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2016-2020 PERINATAL PERIODS OF RISK (PPOR) DELAWARE COUNTY, PA

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Delaware County Health Department (DCHD), Perinatal Periods of Risk (PPOR) Report (2016-2020)

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Abstract

Background

The United States, Pennsylvania, and Delaware County recently experienced an increase in infant mortality rates. US infant mortality rate increased by 3% from 2021 to 2022 (first year-to-year increase in the rate since 2001 to 2002). From 2002 to 2021, the US infant mortality rate declined 22%.¹ Pennsylvania infant mortality rates modestly increased from 2021 to 2022, from 563.6 to 564.0 per 100,000 (or 5.636 to 5.64 per 1,000 births).² Although small numbers should be interpreted with caution, Delaware County's infant mortality rate increased from 5.3 in 2021 to 7.2 in 2022 (all races).³ Significant differences in Black and White infant mortality rates persist at the national, state and county levels. The Perinatal Periods of Risk (PPOR) approach identifies periods of higher risk of infant mortality and significant Black / White disparities in premature deaths. Previous PPOR reports were completed for Delaware County by The Foundation for Delaware County for the periods 2008-2012 and 2012-2016. This PPOR report was completed by DCHD for the period 2016-2020.

Objectives

The principal aim of the 2016-2020 PPOR analysis is to provide data that supports and informs policymakers regarding areas of improvement in Delaware County disparities in infant mortality. A second aim of this analysis is to compare progress made using comparative data from earlier PPOR projects in Delaware County.

Methods

Protected data files linking birth to death certificates were analyzed to identify differences in infant mortality among Black and White mothers. The PPOR measures infant mortality (IM) or deaths at different time periods including neonatal 0 to 27, and post neonatal 28 to 364 days of

¹ CDC <https://www.cdc.gov/nchs/data/vsrr/vsrr033.pdf>

² PA DOH <https://www.pa.gov/content/dam/copapwp-pagov/en/health/documents/topics/documents/programs/2024%20CDR%20Annual%20Report.pdf>

³ PADOH EDDIE <https://www.phaim1.health.pa.gov/EDD/WebForms/InfDeathCnty.aspx>

life, respectively. PPOR data also includes fetal deaths and measures IM according to birth weight. The 2016-2020 Delaware County PPOR analysis included data from all jurisdictions in Delaware County.

Results

A total of 273 fetal and 198 infant deaths were reported in Delaware County during the 2016-2020 period. Delaware County Black mothers were younger and had a higher number of fetal and infant deaths compared to Delaware County White mothers. Delaware County White mothers 34-38 years of age had a higher percentage of fetal or infant deaths compared to Delaware County Black mothers. Delaware County Black mothers sustained a higher excess infant mortality deaths. Phase II analysis of the PPOR data indicated that a higher number of Delaware County Black infants born with very low birth weight (VLBW) was considered as the main contributing factor in excess infant mortality deaths. Preterm births and mothers' chronic disease experience were also major contributors to excess Black infant mortality rates in Delaware County. The same findings regarding Black excess mortality due to a large number of very low birth weights were observed in Delaware County prior PPOR studies conducted by The Foundation for Delaware County (2008-2012 and 2012-2016). The number of times Black infant mortality rates (IMRs) were higher than White decreased from 2.85 in 2012-2016 to 2.53 in 2020-2022 in Pennsylvania. In contrast, Delaware County showed an increase from 2.90 times higher IMRs to 3.94 in Black mothers during the same time period.

Conclusions

Racial disparities in fetal and infant deaths in Delaware County persist and in some cases increased in the 2016-2020 time period. It is critical to continue and augment public and private efforts to address maternal health and infant prematurity including a prevention focus on pre-conceptional health, unintended pregnancies, smoking, drug abuse, and specialized perinatal care (e.g., perinatologists, or maternal-fetal medicine specialists). Equally important in the reduction of racial disparities is to factor in the role of social determinants of health (income, education, housing, access to health care, social inclusion, and non-discrimination) in policies impacting the health and social services of women and families.^{4,5}

Background

Infant mortality (IM) is defined as the number of infant deaths occurring in the first year of life, divided by the total number of births, and multiplied by 1,000. IM measures premature deaths within time, e.g., one year of life, and it is expressed as a rate, for

⁴ WHO https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1

⁵ Kim D, Saada A. The Social Determinants of Infant Mortality and Birth Outcomes in Western Developed Nations: A Cross-Country Systematic Review. *International Journal of Environmental Research and Public Health*. 2013; 10(6):2296-2335. <https://doi.org/10.3390/ijerph10062296>

example, 12 per 1,000 live births. More than 20,500 infants died in the United States (US) in 2022. The five leading causes of infant death in 2022 were:

