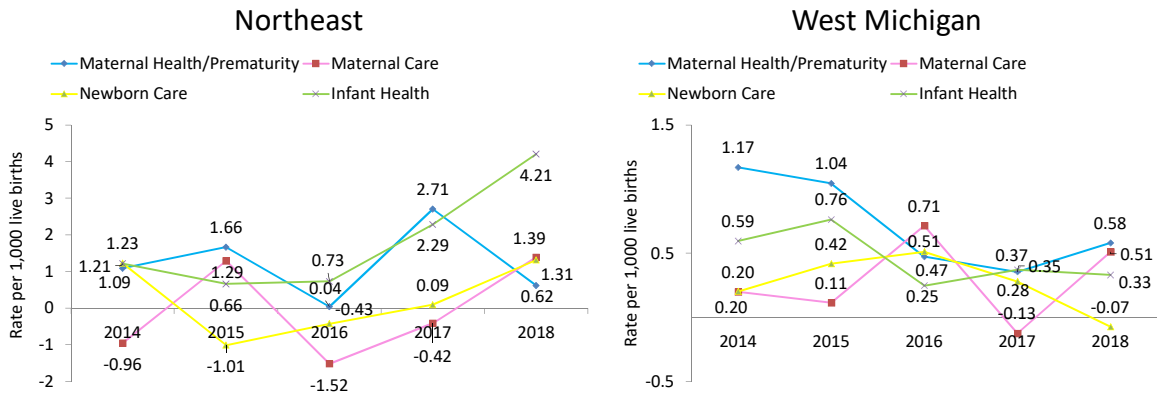
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality excess rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, in the upper peninsula prosperity alliance region, the feto-infant excess mortality rate in the maternal health and prematurity period increased from 2014 to 2016, decreased in 2017, and then increased again in 2018. The excess mortality rate in the newborn care period has increased since 2014. The excess mortality rate in the infant health period increased from 2014 to 2016, and then decreased from 2016 to 2018. The excess mortality rate in the maternal care period increased from 2014 to 2017 and then declined in 2018.

From 2014 to 2018, in the northwest prosperity region, the feto-infant excess mortality rate in the maternal health and prematurity period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018. The excess mortality rate in the newborn care period increased from 2014 to 2017, and then decreased in 2018. The excess mortality rate in the infant health period decreased from 2014 to 2015, and then increased from 2015 to 2018. The excess mortality rate in the maternal care period increased from 2014 to 2015, decreased in 2016, increased again in 2017, and then declined again in 2018.

Michigan Feto-Infant Excess Mortality Rate* Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).
- Excess mortality rates less than 0 mean mortality rates are lower in the population compared to the reference group.

32

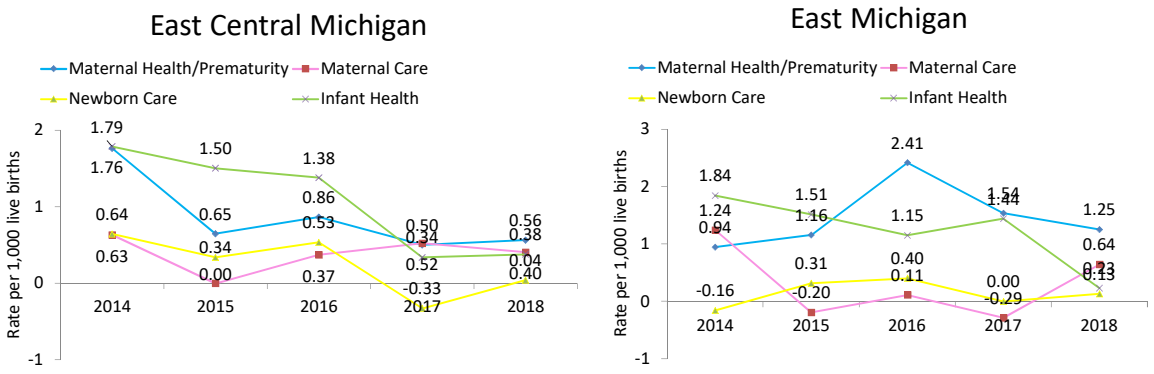
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, in the northeast prosperity region, the feto-infant excess mortality rate in the maternal health and prematurity period increased from 2014 to 2015, declined in 2016, increased again in 2017, and then decreased again in 2018. The excess mortality rate in the newborn care period decreased from 2014 to 2015, and then has increased since 2015. The excess mortality rate in the infant health period decreased from 2014 to 2016, and then has increased since 2016. The excess mortality rate in the maternal care period increased from 2014 to 2015, decreased in 2016, and then has increased since 2016.

From 2014 to 2018, in the west Michigan prosperity alliance, the feto-infant excess mortality rate in the maternal health and prematurity period has decreased since 2014. The excess mortality rate in the newborn care period increased from 2014 to 2016, and then decreased from 2016 to 2018. The excess mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, and then has increased since 2016. The excess mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased agian in 2018.

Michigan Feto-Infant Excess Mortality Rate* Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).
- Excess mortality rates less than 0 mean mortality rates are lower in the population compared to the reference group.

33

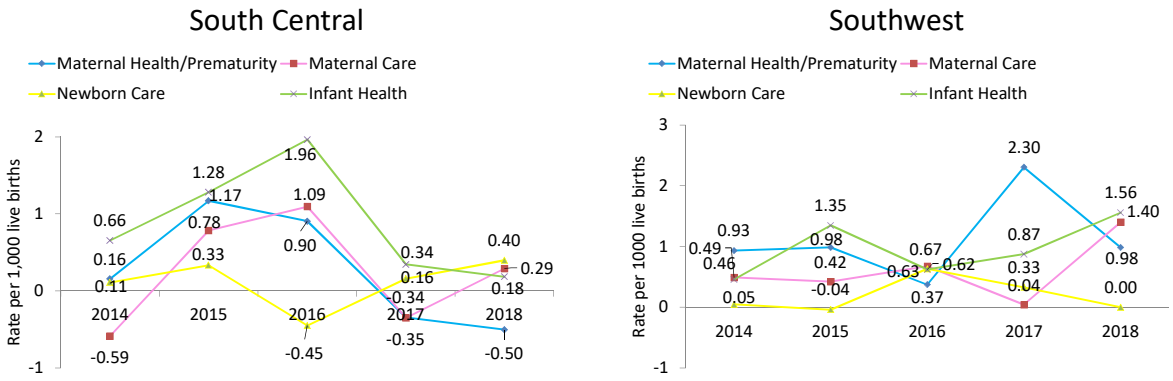
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, in the east central Michigan prosperity region, the feto-infant excess mortality rate in the maternal health and prematurity period decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased again in 2018. The excess mortality rate in the newborn care period decreased in 2015, increased in 2016, decreased again in 2017, and then increased again in 2018. The excess mortality rate in the infant health period has been on a slow decline since 2014. The excess mortality rate in the maternal care period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018.

From 2014 to 2018, in the east Michigan prosperity alliance, the feto-infant excess mortality rate in the maternal health and prematurity period increased from 2014 to 2016, and then decreased from 2015 to 2018. The excess mortality rate in the newborn care period increased from 2014 to 2016, and then has decreased since 2016. The excess mortality rate in the infant health period decreased from 2014 to 2016, increased in 2017, and then decreased again in 2018. The excess mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased again in 2018.

Michigan Feto-Infant Excess Mortality Rate* Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).
- Excess mortality rates less than 0 mean mortality rates are lower in the population compared to the reference group.

34

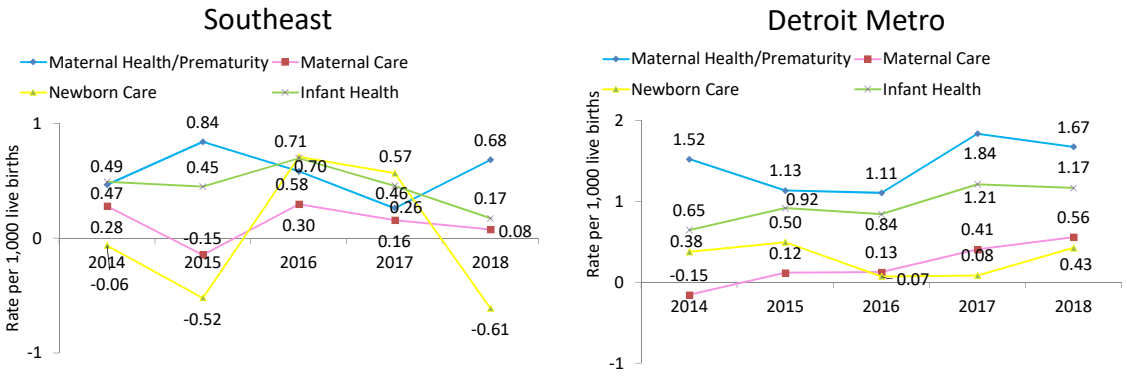
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, in the south central Michigan prosperity region, the feto-infant excess mortality rate in the maternal health and prematurity period increased from 2014 to 2015, and then decreased from 2015 to 2018. The excess mortality rate in the newborn care period increased from 2014 to 2015, decreased in 2016, and then increased from 2016 to 2018. The excess mortality rate in the infant health period increased from 2014 to 2016, and then decreased from 2016 to 2018. The excess mortality rate in the maternal care period increased from 2014 to 2016, declined in 2017, and then increased again in 2018.

From 2014 to 2018, in the southwest Michigan prosperity alliance, the feto-infant excess mortality rate in the maternal health and prematurity period increased from 2014 to 2015, decreased in 2016, increased again in 2017, and then decreased again in 2018. The excess mortality rate in the newborn care period decreased from 2014 to 2015, increased in 2016, and then decreased again from 2016 to 2018. The excess mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, and then increased again from 2016 to 2018. The excess mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased again in 2018 .

Michigan Feto-Infant Excess Mortality Rate* Trend by Prosperity Region: 2014-2018 (rate per 1,000 live births)



- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).
- Excess mortality rates less than 0 mean mortality rates are lower in the population compared to the reference group.

35

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

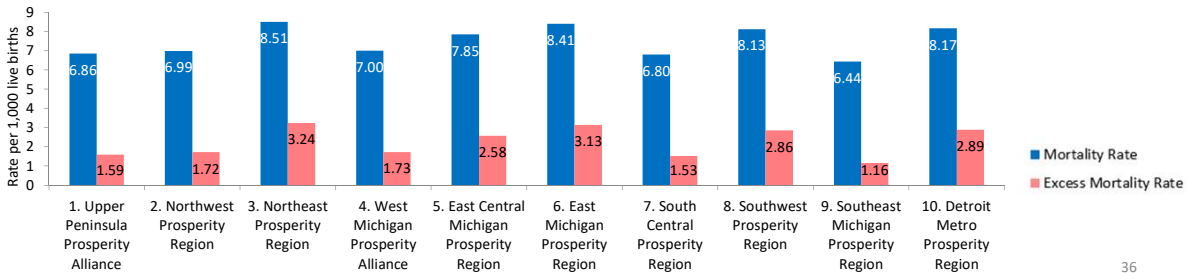
This slide shows the feto-infant excess mortality rate trend by prosperity region of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, in the southeast prosperity region, the feto-infant excess mortality rate in the maternal health and prematurity period increased from 2014 to 2015, decreased from 2015 to 2017, and then increased again in 2018. The excess mortality rate in the newborn care period decreased from 2014 to 2015, increased in 2016, and then decreased again from 2016 to 2018. The excess mortality rate in the infant health period has been on a slow decline since 2014. The excess mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, and then decreased again from 2016 to 2018.

From 2014 to 2018, in the Detroit metro prosperity region, the feto-infant excess mortality rate in the maternal health and prematurity period decreased from 2014 to 2016, and then increased from 2016 to 2018. The excess mortality rate in the newborn care period increased from 2014 to 2015, declined from 2016 to 2017, and then increased again in 2018. The excess mortality rate in the infant health period has been on a slow increase since 2014. The excess mortality rate in the maternal care period has increased since 2014.

Michigan Feto-Infant Mortality Rate by Prosperity Region: 2014-2018 (rate per 1,000 live births)

		Number of deaths by perinatal period				Rate of deaths per 1,000 live births by perinatal period						Excess rate of deaths per 1,000 live births				
	Live births 5 years	Maternal Health/Prematurity	Maternal Care	Newborn Care	Infant Health	Maternal Health/Prematurity	Maternal Care	Newborn Care	Infant Health	Total	Overall 5year	Maternal Health/Prematurity	Maternal Care	Newborn Care	Infant Health	Overall Excess Mortality
1. Upper Peninsula Prosperity Alliance	13695	30	23	19	22	2.19	1.68	1.39	1.61	94	6.86	0.41	0.17	0.42	0.59	1.59
2. Northwest Prosperity Region	14587	37	20	18	27	2.54	1.37	1.23	1.85	102	6.99	0.76	-0.14	0.27	0.83	1.72
3. Northeast Prosperity Region	8815	26	13	11	25	2.95	1.47	1.25	2.84	75	8.51	1.17	-0.04	0.28	1.82	3.24
4. West Michigan Prosperity Alliance	97730	238	176	125	145	2.44	1.80	1.28	1.48	684	7.00	0.66	0.29	0.31	0.46	1.73
5. East Central Michigan Prosperity Region	29427	76	56	37	62	2.58	1.90	1.26	2.11	231	7.85	0.81	0.39	0.29	1.09	2.58
6. East Michigan Prosperity Region	45440	144	83	52	103	3.17	1.83	1.14	2.27	382	8.41	1.39	0.32	0.18	1.25	3.13
7. South Central Prosperity Region	26029	52	46	29	50	2.00	1.77	1.11	1.92	177	6.80	0.22	0.26	0.15	0.90	1.53
8. Southwest Prosperity Region	45765	129	97	55	91	2.82	2.12	1.20	1.99	372	8.13	1.04	0.61	0.24	0.97	2.86
9. Southeast Michigan Prosperity Region	51425	117	85	53	76	2.28	1.65	1.03	1.48	331	6.44	0.50	0.14	0.07	0.46	1.16
10. Detroit Metro Prosperity Region	229720	726	397	299	454	3.16	1.73	1.30	1.98	1876	8.17	1.38	0.22	0.34	0.96	2.89



36

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

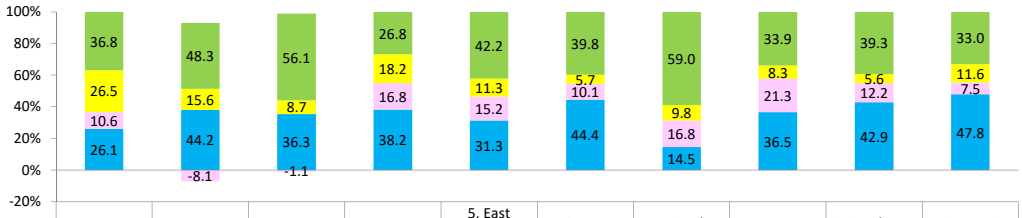
This slide shows the feto-infant mortality rate and excess rate by prosperity region of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

The feto-infant mortality rate in the northeast prosperity region was higher than that in other regions at 8.51 deaths per 1,000 live births, followed by the east Michigan prosperity region (8.41 deaths per 1,000 live births) and the Detroit metro prosperity region (8.17 deaths per 1,000 live births). The feto-infant mortality rate in the southeast Michigan prosperity region was the lowest at 6.44 deaths per 1,000 live births.

From 2014 to 2018, the feto-infant excess mortality rate in the northeast prosperity region was higher than that in other regions at 3.24 deaths per 1,000 live births, followed by the east Michigan prosperity region (3.13 deaths per 1,000 live births) and the Detroit metro prosperity region (2.89 deaths per 1,000 live births). The feto-infant excess mortality rate in the southeast Michigan prosperity region was the lowest at 1.16 deaths per 1,000 live births.

Michigan Feto-Infant Mortality Rate by Prosperity Region: 2014-2018 (rate per 1,000 live births)

Percentage of Excess Infant Deaths Attributed by Prosperity Region, Michigan, 2014-2018



	1. Upper Peninsula Prosperity Alliance	2. Northwest Prosperity Region	3. Northeast Prosperity Region	4. West Michigan Prosperity Alliance	5. East Central Michigan Prosperity Region	6. East Michigan Prosperity Region	7. South Central Prosperity Region	8. Southwest Prosperity Region	9. Southeast Michigan Prosperity Region	10. Detroit Metro Prosperity Region
Infant Health	36.8	48.3	56.1	26.8	42.2	39.8	59.0	33.9	39.3	33.0
Newborn Care	26.5	15.6	8.7	18.2	11.3	5.7	9.8	8.3	5.6	11.6
Maternal Care	10.6	-8.1	-1.1	16.8	15.2	10.1	16.8	21.3	12.2	7.5
Maternal Health/Prematurity	26.1	44.2	36.3	38.2	31.3	44.4	14.5	36.5	42.9	47.8

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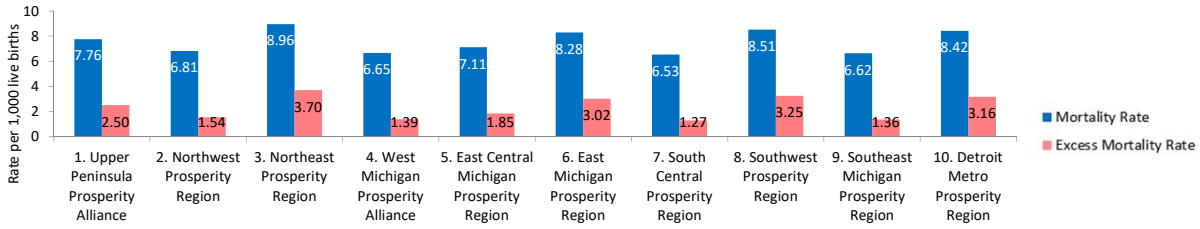
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the percentage of feto-infant excess mortality rate attributed to each PPOR period by prosperity region of residence in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, in the Detroit metro prosperity region (#10), 47.8 percent of excess infant deaths were attributed to the maternal health and prematurity period. In the southwest prosperity region (#8), 21.3 percent of excess infant deaths were attributed to the maternal care period. In the upper peninsula prosperity alliance (#1), 26.5 percent of excess infant deaths were attributed to the neonatal care period. In the south central prosperity region (#7), 59.0 percent of excess infant deaths were attributed to the infant health period.

Michigan Feto-Infant Mortality Rate by Prosperity Region: 2016-2018 (rate per 1,000 live births)

		Number of deaths by perinatal period				Rate of deaths per 1,000 live births by perinatal period					Excess rate of deaths per 1,000 live births				
	Live births 3 years	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Total	Overall 3year	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Overall Excess Mortality
1. Upper Peninsula Prosperity Alliance	8117	16	19	15	13	1.97	2.34	1.85	1.60	63	7.76	0.26	0.82	0.84	0.58	2.50
2. Northwest Prosperity Region	8669	22	10	11	16	2.54	1.15	1.27	1.85	59	6.81	0.83	-0.37	0.26	0.82	1.54
3. Northeast Prosperity Region	5247	15	7	7	18	2.86	1.33	1.33	3.43	47	8.96	1.15	-0.18	0.32	2.41	3.70
4. West Michigan Prosperity Alliance	58314	127	110	73	78	2.18	1.89	1.25	1.34	388	6.65	0.47	0.37	0.24	0.32	1.39
5. East Central Michigan Prosperity Region	17434	41	34	19	30	2.35	1.95	1.09	1.72	124	7.11	0.64	0.43	0.08	0.70	1.85
6. East Michigan Prosperity Region	26944	93	45	32	53	3.45	1.67	1.19	1.97	223	8.28	1.74	0.15	0.18	0.94	3.02
7. South Central Prosperity Region	15459	27	29	16	29	1.75	1.88	1.03	1.88	101	6.53	0.04	0.36	0.02	0.85	1.27
8. Southwest Prosperity Region	27016	79	60	36	55	2.92	2.22	1.33	2.04	230	8.51	1.21	0.70	0.32	1.01	3.25
9. Southeast Michigan Prosperity Region	30655	68	52	38	45	2.22	1.70	1.24	1.47	203	6.62	0.51	0.18	0.23	0.45	1.36
10. Detroit Metro Prosperity Region	137111	445	258	165	287	3.25	1.88	1.20	2.09	1155	8.42	1.54	0.36	0.19	1.07	3.16



* Prosperity Regions 2 and 3 are based on less than 60 deaths for 2016-2018.