1. [Birth defects](#).
2. [Preterm birth](#) and low birth weight.
3. [Sudden infant death syndrome](#).
4. [Unintentional injuries](#) (e.g., [car crashes](#)).
5. Maternal [pregnancy complications](#).⁶

The number of infant deaths has shown a significant decline with improved sanitation, advances in medicine, health and social services, and collection and monitoring of birth and death data. From 1915 to 1950, the infant mortality rate (IMR) in the US declined from 100 to fewer than 30 deaths per every 1,000 live births. Medical technologies and vaccination significantly contributed to lower IMRs.⁷ In 2022 the US the infant mortality rate among all races was **5.60 infant deaths per 1,000 live births** or 3% higher than the rate in 2021 (5.44 per 1,000) This change from 2021 to 2022 was the first time IMRs increased after a continuous decreasing trend was observed from 1995 to 2020.^{8,9} In 2022, US IMRs were different among races (all IMRs listed are per every 1,000 live births):

- Non-Hispanic Black: 10.9
- Non-Hispanic American Indian and Alaska Native: 9.1
- Non-Hispanic Native Hawaiian or other Pacific Islander: 8.5
- Hispanic: 4.9
- Non-Hispanic white: 4.5, and
- Non-Hispanic Asian: 3.5.¹⁰

[Pennsylvania and Delaware County](#)

Data from the Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE) indicate that from 1999 to 2021, IMR among all races and ethnicities declined in both Pennsylvania (PA) and Delaware County (Delco).

However, Delco IMRs have been consistently higher than the PA IMR from 2012 to 2020. From 1999 to 2001, 2005, 2007, 2009, and 2021, the opposite was true, Delco IMRs were lower than PA (Figure 1). PA's IMR in 2022 was 5.7 per 1,000, and for Delco it was higher at 7.2 per 1,000.¹¹

Although reductions in infant mortality rates have been realized over time, significant

⁶ CDC <https://www.cdc.gov/maternal-infant-health/infant-mortality/index.html>

⁷ Bhatia A, Krieger N, Subramanian SV. Learning From History About Reducing Infant Mortality: Contrasting the Centrality of Structural Interventions to Early 20th-Century Successes in the United States to Their Neglect in Current Global Initiatives. *Milbank Q.* 2019 Mar;97(1):285-345 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6422600/>

⁸ CDC <https://www.cdc.gov/nchs/data/vsrr/vsrr033.pdf>

⁹ Ely DM, Driscoll AK. Infant Mortality in the United States, 2022: Data From the Period Linked Birth/Infant Death File. 2024 Jul 25. In: *National Vital Statistics Reports* [Internet]. Hyattsville (MD): National Center for Health Statistics (US); 2024 Jul-. 73 Number 5. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK606163/> doi: 10.15620/cdc/157006

¹⁰ CDC <https://www.cdc.gov/maternal-infant-health/infant-mortality/index.html>

¹¹ PA DOH EDDIE <https://www.phaim1.health.pa.gov/EDD/WebForms/InfDeathCntyChrt.aspx>

differences in Black and White infant mortality rates persist in both Pennsylvania and Delco. Data from 2008 to 2022 indicate PA Black IMRs were between 2.45 to 2.85 times higher than White, and among Delco Black mothers from 2.90 to 3.94 times higher than White. The number of times Black IMRs were higher than White decreased from 2.85 in 2012-2016 to 2.53 in 2020-2022 in PA. Delco showed an increase from 2.90 times higher IMRs to 3.94 in Black mothers during the same period (Figure 2). Note, at the county level single year rates involve small numbers that should be interpreted cautiously.

Objectives

The principal aim of the 2016-2020 PPOR analysis is to provide data that supports and informs policymakers regarding areas for improvement in Delaware County Black White disparities in infant mortality. The intent of the PPOR approach is to leverage a collective effort from a diverse group of stakeholders working on health and social changes needed to reduce and or prevent excess Black infant mortality rates. A second aim of this analysis is to compare progress made using comparative data from earlier PPOR projects in Delaware County. Historical and current national and state trends in infant mortality are also presented and adds contextual value to PPOR results and conclusions.

Methods: What is the PPOR?

The PPOR measures infant mortality (IM) or deaths at different time periods including neonatal 0 to 27, and post neonatal 28 to 364 days of life, respectively. PPOR data also includes fetal deaths and measures IM according to birth weight. PPOR analysis promotes the opportunity to create a Community Action Plan (CAP), a community-driven process in which stakeholders and families collectively work on strategies to reduce inequalities in infant mortality. CAP members/partners reached consensus on a number of activities intended to reduce IM disparities. In addition to social determinants of health, CAP activities are focused on risk factors associated with deaths within the fetal, neonatal, and post-neonatal periods, as well as the health of the mother. The goal of the CAP process is to reduce disparities in infant mortality by promoting and facilitating changes in the health care system as well as among individuals (mothers and infants).