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 feto-infant mortality rate and excess rate by prosperity region of residence and PPOR period in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, the feto-infant mortality rate in the northeast prosperity region (#3) was higher than that in other regions at 8.96 deaths per 1,000 live births, followed by the southwest prosperity region (#8) at 8.51 deaths per 1,000 live births and the Detroit metro prosperity region (#10) at 8.42 deaths per 1,000 live births. The feto-infant mortality rate in the south central prosperity region (#7) was the lowest at 6.53 deaths per 1,000 live births.

From 2016 to 2018, the feto-infant excess mortality rate in the northeast prosperity region (#3) was higher than that in other regions at 3.70 deaths per 1,000 live births, followed by the southwest prosperity region (#8) at 3.25 deaths per 1,000 live births and the Detroit metro prosperity region (#10) at 3.16 deaths per 1,000 live births. The rate in the south central prosperity region (#8) was the lowest (1.27 per 1,000 live births).

Michigan Feto-Infant Mortality Rate by Prosperity Region: 2016-2018 (rate per 1,000 live births)

Percentage of Excess Infant Deaths Attributed by Prosperity Region, Michigan, 2016-2018

	1. Upper Peninsula Prosperity Alliance	2. Northwest Prosperity Region	3. Northeast Prosperity Region	4. West Michigan Prosperity Alliance	5. East Central Michigan Prosperity Region	6. East Michigan Prosperity Region	7. South Central Prosperity Region	8. Southwest Prosperity Region	9. Southeast Michigan Prosperity Region	10. Detroit Metro Prosperity Region
Infant Health	23.2	53.3	65.2	22.6	37.7	31.3	67.1	31.2	32.8	33.9
Neonatal Care	33.5	16.7	8.8	17.3	4.3	5.9	1.9	9.9	16.8	6.1
Maternal Care	32.9	-23.6	-5.0	26.4	23.3	5.0	28.1	21.6	13.0	11.5
Maternal Health/Prematurity	10.5	53.6	31.1	33.6	34.7	57.8	2.9	37.3	37.4	48.6

* Prosperity Regions 2 and 3 are based on less than 60 deaths for 2016-2018.

39

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 percentage of feto-infant excess mortality rate attributed to each PPOR period by prosperity region of residence in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, in the east Michigan prosperity region (#6), 57.8 percent of excess infant deaths were attributed to the maternal health and prematurity period. In the upper peninsula prosperity alliance (#1), 32.9 percent of excess infant deaths were attributed to the maternal care period and another 33.5 percent were attributed to the neonatal care period. In the south central prosperity region (#7), 67.1 percent of excess infant deaths were attributed to the infant health period.

PPOR by County of Residence

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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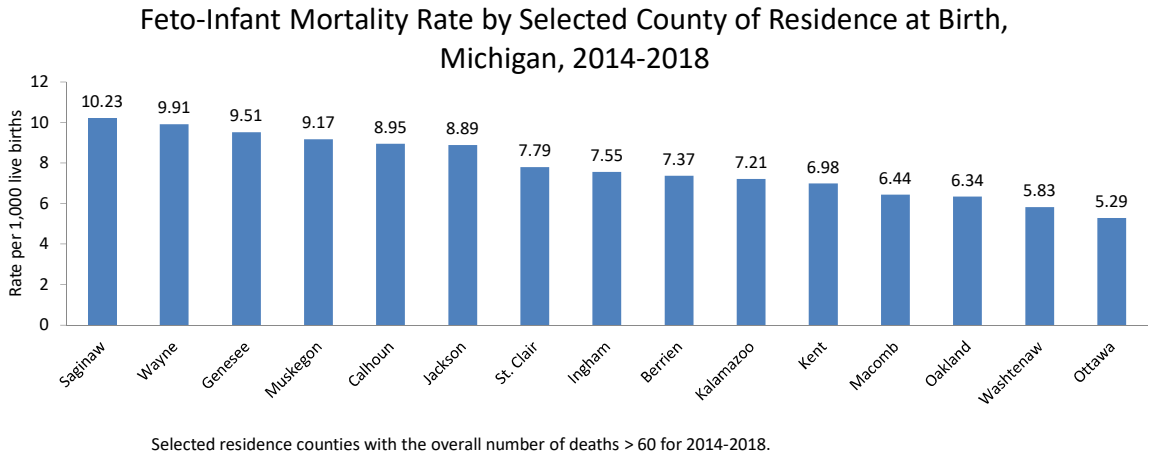
The next several slides contain updated PPOR results by county of residence at birth for the State of Michigan.

Michigan Feto-Infant Mortality Rate by County of Residence at Birth: 2014-2018 (rate per 1,000 live births)



Selected residence counties with the overall number of deaths > 60 for 2014-2018.

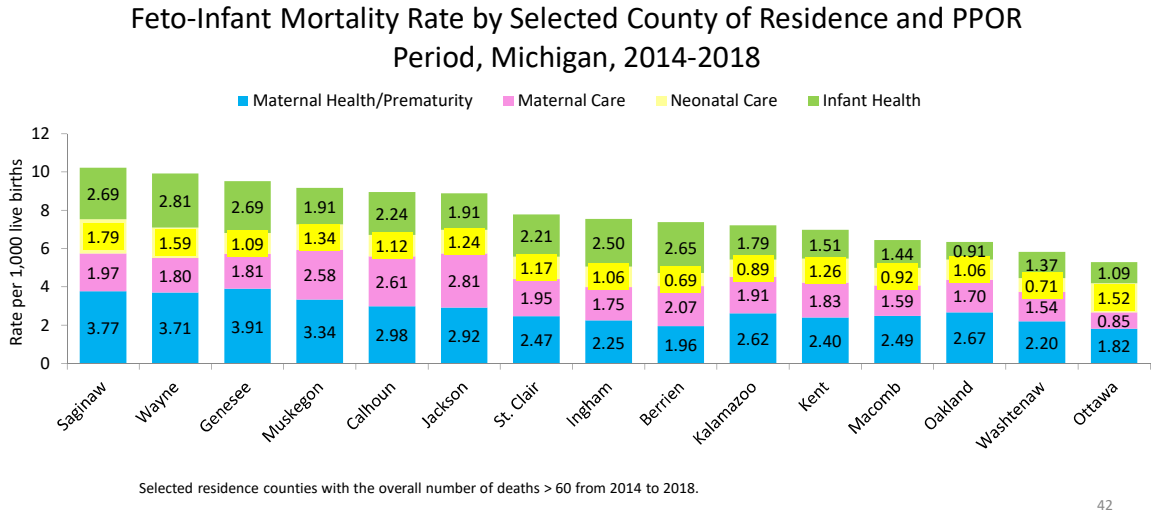
41

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 feto-infant mortality rate by selected county of residence in Michigan from 2014 to 2018.

The feto-infant mortality rate in Saginaw County was higher than that in other counties at 10.23 deaths per 1,000 live births, followed by Wayne County (9.91 deaths per 1,000 live births) and Genesee County (9.51 deaths per 1,000 live births). The feto-infant mortality rate in Ottawa County (5.29 deaths per 1,000 live births) was lower than other selected counties.

Michigan Feto-Infant Mortality Rate by County of Residence: 2014-2018 (rate per 1,000 live births)



Selected residence counties with the overall number of deaths > 60 from 2014 to 2018.

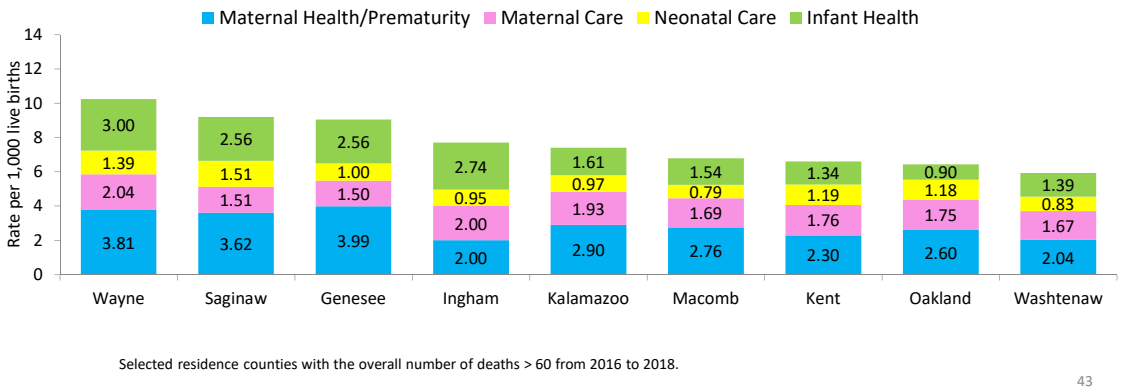
42

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 feto-infant mortality rate by selected county of residence at birth and PPOR period in Michigan from 2014 to 2018.

From 2014 to 2018, the feto-infant mortality rate was highest in Genesee County for the maternal health and prematurity period, in Jackson County for the maternal care period, in Saginaw County for the newborn care, and in Wayne County for the infant health period.

Michigan Feto-Infant Mortality Rate by County of Residence: 2016-2018 (rate per 1,000 live births)



Selected residence counties with the overall number of deaths > 60 from 2016 to 2018.

43

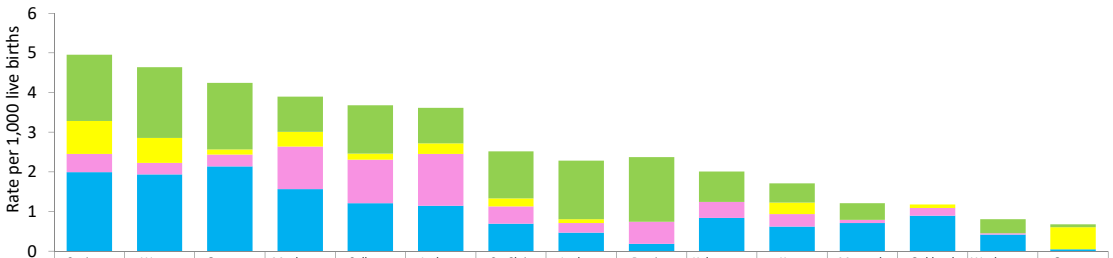
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate by selected county of residence at birth and PPOR period in Michigan from 2016 to 2018.