In Delaware County, DCHD will promote the integration of the CAP process into the county's Community Health Improvement Plan (CHIP)'s Maternal, Parental, and Infant Health Committee. This will be done in coordination with current CAP's groups spearheaded by The Foundation for Delaware County prior PPOR projects and it is expected to galvanize and coordinate strategic work for this priority.

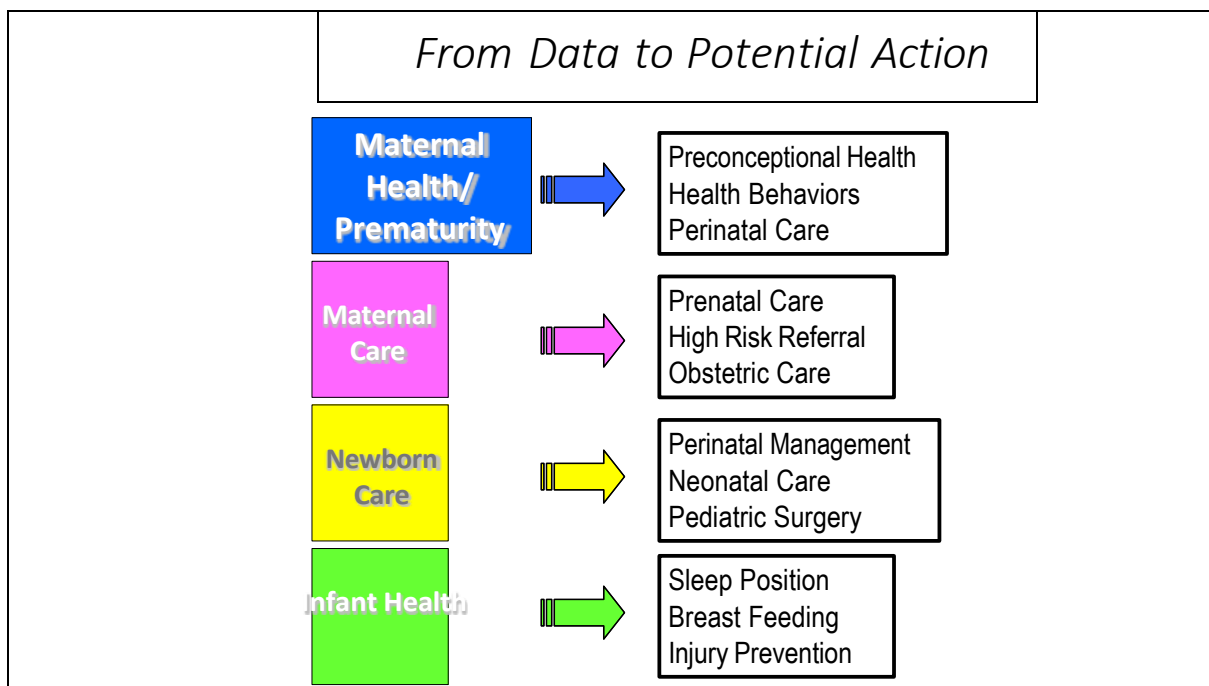
The PPOR analysis includes data sets of birth linked to death certificates. These data sets were obtained from the Pennsylvania Department of Health, Vital Statistics Office.

Information about fetal deaths and infant deaths linked to birth certificates include and

is not limited to mother and child demographics, medical conditions, nature of onset and delivery of the baby, diseases of the mother and child, age of death, birth weight at the time of death, type of medical insurance (e.g., private, publicly supported, self-pay, or other), and smoking, alcohol, drug use.

In most instances, the PPOR process calculates infant mortality rates for two groups. One group is usually comprised of Black or African American mothers, and the second group also known as the reference group, consists of White mothers. Infant mortality rates are calculated separately during four distinct perinatal periods of risk. Maternal Health and Prematurity (MH/P) is the 1st perinatal period of risk, Maternal Care (MC), Newborn Care (NC), and Infant Health (IH), are the 2nd, 3rd, and 4th perinatal periods.

1. The MH/P includes fetal and infant deaths in the neonatal (0-27days) and post neonatal (28-364 days) age of death with a birthweight less than 1,500 grams.
2. MC involves fetal deaths of at least 1,500 grams or more and 16* or more weeks of gestation (*See Note in text box).
3. NC includes neonatal infant deaths, and
4. IH includes only post-neonatal deaths, both with births weighing 1,500 or more grams.



CityMatCH, the CDC, and maternal and child health researchers recommend preventive strategies for reducing IM in each of the four perinatal periods of risk. For the MH/P period, the prevention focus is on pre-conceptional health, unintended pregnancies, smoking, drug abuse, and specialized perinatal care (e.g., perinatologists, or maternal-

fetal medicine specialists). MC prevention strategies may include early entrance and continuous prenatal care, referral of high-risk pregnancies and proper management of diabetes, seizures, post maturity or other medical complications. In NC, the focus is on advanced neonatal care and treatment of congenital anomalies. Lastly for IH, the emphasis is on Sudden Infant Death Syndrome (SIDS) and injury prevention, for example, safe sleep position, breast feeding, access to a medical home and injury prevention.

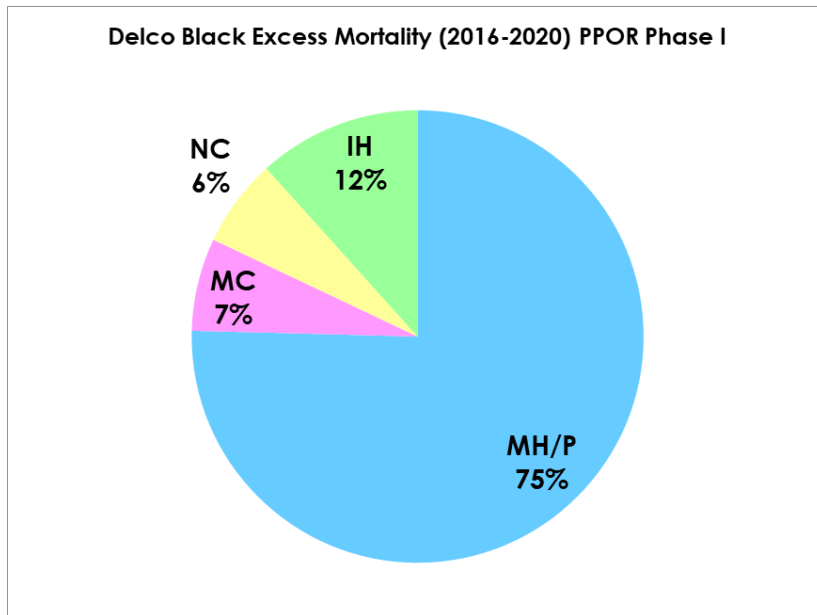
** Note: The original CityMatCH PPOR calculation includes birthweights from 500-1499 grams and equal to and greater than 1,500 grams. It also measures fetal deaths with at least 24 weeks and more of gestation.*

This current 2016-2020 PPOR report follows earlier Delco PPOR methods and used different cut off points (i.e., birthweight <1,500 grams and 1,500+ grams) and includes fetal deaths with 16 weeks and over of gestation. This allows comparison across prior PPOR analyses.

		Age at Death		
		Fetal Death	Neonatal	Post-neonatal
Birthweight	< 1500 grams	Maternal Health/ Prematurity		
	1500+ grams	Maternal Care	Newborn Care	Infant Health

2008-2012 Foundation for Delaware County PPOR birthweights

The PPOR Phase I allows the identification of excess infant mortality. Excess mortality is the product of White IM rates minus Black IM rates in each of the four perinatal periods of risk (identified by Blue for MH/P, Pink MC, Yellow NC, and Green IH. The pie chart “Delco Black Excess Mortality” point to MH/P as the period of risk with the highest excess of Black infant mortality rate in Delaware County 2016-2020 PPOR (75% higher).



2016-2020 Delco PPOR Phase I, II

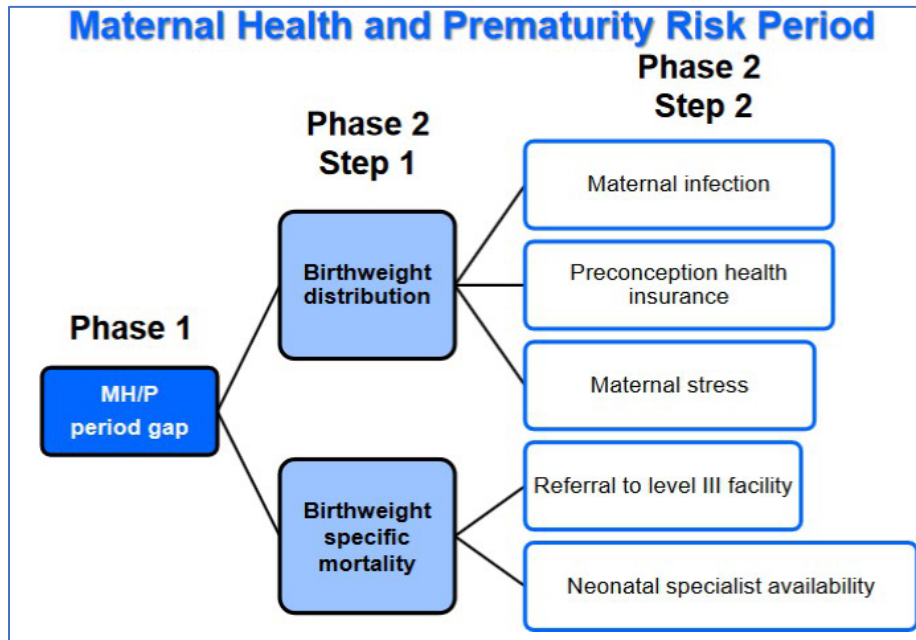
The PPOR analytic methods involve calculations of two Phases. Phase I was described above and identified the perinatal period with the highest risk for infant mortality and with excess mortality. For the 2016-2020 analysis, this is the MH/P period. Phase II answers two main questions regarding the root causes of excess Black infant mortality: #1) Is the problem of excess deaths due to Black babies' birthweight distribution--a higher frequency of prematurity or growth retardation or stated in another way a higher number of Black babies born with VLBW (very low birth weight VLBW = less than 1,500 grams or 3 pounds, 5 ounces), or #2) is the problem due to higher mortality rates once born at that birthweight i.e., VLBW (higher IM rates among babies born with VLBW).