From 2016 to 2018, the feto-infant mortality rate was highest in Genesee County for the maternal health and prematurity period, in Wayne County for the maternal care and infant health periods, and in Saginaw County for the newborn care period.

Michigan Feto-Infant Excess Mortality Rate* by County of Residence: 2014-2018 (rate per 1,000 live births)

Feto-Infant Excess Mortality Rate by Selected County of Residence and PPOR Period, Michigan, 2014-2018



	Saginaw	Wayne	Genesee	Muskegon	Calhoun	Jackson	St. Clair	Ingham	Berrien	Kalamazoo	Kent	Macomb	Oakland	Washtenaw	Ottawa
Infant Health	1.67	1.79	1.67	0.89	1.22	0.89	1.19	1.48	1.63	0.77	0.49	0.42	-0.11	0.35	0.07
Neonatal Care	0.83	0.63	0.13	0.37	0.15	0.27	0.20	0.10	-0.27	-0.07	0.29	-0.04	0.09	-0.25	0.55
Maternal Care	0.46	0.29	0.30	1.07	1.10	1.30	0.44	0.24	0.56	0.40	0.31	0.08	0.19	0.03	-0.66
Maternal Health/Prematurity	1.99	1.94	2.14	1.57	1.21	1.15	0.69	0.47	0.18	0.84	0.62	0.71	0.90	0.42	0.05

* Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).
Selected residence counties with the overall number of deaths > 60 from 2014 to 2018.

44

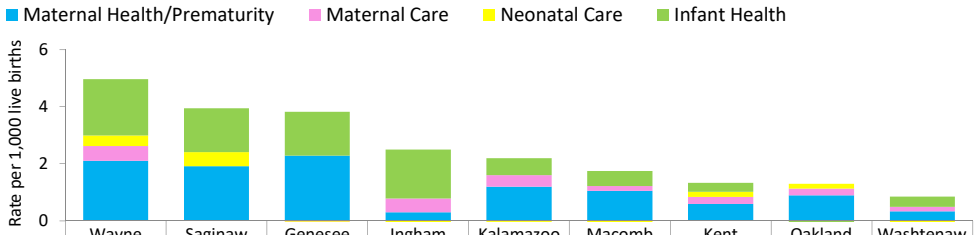
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate by selected county of residence at birth and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, the feto-infant excess mortality rate was highest in Genesee County for the maternal health and prematurity and infant health periods, in Jackson County for the maternal care period, and in Saginaw County for the newborn care period.

Michigan Feto-Infant Excess Mortality Rate* by County of Residence: 2016-2018 (rate per 1,000 live births)

Feto-Infant Excess Mortality Rate by Selected County of Residence and PPOR Period, Michigan, 2016-2018



	Wayne	Saginaw	Genesee	Ingham	Kalamazoo	Macomb	Kent	Oakland	Washtenaw
Infant Health	1.98	1.54	1.54	1.72	0.59	0.52	0.32	-0.12	0.37
Neonatal Care	0.38	0.50	-0.01	-0.06	-0.04	-0.22	0.18	0.17	-0.18
Maternal Care	0.52	-0.01	-0.02	0.49	0.41	0.17	0.24	0.23	0.15
Maternal Health/Prematurity	2.10	1.91	2.28	0.29	1.19	1.05	0.59	0.89	0.33

* Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery). Selected residence counties with the overall number of deaths > 60 from 2016 to 2018.

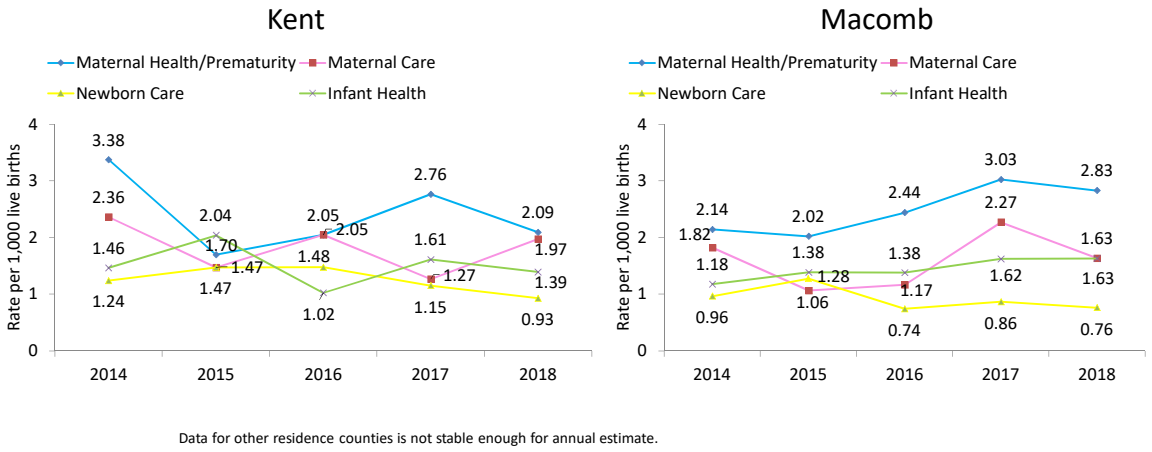
45

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 feto-infant excess mortality rate by selected county of residence at birth and PPOR period in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, the feto-infant excess mortality rate was highest in Genesee County for the maternal health and prematurity period, in Wayne County for the maternal care and infant health periods, and in Saginaw County for the newborn care period.

Michigan Feto-Infant Mortality Rate Trend by County of Residence: 2014-2018 (rate per 1,000 live births)



Data for other residence counties is not stable enough for annual estimate.

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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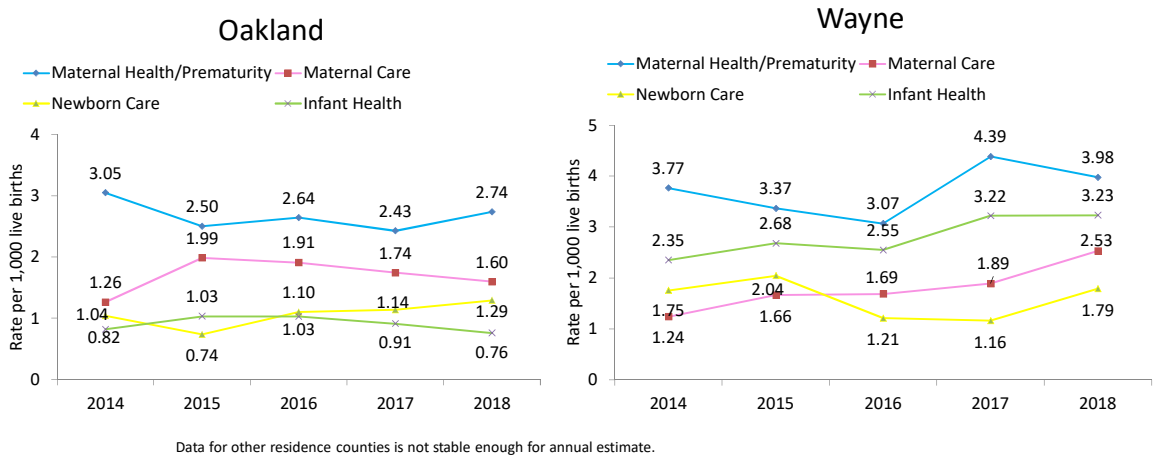
This slide shows the feto-infant mortality rate trend by selected county of residence and PPOR period in Michigan from 2014 to 2018. Data for some counties, except Kent, Macomb, Oakland, and Wayne, is not stable enough for annual estimate.

From 2014 to 2018, in Kent County, the feto-infant mortality rate in the maternal health and prematurity period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018. The feto-infant mortality rate in the newborn care period increased from 2014 to 2016 and then decreased from 2016 to 2018. The feto-infant mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, increased again in 2017, and then decreased again in 2018. The feto-infant mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased again in 2018.

From 2014 to 2018, in Macomb County, the feto-infant mortality rate in the maternal health and prematurity period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018. The feto-infant mortality rate in the newborn care period increased from 2014 to 2015, decreased in 2016, increased again in 2017, and then decreased again in 2018. The feto-infant mortality rate in the infant health period has been on a slow increase since 2014. The feto-infant mortality rate in the maternal care period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018.

Michigan Feto-Infant Mortality Rate Trend by County of Residence: 2014-2018 (rate per 1,000 live births)



Data for other residence counties is not stable enough for annual estimate.

47

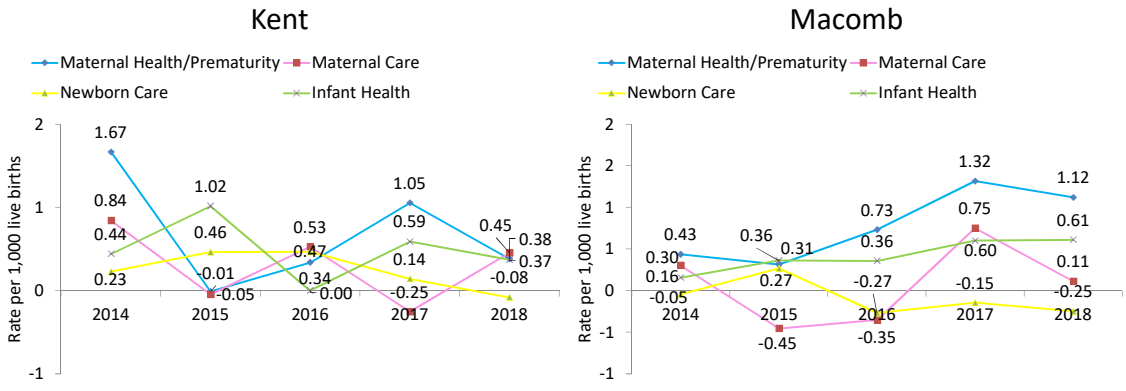
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate trend by selected county of residence and PPOR period in Michigan from 2014 to 2018. Data for some counties, except Kent, Macomb, Oakland, and Wayne, is not stable enough for annual estimate.