Causes of low birth weight include preterm birth (short gestation <37 completed weeks) and/or intrauterine growth restriction (fetal growth restriction), or both.¹²

According to CityMatCH, excess deaths due to birthweight distribution (#1 above) are associated with mothers' behavioral, social, health, and economic disparities and primarily manifest themselves as delivering a VLBW birth. Higher mortality rates (#2) are associated with medical care provided to the mother and infant before, during and or after birth. The following CityMatCH image (Maternal Health and Prematurity Risk Period) illustrates the concept of Phase II birthweight distribution in the MH/P period.¹³

¹² Cutland CL 2017 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5710991/>

¹³ CityMatCH <https://www.citymatch.org/wp-content/uploads/2018/01/PPOR-Phase-2-Analysis-.pdf>



Results: Delaware County Perinatal Periods of Risk 2016 to 2020

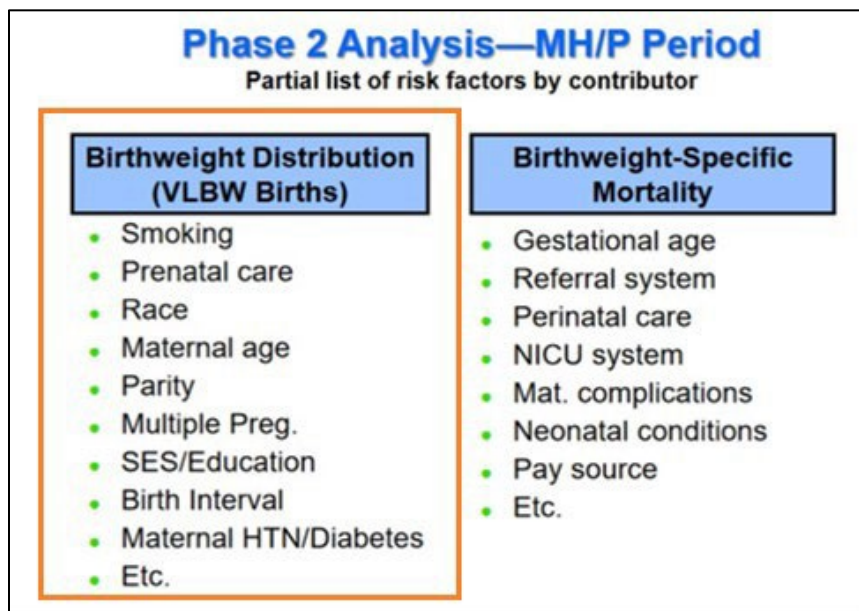
Delaware County's 2016-2020 PPOR report analysis included data from birth linked to infant and fetal death files covering fetal and infant deaths during the 2016 to 2020 period. The 2016-2020 Delaware County PPOR analysis included data from all jurisdictions in Delaware County and shows White and Black non-Hispanic women disparities in Infant Mortality Rates (IMRs). A total of 273 fetal and 198 infant deaths were reported during the 2016-2020 period. Similarly, to the 2008-2012 PPOR, compared to White mothers (41 out of 69 or 59.4%), more Black mothers (74 out of 110 or 67.3%), had babies with very low birth weight (VLBW less than 1,500 grams or 3 pounds 4 ounces). Black mothers were younger and had a higher number of fetal and infant deaths compared to White mothers. White mothers 34-38 years of age had a higher percentage of fetal or infant deaths compared to Black mothers. Regarding educational attainment, more Black mothers completed the 9th to 10th grades and were High School graduates than White. More White mothers had a bachelor's or master's degree, and more Black mothers reported having a doctorate degree (See Table 1. Demographic Characteristics White and Black Mothers). Concerning Delaware County cities with the largest number of fetal and infant deaths (FIDs), data from the 2008-2012 PPOR had Upper Darby and Chester City with the largest percentage of FIDs, 24.62%, and 13.41% respectively. In the 2016-2020 PPOR analysis, Upper Darby had 40 fetal deaths and Chester City followed with 34. Data on the number of infant deaths by city/place were not reliable for this period.

Root Causes Excess Black IMRs

As mentioned earlier, PPOR Phase II answers two main questions regarding the root causes of excess Black infant mortality; # 1) Is the problem of excess deaths due to a

higher number (birthweight distribution) of Black babies with very low birth weight (very low birth weight [VLBW] = less than 1,500 grams or 3 pounds, 5 ounces) and a higher frequency of prematurity or growth retardation or stated in another way a higher number (birthweight distribution) with VLBW, or # 2) is the problem due to higher mortality rates once born at that birthweight i.e., VLBW (higher IM rates among babies born with VLBW)."

DCHD 2016-2020 PPOR Phase II analysis indicates that MH/P's *birthweight distribution* (#1 above) is the largest contributor to Black excess infant mortality in Delaware County in this time period. The first column in the figure below (Phase 2 Analysis – MH/P Period) describes a selected list of VLBW's risk factors associated with infant deaths in the MH/P period due to *birthweight distribution* as the leading component of excess Black infant deaths. These risk factors may explain why a large number of Black babies born with VLBW die before their first birthdate, as well as describe opportunities for improvement in collective efforts and prevention strategies.



It is important to understand the risk factors associated with VLBW contributing to excess Black IMRs in the 2016-2020 PPOR data set. Information from the March of Dimes (MODs) is presented below as a proxy for VLBW. (Note, risk factors for low birth weight (less 2,500 grams or 5 pounds 8 ounces) and VLBW are used interchangeably.) MODs is a national non-profit organization created in 1938 during the polio crisis and more recently is addressing birth defects, healthy pregnancies, preterm births, and innovations such as folic acid to prevent neural tube defects/spina bifida, newborn screening and surfactant therapy.¹⁴ MODs and the CDC assisted CityMatCH in the implementation of the PPOR approach in the US. According to MODs, risk factors for having low birth weight birth include:

- Preterm labor (before 37 weeks of pregnancy)

¹⁴ March of Dimes <https://www.marchofdimes.org/about-us>

- **Chronic health conditions (high blood pressure or HTN, diabetes and heart, lung and kidney problems)**
- Certain medicines to treat high blood pressure, epilepsy and blood clots
- Infections e.g., cytomegalovirus, rubella, chickenpox, toxoplasmosis and certain sexually transmitted infections
- Placenta problems
- Not gaining enough weight during pregnancy
- History of low birthweight birth
- Pregnant with multiples (twins, triplets or more)
- Smoking, drinking alcohol, using street drugs and abusing prescription drugs
- Air pollution or lead poisoning
- Racism and health disparities
- Domestic violence (physical, sexual and emotional abuse)
- Age younger than 15 or being older than 35 years of age

Note, in the bullets above, color coded text highlights associated risk factors for VLBW that corresponds with Delaware County's 2016-2020 PPOR data.

Higher Frequency of VLBW Risk Factors Among Black Mothers

A higher number of Black mothers experiencing infant deaths in Delco in 2016-2020 had chronic conditions including pre-pregnancy and gestational diabetes, pre-pregnancy and gestational hypertension. More Black mothers in Delco over this time period had eclampsia (seizures during delivery and or post-partum, a history of previous pre-term births (less 37 weeks of pregnancy), needed closure of the cervix to prevent a premature birth and required treatment with steroids and antibiotics. Demographic differences included more Black mothers with a 9th to 12th grade education without a diploma and more births paid by publicly funded health insurance (Medicaid). Detailed differences are presented in Table 3. Delivery Characteristics Black White mothers.

Major Causes of Black / White Infant Deaths

PPOR data indicate prematurity and extreme prematurity – associated with VLBW – were more frequent among Black mothers compared to White. Further, a significantly higher number of Black infants died with a diagnosis of respiratory failure. Respiratory failure has been associated with premature births and lungs that are not fully developed, and/or not having sufficient surfactant (preventing collapse of alveoli lung structures at end-expiration) levels.¹⁵ The following list presents the top 15 causes of death among White and Black infants in Delaware County in 2016-2020.