From 2014 to 2018, in Oakland County, the feto-infant mortality rate in the maternal health and prematurity period was higher than that in other periods and decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased again in 2018. The feto-infant mortality rate in the newborn care period decreased from 2014 to 2015, and then increased from 2015 to 2018. The feto-infant mortality rate in the infant health period increased from 2014 to 2015 and then decreased from 2015 to 2018. The feto-infant mortality rate in the maternal care period increased from 2014 to 2015 and then decreased from 2015 to 2018.

From 2014 to 2018, in Wayne County, the feto-infant mortality rate in the maternal health and prematurity period was higher than that in other periods and decreased from 2014 to 2016, increased in 2017, and then decreased again in 2018. The feto-infant mortality rate in the newborn care period increased from 2014 to 2015, decreased from 2015 to 2017, and then increased again in 2018. The feto-infant mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, and then increased again from 2016 to 2018. The feto-infant mortality rate in the maternal care period has been on a slow increase since 2014.

Michigan Feto-Infant Excess Mortality Rate* Trend by County of Residence: 2014-2018 (rate per 1,000 live births)



* Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery).
Data for other residence counties is not stable enough for annual estimate.

48

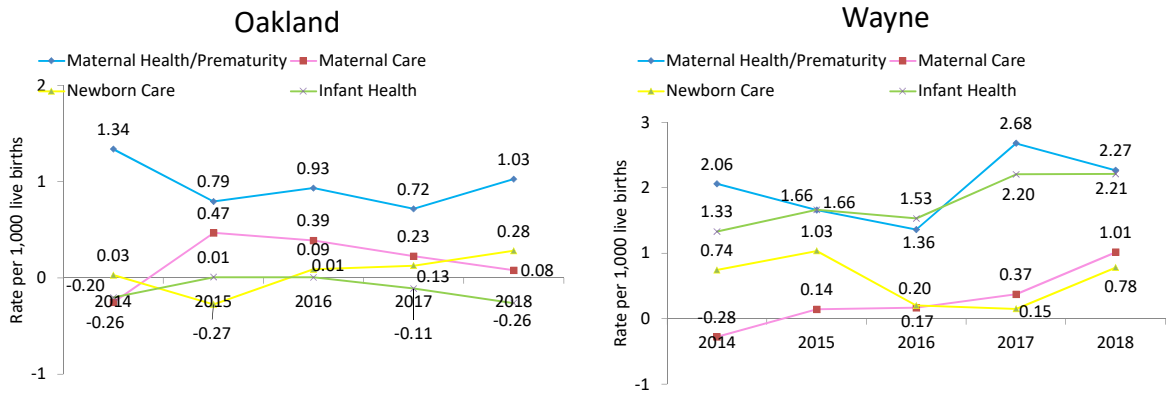
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate trend by selected county of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery. Data for some counties, except Kent, Macomb, Oakland, and Wayne, is not stable enough for annual estimate.

From 2014 to 2018, in Kent County, the feto-infant excess mortality rate in the maternal health and prematurity period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018. The excess mortality rate in the newborn care period increased from 2014 to 2016 and then decreased from 2016 to 2018. The excess mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, increased again in 2017, and then decreased again in 2018. The excess mortality rate in the maternal care period decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased again in 2018.

From 2014 to 2018, in Macomb County, the feto-infant excess mortality rate in the maternal health and prematurity period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018. The excess mortality rate in the newborn care period increased from 2014 to 2015, decreased in 2016, increased again in 2017, and then decreased again in 2018. The excess mortality rate in the infant health period has been on a slow increase since 2014. The excess mortality rate in the maternal care period decreased from 2014 to 2015, increased from 2015 to 2017, and then decreased again in 2018.

Michigan Feto-Infant Excess Mortality Rate* Trend by County of Residence: 2014-2018 (rate per 1,000 live births)



* Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery). Data for other residence counties is not stable enough for annual estimate.

49

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

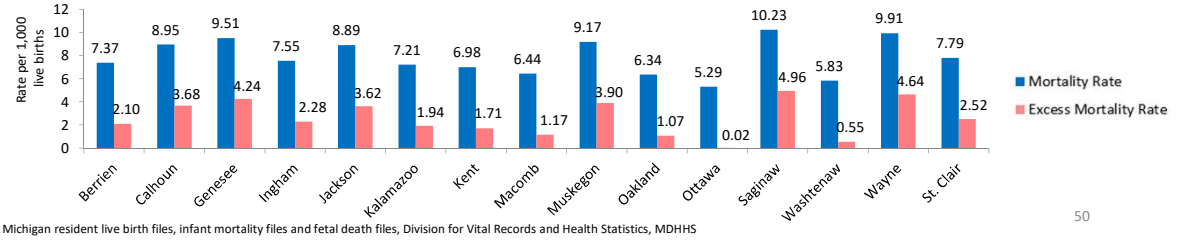
This slide shows the feto-infant excess mortality rate trend by selected county of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery. Data for some counties, except Kent, Macomb, Oakland, and Wayne, is not stable enough for annual estimate.

From 2014 to 2018, in Oakland County, the feto-infant excess mortality rate in the maternal health and prematurity period was higher than that in other periods and decreased from 2014 to 2015, increased in 2016, decreased again in 2017, and then increased again in 2018. The excess mortality rate in the newborn care period decreased from 2014 to 2015 and then increased from 2015 to 2018. The excess mortality rate in the infant health period increased from 2014 to 2015 and then decreased from 2015 to 2018. The excess mortality rate in the maternal care period increased from 2014 to 2015 and then decreased from 2015 to 2018.

From 2014 to 2018, in Wayne County, the feto-infant excess mortality rate in the maternal health and prematurity period decreased from 2014 to 2016, increased in 2017, and then decreased again in 2018. The excess mortality rate in the newborn care period increased from 2014 to 2015, decreased from 2015 to 2017, and then increased again in 2018. The excess mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, and then increased again from 2016 to 2018. The excess mortality rate in the maternal care period has been on a slow increase since 2014.

Michigan Feto-Infant Mortality Rate by County of Residence: 2014-2018 (rate per 1,000 live births)

		Number of deaths by perinatal period				Rate of deaths per 1,000 live births by perinatal period						Excess rate of deaths per 1,000 live births				
	Live births 5 years	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Total	Overall 5years	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Overall Excess Mortality
Berrien	8679	17	18	6	23	1.96	2.07	0.69	2.65	64	7.37	0.18	0.56	-0.27	1.63	2.10
Calhoun	8045	24	21	9	18	2.98	2.61	1.12	2.24	72	8.95	1.21	1.10	0.15	1.22	3.68
Genesee	23756	93	43	26	64	3.91	1.81	1.09	2.69	226	9.51	2.14	0.30	0.13	1.67	4.24
Ingham	16022	36	28	17	40	2.25	1.75	1.06	2.50	121	7.55	0.47	0.24	0.10	1.48	2.28
Jackson	8889	26	25	11	17	2.92	2.81	1.24	1.91	79	8.89	1.15	1.30	0.27	0.89	3.62
Kalamazoo	15668	41	30	14	28	2.62	1.91	0.89	1.79	113	7.21	0.84	0.40	-0.07	0.77	1.94
Kent	43809	105	80	55	66	2.40	1.83	1.26	1.51	306	6.98	0.62	0.31	0.29	0.49	1.71
Macomb	46599	116	74	43	67	2.49	1.59	0.92	1.44	300	6.44	0.71	0.08	-0.04	0.42	1.17
Muskegon	10471	35	27	14	20	3.34	2.58	1.34	1.91	96	9.17	1.57	1.07	0.37	0.89	3.90
Oakland	67005	179	114	71	61	2.67	1.70	1.06	0.91	425	6.34	0.90	0.19	0.09	-0.11	1.07
Ottawa	16451	30	14	25	18	1.82	0.85	1.52	1.09	87	5.29	0.05	-0.66	0.55	0.07	0.02
Saginaw	11147	42	22	20	30	3.77	1.97	1.79	2.69	114	10.23	1.99	0.46	0.83	1.67	4.96
Washtenaw	18195	40	28	13	25	2.20	1.54	0.71	1.37	106	5.83	0.42	0.03	-0.25	0.35	0.55
Wayne	116116	431	209	185	326	3.71	1.80	1.59	2.81	1151	9.91	1.94	0.29	0.63	1.79	4.64
St. Clair	7705	19	15	9	17	2.47	1.95	1.17	2.21	60	7.79	0.69	0.44	0.20	1.19	2.52



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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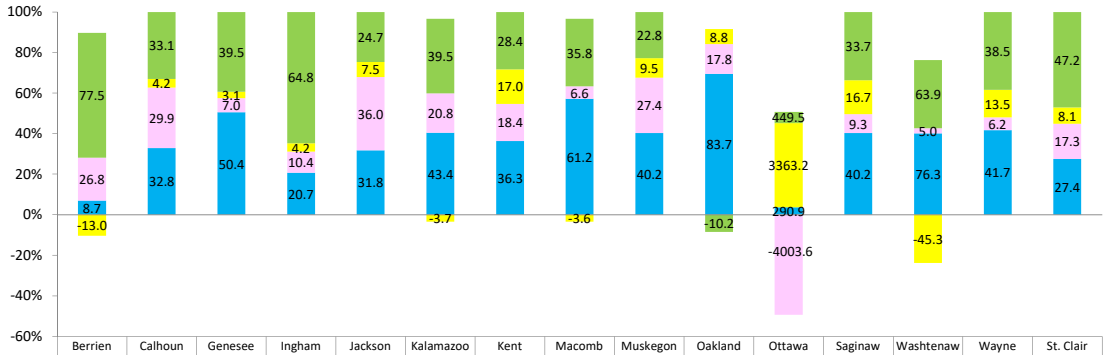
This slide shows the feto-infant mortality rate and excess rate by selected county of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, the feto-infant mortality rate in Saginaw County was higher than that in other counties at 10.23 deaths per 1,000 live births, followed by Wayne County (9.91 deaths per 1,000 live births), Genesee County (9.51 deaths per 1,000 live births), and Muskegon County (9.17 deaths per 1,000 live births). The feto-infant mortality rate in Ottawa County (5.29 deaths per 1,000 live births) was lower than other selected counties.

From 2014 to 2018, the feto-infant excess mortality rate in Saginaw County was higher than that in other selected counties at 4.96 deaths per 1,000 live births, followed by Wayne County (4.64 deaths per 1,000 live births), Genesee County (4.24 deaths per 1,000 live births), and Muskegon County (3.90 deaths per 1,000 live births). The excess mortality rate in Ottawa County (0.02 deaths per 1,000 live births) was lower than other selected counties.

Michigan Feto-Infant Mortality Rate by County of Residence: 2014-2018 (rate per 1,000 live births)

Percentage of Excess Infant Deaths Attributed by County of Residence, Michigan, 2014-2018



	Berrien	Calhoun	Genesee	Ingham	Jackson	Kalamazoo	Kent	Macomb	Muskegon	Oakland	Ottawa	Saginaw	Washtenaw	Wayne	St. Clair
Infant Health	77.5	33.1	39.5	64.8	24.7	39.5	28.4	35.8	22.8	-10.2	449.5	33.7	63.9	38.5	47.2
Neonatal Care	-13.0	4.2	3.1	4.2	7.5	-3.7	17.0	-3.6	9.5	8.8	3363.2	16.7	-45.3	13.5	8.1
Maternal Care	26.8	29.9	7.0	10.4	36.0	20.8	18.4	6.6	27.4	17.8	-4003.6	9.3	5.0	6.2	17.3
Maternal Health/Prematurity	8.7	32.8	50.4	20.7	31.8	43.4	36.3	61.2	40.2	83.7	290.9	40.2	76.3	41.7	27.4

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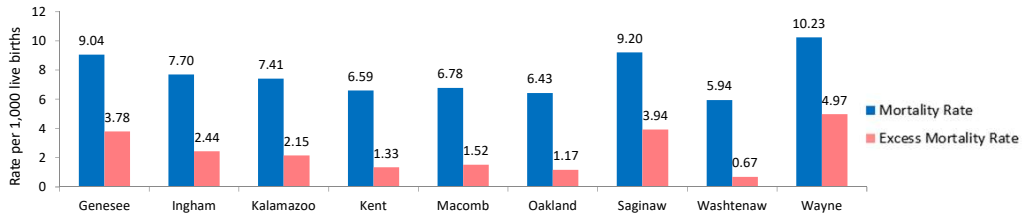
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the percentage of feto-infant excess mortality rate attributed to each PPOR period by selected county of residence in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, in Oakland County, 83.7 percent of excess infant deaths were attributed to the maternal health and prematurity period. In Jackson County, 36.0 percent of excess infant deaths were attributed to the maternal care period. In Kent County, 17.0 percent of excess infant deaths were attributed to the neonatal care period. In Berrien County, 77.5 percent of excess infant deaths were attributed to the infant health period.

Michigan Feto-Infant Mortality Rate by County of Residence: 2016-2018 (rate per 1,000 live births)

		Number of deaths by perinatal period				Rate of deaths per 1,000 live births by perinatal period						Excess rate of deaths per 1,000 live births				
	Live births 3 years	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Total	Overall 3years	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Overall Excess Mortality
Genesee	14041	56	21	14	36	3.99	1.50	1.00	2.56	127	9.04	2.28	-0.02	-0.01	1.54	3.78
Ingham	9480	19	19	9	26	2.00	2.00	0.95	2.74	73	7.70	0.29	0.49	-0.06	1.72	2.44
Kalamazoo	9315	27	18	9	15	2.90	1.93	0.97	1.61	69	7.41	1.19	0.41	-0.04	0.59	2.15
Kent	26092	60	46	31	35	2.30	1.76	1.19	1.34	172	6.59	0.59	0.24	0.18	0.32	1.33
Macomb	27870	77	47	22	43	2.76	1.69	0.79	1.54	189	6.78	1.05	0.17	-0.22	0.52	1.52
Oakland	39963	104	70	47	36	2.60	1.75	1.18	0.90	257	6.43	0.89	0.23	0.17	-0.12	1.17
Saginaw	6632	24	10	10	17	3.62	1.51	1.51	2.56	61	9.20	1.91	-0.01	0.50	1.54	3.94
Washtenaw	10782	22	18	9	15	2.04	1.67	0.83	1.39	64	5.94	0.33	0.15	-0.18	0.37	0.67
Wayne	69278	264	141	96	208	3.81	2.04	1.39	3.00	709	10.23	2.10	0.52	0.38	1.98	4.97



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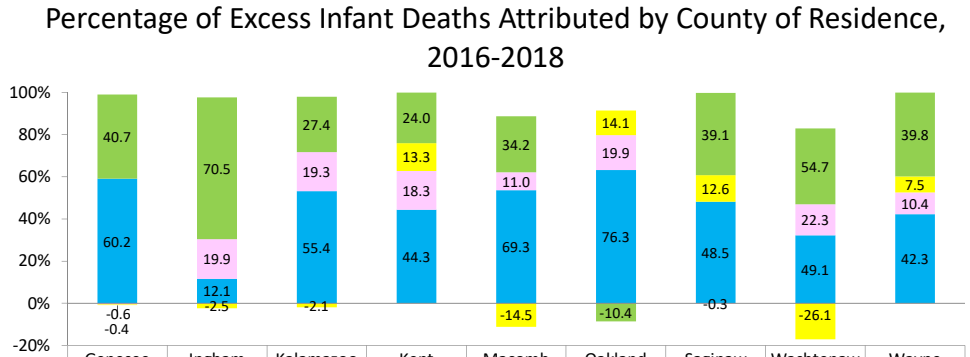
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality rate and excess rate by selected county of residence and PPOR period in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, the feto-infant mortality rate in Wayne County was higher than that in other counties at 10.23 deaths per 1,000 live births, followed by Saginaw County (9.20 deaths per 1,000 live births) and Genesee County (9.04 deaths per 1,000 live births). The feto-infant mortality rate in Washtenaw County (5.94 deaths per 1,000 live births) was lower than other selected counties.

From 2016 to 2018, the feto-infant excess mortality rate in Wayne County was higher than that in other selected counties at 4.97 deaths per 1,000 live births, followed by Saginaw County (3.94 deaths per 1,000 live births) and Genesee County (3.78 deaths per 1,000 live births). The excess mortality rate in Washtenaw County (0.67 deaths per 1,000 live births) was lower than other selected counties.

Michigan Feto-Infant Mortality Rate by County of Residence: 2016-2018 (rate per 1,000 live births)



	Genesee	Ingham	Kalamazoo	Kent	Macomb	Oakland	Saginaw	Washtenaw	Wayne
Infant Health	40.7	70.5	27.4	24.0	34.2	-10.4	39.1	54.7	39.8
Neonatal Care	-0.4	-2.5	-2.1	13.3	-14.5	14.1	12.6	-26.1	7.5
Maternal Care	-0.6	19.9	19.3	18.3	11.0	19.9	-0.3	22.3	10.4
Maternal Health/Prematurity	60.2	12.1	55.4	44.3	69.3	76.3	48.5	49.1	42.3

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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 percentage of feto-infant excess mortality rate attributed to each PPOR period by selected county of residence in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, in Oakland County, 76.3 percent of excess infant deaths were attributed to the maternal health and prematurity period. In Washtenaw County, 22.3 percent of excess infant deaths were attributed to the maternal care period. In Oakland County, 14.1 percent of excess infant deaths were attributed to the neonatal care period. In Ingham County, 70.5 percent of excess infant deaths were attributed to the infant health period.

PPOR by City of Residence

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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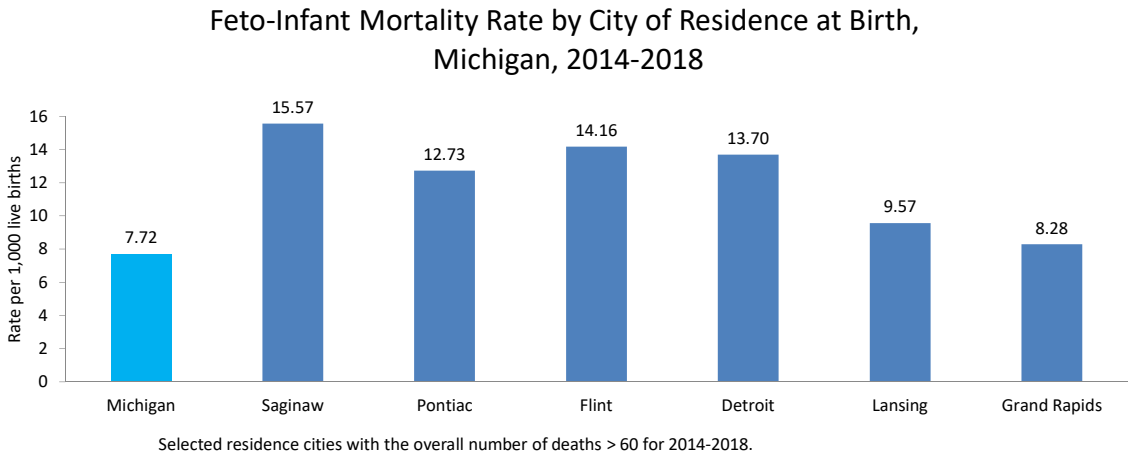
The next several slides contain updated PPOR results by city of residence at birth for the State of Michigan.

Michigan Feto-Infant Mortality Rate by City of Residence at Birth: 2014-2018 (rate per 1,000 live births)



Selected residence cities with the overall number of deaths > 60 for 2014-2018.