¹⁵ Nationwide Children's <https://www.nationwidechildrens.org/conditions/respiratory-distress-syndrome-newborn>

Top 15 Causes of Infant Death in Delaware County (2016-2020)	White	% White	Black	% Black
Total with Diagnosis Cause Death	69	100%	110	100%
EXTREME PREMATURITY	11	15.94%	17	15.45%
RESPIRATORY FAILURE	3	4.35%	13	11.82%
PREMATURITY	5	7.25%	9	8.18%
PENDING FURTHER STUDIES	1	1.45%	6	5.45%
PREVIABLE* PRETERM LABOR *Certain Death	3	4.35%	1	0.91%
PENDING	1	1.45%	3	2.73%
SUDDEN UNEXPLAINED INFANT DEATH	1	1.45%	2	1.82%
CARDIOPULMONARY ARREST			3	2.73%
UNDETERMINED	1	1.45%	2	1.82%
PREVIABLE DELIVERY	2	2.90%		0.00%
RESPIRATORY ARREST	1	1.45%	1	0.91%
PULMONARY HEMORRHAGE			2	1.82%
CONGENITAL DIAPHRAGMATIC HERNIA	2	2.90%		0.00%
PREVIABLE	1	1.45%	1	0.91%
GROSS PREMATURITY			2	1.82%
Empty cells due to no data reported				

Comparative Analysis With Previous Delaware County PPORs

The DCHD 2016-2020 PPOR report includes comparative findings with two earlier PPORs analysis made by The Foundation for Delaware County in two periods, i.e., 2008-2012¹⁶ and 2012-2016.¹⁷

The following trends can be observed across the 2008-2020 PPOR analyses available for Delaware County:

- 1) Fetal-infant mortality rates were higher among Black women compared to White in each of the four perinatal periods of risk as well as all three five-year cycles of analysis.
- 2) After realizing a modest decrease in the MH/P period Black IMRs during 2012-2016, a slight increase was observed in the 2016-2020 cycle (returning to the 2008-2012 level).
- 3) White mothers sustained an increasing trend in the MH/P risk period.
- 4) Black MC IMRs decreased from 2.7 to 2.28, while White increased from 1.2 to 1.36.
- 5) NC IMRs increased from 1 to 2.06 among Black mothers, and from 0.6 to 1.19 in White mothers.

¹⁶ Baby’s 1st Project, Perinatal Periods of Risk Study & Community Action Plan (2008-2012), Foundation for Delaware County (2017), <https://delcofoundation.org/app/uploads/2021/09/Final-PPOR-Report.pdf>

¹⁷ Personal Communication from The Foundation for Delaware County to DCHD.

- 6) IH IMRs in Black mothers showed a slight increase from 2 to 2.06, while White mothers realized a significant decrease from 0.9 to 0.45.
- 7) Total excess Black IMRs modestly decreased from 14 to 13.8. However, in the MH/P risk period, Black excess IMRs increased from 11 to 13.37.
- 8) While Black MC excess IMRs decreased from 1.5 to 0.91, a significant increase was observed in the NC period going from 0.4 to 0.87.
- 9) Black IH excess IMRs showed a modest decrease from 1.1 to 0.9 from 2008-2012 to 2012-2016, then followed by increasing to 1.60 in 2016-2020.

These results are summarized in detail in Table 2, PPOR Comparison 2008-2012, 2012-2016, 2016-2020, and Figure 3, Earlier PPOR Analysis.

The following summarizes selected IMRs PPOR periods of risk from above and prevention strategies areas suggested by experts:

Increase in IMRs PPOR period	Black / White Mothers	Prevention strategy area
MH/P	Black , White	Pre-conceptional health, unintended pregnancies, smoking, drug abuse, and specialized perinatal care (e.g., perinatologists, or maternal-fetal medicine specialists)
MC	White	Early entrance and continuous prenatal care, referral of high-risk pregnancies and proper management of diabetes, seizures, post-maturity or other medical complications
NC	Black , White	Advanced neonatal care and treatment of congenital anomalies
IH	Black	Sudden Infant Death Syndrome (SIDS) and injury prevention, for example, safe sleep position, breast feeding, access to a medical home and injury prevention

Conclusions

The Delaware County 2016-2020 PPOR analysis shows similarities with recent national and state trends in Black and White disparities in infant mortality rates. Noteworthy are

disparities and increases in Black infant mortality rates in the 2016-2020 period when compared to 2012-2016 earlier Delaware County PPOR project period. Increases in infant mortality were observed in all four PPOR periods, Maternal Health and Prematurity, Maternal Care, Newborn Care, and Infant Health periods. Excess Black infant mortality rates also increased from the 2012-2016 to the 2016-2020 PPOR (Table 2. PPOR Comparison 2008-2012, 2012-2016, 2016-2020). PPOR Phase II (using complex mathematical formula) identified a higher number of very low birth weight births as the main factor attributed to excess infant mortality among Black mothers. More Black mothers had chronic diseases such as gestational diabetes and hypertension and more Black infants had prematurity and respiratory distress as the causes of death.

Racial disparities in fetal and infant deaths in Delaware County persist and in some cases increased in the 2016-2020 time period. It is critical to continue and augment public and private efforts to address maternal health and infant prematurity including a prevention focus on pre-conceptional health, unintended pregnancies, smoking, drug abuse, and specialized perinatal care (e.g., perinatologists, or maternal-fetal medicine specialists).