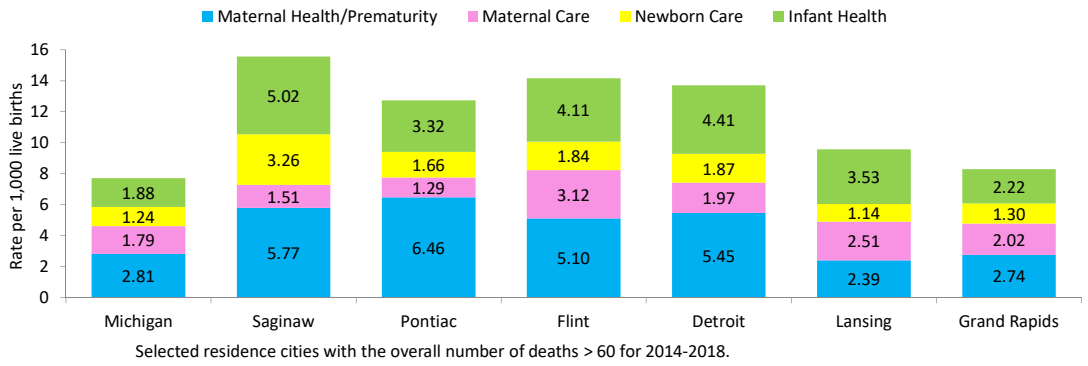
55

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 feto-infant mortality rate by selected city of residence in Michigan from 2014 to 2018. Selected residence cities with the overall number of deaths are greater than 60 for 2014-2018.

The feto-infant mortality rate in Saginaw was higher than that in other cities at 15.57 deaths per 1,000 live births, followed by Flint (14.16 deaths per 1,000 live births), Detroit (13.70 deaths per 1,000 live births) and Pontiac (12.73 deaths per 1,000 live births). The feto-infant mortality rate in Grand Rapids (8.28 deaths per 1,000 live births) was lower than other cities.

Michigan Feto-Infant Mortality Rate by City of Residence at Birth: 2014-2018 (rate per 1,000 live births)



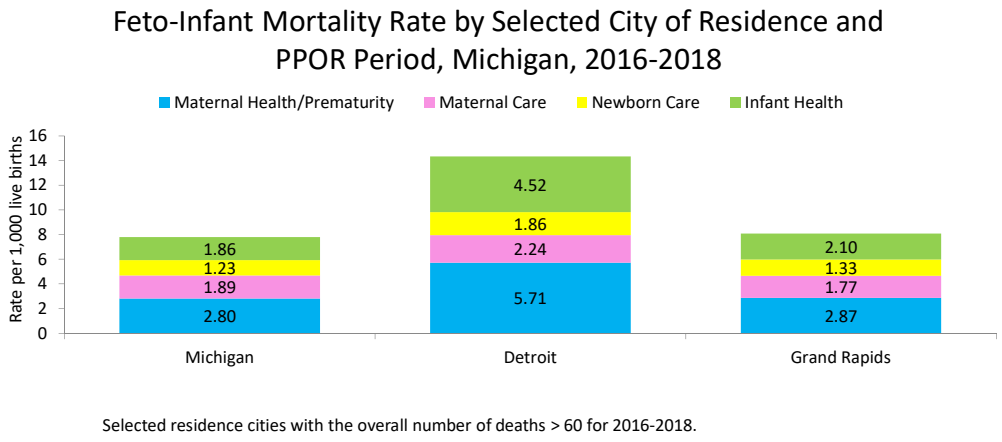
56

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 feto-infant mortality rate by selected city of residence at birth and PPOR period in Michigan from 2014 to 2018. Selected residence cities with the overall number of deaths are greater than 60 for 2014-2018.

From 2014 to 2018, the feto-infant mortality rate was highest in Pontiac for the maternal health and prematurity period, in Flint for the maternal care period, and in Saginaw for the newborn care period and infant health periods.

Michigan Feto-Infant Mortality Rate by City of Residence at Birth: 2016-2018 (rate per 1,000 live births)



Selected residence cities with the overall number of deaths > 60 for 2016-2018.

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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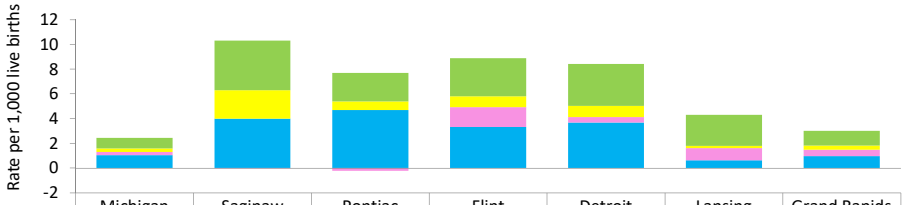
This slide shows the feto-infant mortality rate by selected city of residence at birth and PPOR period in Michigan from 2016 to 2018. Selected residence cities with the overall number of deaths are greater than 60 for 2016-2018.

From 2016 to 2018, the feto-infant mortality rate in Detroit was 5.71 deaths per 1,000 live births for the maternal health and prematurity period, 2.24 deaths per 1,000 live births for the maternal care period, 1.86 deaths per 1,000 live births for the newborn care period, and 4.52 deaths per 1,000 live births for the infant health period.

From 2016 to 2018, the feto-infant mortality rate in Grand Rapids was 2.87 deaths per 1,000 live births for the maternal health and prematurity period, 1.77 deaths per 1,000 live births for the maternal care period, 1.33 deaths per 1,000 live births for the newborn care period, and 2.10 deaths per 1,000 live births for the infant health period.

Michigan Feto-Infant Excess Mortality Rate* by City of Residence at Birth: 2014-2018 (rate per 1,000 live births)

Feto-Infant Excess Mortality Rate by Selected City of Residence and PPOR Period, Michigan, 2014-2018



	Michigan	Saginaw	Pontiac	Flint	Detroit	Lansing	Grand Rapids
Infant Health	0.86	4.00	2.30	3.09	3.39	2.51	1.20
Newborn Care	0.28	2.30	0.70	0.88	0.90	0.17	0.34
Maternal Care	0.28	0.00	-0.22	1.60	0.46	1.00	0.51
Maternal Health/Prematurity	1.04	4.00	4.68	3.32	3.68	0.62	0.96

- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery). Selected residence cities with the overall number of deaths are greater than 60 for 2014-2018.

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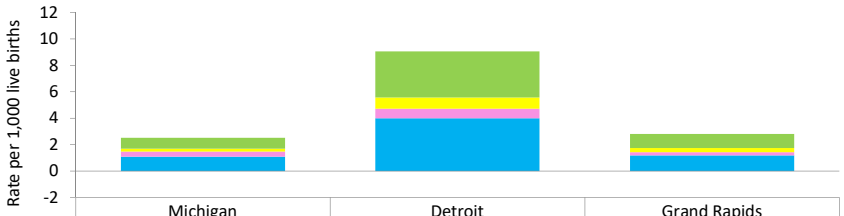
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant mortality excess rate by selected city of residence at birth and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, the feto-infant excess mortality rate was highest in Pontiac for the maternal health and prematurity period, in Flint for the maternal care period, in Grand Rapids for the newborn care period, and in Saginaw for the infant health period.

Michigan Feto-Infant Excess Mortality Rate* by City of Residence at Birth: 2016-2018 (rate per 1,000 live births)

Feto-Infant Excess Mortality Rate by Selected City of Residence and PPOR Period, Michigan, 2016-2018



	Michigan	Detroit	Grand Rapids
Infant Health	0.84	3.50	1.08
Newborn Care	0.22	0.85	0.32
Maternal Care	0.37	0.72	0.25
Maternal Health/Prematurity	1.09	4.00	1.17

- Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery). Selected residence cities with the overall number of deaths are greater than 60 for 2014-2018.

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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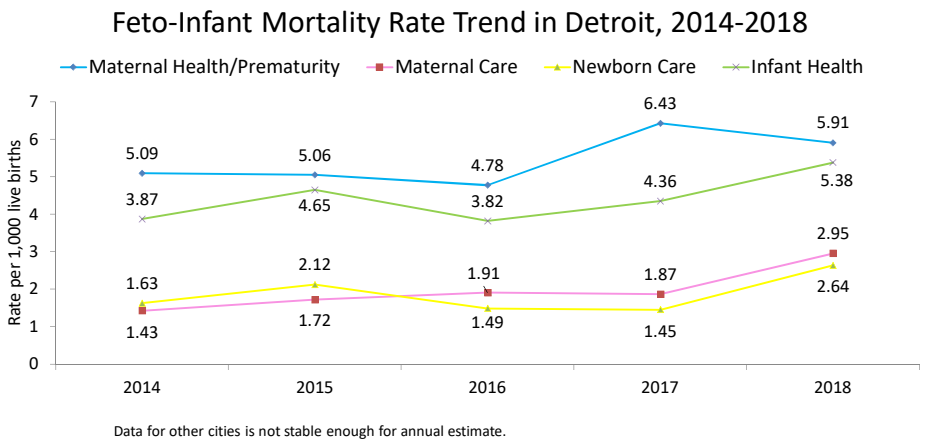
This slide shows the feto-infant mortality excess rate by selected city of residence at birth and PPOR period in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, the feto-infant excess mortality rate in Detroit was 4.00 deaths per 1,000 live births for the maternal health and prematurity period, 0.72 deaths per 1,000 live births for the maternal care period, 0.85 deaths per 1,000 live births for the newborn care period, and 3.50 deaths per 1,000 live births for the infant health period.

From 2016 to 2018, the feto-infant excess mortality rate in Grand Rapids was 1.17 deaths per 1,000 live births for the maternal health and prematurity period, 0.25 deaths per 1,000 live births for the maternal care period, 0.32 deaths per 1,000 live births for the newborn care period, and 1.08 deaths per 1,000 live births for the infant health period.

Michigan Feto-Infant Mortality Rate Trend by City of Residence at Birth: 2014-2018 (rate per 1,000 live births)



Data for other cities is not stable enough for annual estimate.

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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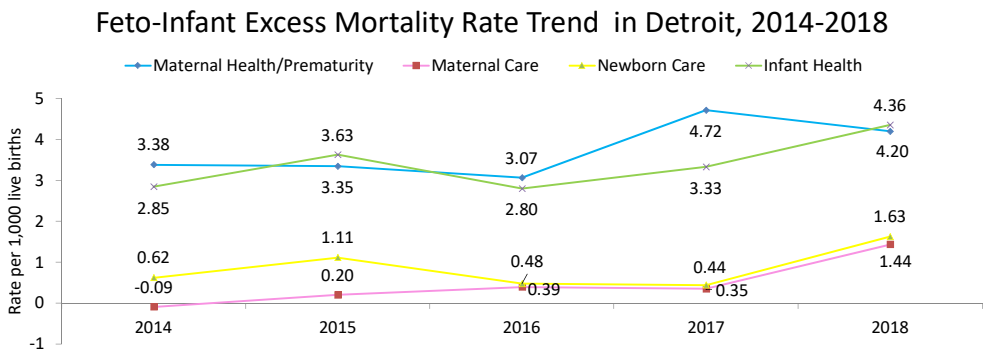
This slide shows the feto-infant mortality rate trend by selected city of residence and PPOR period in Michigan from 2014 to 2018. Data for some cities, except Detroit, is not stable enough for annual estimate.

From 2014 to 2018, in Detroit, the feto-infant mortality rate in the maternal health and prematurity period decreased from 2014 to 2016, increased in 2017, and then decreased again in 2018. The feto-infant mortality rate in the newborn care period increased from 2014 to 2015, decreased from 2015 to 2017, and then increased again in 2018. The feto-infant mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, and then increased again from 2016 to 2018. The feto-infant mortality rate in the maternal care period had been on a slow increase since 2014.

Michigan Feto-Infant Excess Mortality Rate* Trend by City of Residence at Birth: 2014-2018 (rate per 1,000 live births)



* Using Michigan reference: White non-Hispanic, 20-<40 years old and (>13 years education or intending to use private insurance at delivery). Data for other cities is not stable enough for annual estimate.

61

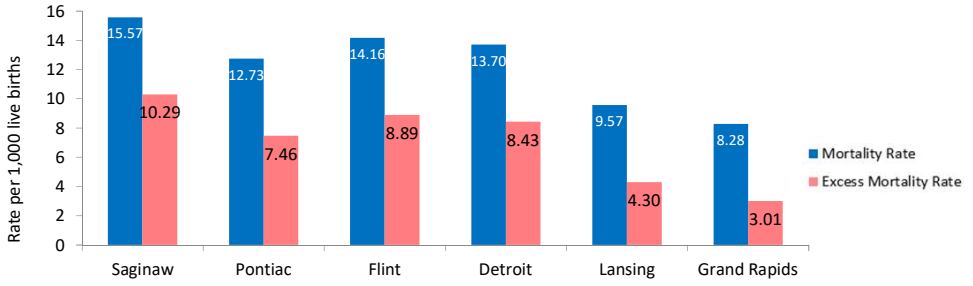
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the feto-infant excess mortality rate trend by selected city of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery. Data for some cities, except Detroit, is not stable enough for annual estimate.

From 2014 to 2018, in Detroit, the feto-infant excess mortality rate in the maternal health and prematurity period decreased from 2014 to 2016, increased in 2017, and then decreased again in 2018. The excess mortality rate in the newborn care period increased from 2014 to 2015, decreased from 2015 to 2017, and then increased again in 2018. The excess mortality rate in the infant health period increased from 2014 to 2015, decreased in 2016, and then increased again from 2016 to 2018. The excess mortality rate in the maternal care period has been on a slow increase since 2014.

Michigan Feto-Infant Mortality Rate by City of Residence at Birth: 2014-2018 (rate per 1,000 live births)

		Number of deaths by perinatal period				Rate of deaths per 1,000 live births by perinatal period						Excess rate of deaths per 1,000 live births				
	Live births 5 years	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Total	Overall 5year	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Overall Excess Mortality
Saginaw	3983	23	6	13	20	5.77	1.51	3.26	5.02	62	15.57	4.00	0.00	2.30	4.00	10.29
Pontiac	5419	35	7	9	18	6.46	1.29	1.66	3.32	69	12.73	4.68	-0.22	0.70	2.30	7.46
Flint	7060	36	22	13	29	5.10	3.12	1.84	4.11	100	14.16	3.32	1.60	0.88	3.09	8.89
Detroit	48248	263	95	90	213	5.45	1.97	1.87	4.41	661	13.70	3.68	0.46	0.90	3.39	8.43
Lansing	8778	21	22	10	31	2.39	2.51	1.14	3.53	84	9.57	0.62	1.00	0.17	2.51	4.30
Grand Rapids	15334	42	31	20	34	2.74	2.02	1.30	2.22	127	8.28	0.96	0.51	0.34	1.20	3.01



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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 feto-infant mortality rate and excess rate by selected city of residence and PPOR period in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

The feto-infant mortality rate in Saginaw was higher than that in other cities at 15.57 deaths per 1,000 live births, followed by Flint (14.16 deaths per 1,000 live births), Detroit (13.70 deaths per 1,000 live births) and Pontiac (12.73 deaths per 1,000 live births). The feto-infant mortality rate in Grand Rapids (8.28 deaths per 1,000 live births) was lower than other cities.

From 2014 to 2018, the feto-infant excess mortality rate in Saginaw was higher than that in other selected cities at 10.29 deaths per 1,000 live births, followed by Flint (8.89 deaths per 1,000 live births) and Detroit (8.43 deaths per 1,000 live births). The excess mortality rate in Grand Rapids (3.01 deaths per 1,000 live births) was lower than other selected cities.

Michigan Feto-Infant Mortality Rate by City of Residence at Birth: 2014-2018 (rate per 1,000 live births)

Percentage of Excess Infant Deaths Attributed by City of Residence, Michigan, 2014-2018

	Saginaw	Pontiac	Flint	Detroit	Lansing	Grand Rapids
Infant Health	38.9	30.8	34.7	40.3	58.4	39.8
Neonatal Care	22.3	9.3	9.9	10.7	4.1	11.3
Maternal Care	0.0	-2.9	18.0	5.4	23.2	17.0
Maternal Health/Prematurity	38.8	62.8	37.4	43.6	14.4	32.0

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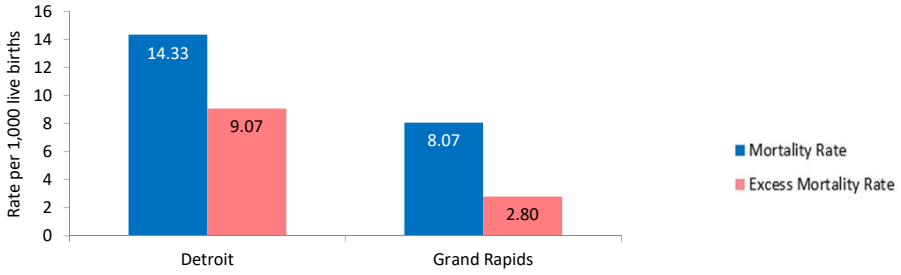
Data source: Michigan resident live birth files, infant mortality files and fetal death files, Division for Vital Records and Health Statistics, MDHHS

This slide shows the percentage of feto-infant excess mortality rate attributed to each PPOR period by selected city of residence in Michigan from 2014 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2014 to 2018, in Pontiac, 62.8 percent of excess infant deaths were attributed to the maternal health and prematurity period. In Lansing, 23.2 percent of excess infant deaths were attributed to the maternal care period. In Saginaw, 22.3 percent of excess infant deaths were attributed to the neonatal care period. In Lansing, 58.4 percent were attributed to the infant health period.

Michigan Feto-Infant Mortality Rate by City of Residence at Birth: 2016-2018 (rate per 1,000 live births)

		Number of deaths by perinatal period				Rate of deaths per 1,000 live births by perinatal period						Excess rate of deaths per 1,000 live births				
	Live births 3 years	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Total	Overall 3year	Maternal Health/Prematurity	Maternal Care	Neonatal Care	Infant Health	Overall Excess Mortality
Detroit	28539	163	64	53	129	5.71	2.24	1.86	4.52	409	14.33	4.00	0.72	0.85	3.50	9.07
Grand Rapids	9045	26	16	12	19	2.87	1.77	1.33	2.10	73	8.07	1.17	0.25	0.31	1.08	2.80



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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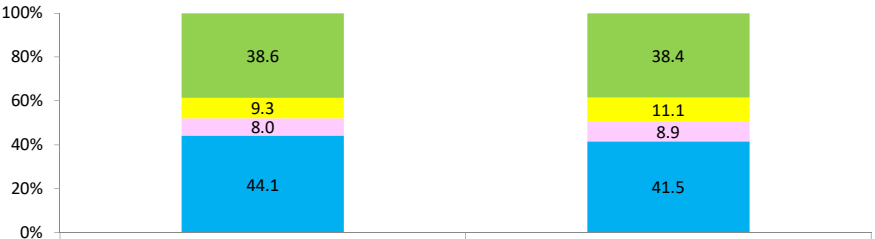
This slide shows the feto-infant mortality rate and excess rate by selected city of residence and PPOR period in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, the feto-infant mortality rate was 14.33 deaths per 1,000 live births in Detroit and 8.07 deaths per 1,000 live births in Grand Rapids.

From 2016 to 2018, the feto-infant excess mortality rate was 9.07 deaths per 1,000 live births in Detroit and 2.80 deaths per 1,000 live births in Grand Rapids.

Michigan Feto-Infant Mortality Rate by City of Residence at Birth: 2016-2018 (rate per 1,000 live births)

Percentage of Excess Infant Deaths Attributed by City of Residence, Michigan, 2014-2018



	Detroit	Grand Rapids
Infant Health	38.6	38.4
Neonatal Care	9.3	11.1
Maternal Care	8.0	8.9
Maternal Health/Prematurity	44.1	41.5

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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 percentage of feto-infant excess mortality rate attributed to each PPOR period by selected city of residence in Michigan from 2016 to 2018. The excess mortality rate is calculated by subtracting the mortality rate of the reference group from the mortality rate of the population group. The reference group is White non-Hispanic Michigan women, over 20 years and less than 40 years old, and at least 13 years education or intending to use private insurance at delivery.

From 2016 to 2018, in Detroit, 44.1 percent of excess infant deaths were attributed to the maternal health and prematurity period; 8.0 percent of excess infant deaths were attributed to the maternal care period; 9.3 percent of excess infant deaths were attributed to the neonatal care period; and 38.6 percent of excess infant deaths were attributed to the infant health period.

From 2016 to 2018, in Grand Rapids, 41.5 percent of excess infant deaths were attributed to the maternal health and prematurity period; 8.9 percent of excess infant deaths were attributed to the maternal care period; 11.1 percent of excess infant deaths were attributed to the neonatal care period; and 38.4 percent of excess infant deaths were attributed to the infant health period.