Tables and Figures

Table 1. Demographic Characteristics White and Black Mothers

PPOR 2016-2020 Delaware County, PA				
Fetal Deaths All Races	273			
Infant Deaths All Races	198			
	White	%	Black	%
Number Fetal Deaths	94	34.43%	110	40.29%
Number Infant Deaths	70	35.35%	110	55.56%
Average Maternal Age in Years	30		28	
Mothers' Age Categories				
19-23	6	8.70%	3	13.64%
24-28	21	30.43%	8	36.36%
29-33	19	27.54%	8	36.36%
34-38	22	31.88%	3	13.64%
39-43	1	1.45%		
Educational Level	White Mothers	%	Black Mothers	%
8th grade or less	1	1.56%		
9th to 10th grade	2	3.13%	11	12.50%
High School graduate or GED	6	9.38%	27	30.68%
Some college no degree	13	20.31%	16	18.18%
Associate degree	4	6.25%	7	7.95%
Bachelor's degree	20	31.25%	12	13.64%
Master's degree	11	17.19%	6	6.82%
Doctorate degree	2	3.13%	9	10.23%
Unknown	5	7.81%		
Health Insurance	White Mothers	%	Black Mothers	%
Private Insurance	54	90.00%	57	64%
Public Insurance Medicaid	5	8.33%	29	33%
Self-pay			1	1%
Other	1	1.67%		
Unknown			2	2%

Table 2. PPOR Comparison 2008-2012, 2012-2016, 2016-2020

Infant Mortality Rate (IMR)	2008-2012 PPOR	2012-2016 PPOR	2016-2020 PPOR
All Perinatal Periods IMR per 1,000 births			
White	7.4	8.2	8.47
Black	21.5	20.4	22.22
PPOR IMR by Period of Risk	2008-2012 IMR	2012-2016 IMR	2016-2020 IMR
Maternal Health / Prematurity Black	15.8	15.1	15.83
Maternal Care Black	2.7	2.2	2.28
Newborn Care Black	1	1.5	2.06
Infant Health Black	2	1.6	2.06
PPOR IMR by Period of Risk	2008-2012 IMR	2012-2016 IMR	2016-2020 IMR
Maternal Health / Prematurity White	4.8	5.2	5.46
Maternal Care White	1.2	1.6	1.36
Newborn Care White	0.6	0.8	1.19
Infant Health B White	0.9	0.7	0.45
Black Excess Infant Mortality Rate	2008-2012 IMR	2012-2016 IMR	2016-2020 IMR
Excess Black Infant Mortality	14	12.1	13.8
Maternal Health / Prematurity Excess Black	11	9.9	13.37
Maternal Care Excess Black	1.5	0.6	0.91
Newborn Care Excess Black	0.4	0.7	0.87
Infant Health B Excess Black	1.1	0.9	1.60

Table 3. Delivery Characteristics Black White Mothers

The following are PPOR 2016-2020 infant and mothers' health and selected demographic characteristics. Percentages include 198 as the denominator of among all races for White and Black mothers. Empty cells due to no data reported, code and names of variables included (R1 Pre-Pregnancy Diabetes).

Protected data PA DOH (birth linked to death certificate)					
198 infant deaths all races		White Mothers	Percent	Black Mothers	Percent
R1	Pre-Pregnancy Diabetes	0	0%	2	1%
R2	Gestational Diabetes	2	1%	7	4%
R3	Pre-Pregnancy Hypertension	4	2%	9	5%
R4	Gestational Hypertension	6	3%	8	4%
R5	Eclampsia (seizures deliver post-partum)	5	3%	19	10%

R6	Previous pre-term Birth	13	7%	32	16%
R7	Previous Poor Pregnancy Outcomes	7	4%	12	6%
R8	Vaginal Bleeding	6	3%	2	1%
R9	Pregnancy resulted from infertility Treatment	17	9%	14	7%
R10	Fertility-enhancing drugs. etc.	16	8%	10	5%
R11	Assisted Reproductive Treatments	26	13%	43	22%
R12	Previous cesarean				
R13	Number of Previous cesarean				
R14	None of the above				
MM - Maternal Morbidity		White Mothers	Percent	Black Mothers	Percent
MM1	Maternal transfusion	3	2%	6	3%
MM2	Perineal Laceration	0	0%	0	0%
MM3	Ruptured Uterus	0	0%	0	0%
MM4	Unplanned Hysterectomy		0%		0%
MM5	Admission to Intensive Care	0	0%	1	1%
MM6	Unplanned operation	2	1%	6	3%
MM7	None of the above	64	32%	100	51%
MOLASTLB	Month of Previous Live Birth				
MOLSTTER	Month of Other Pregnancy Outcome				
MOMHtFeet	Maternal height (feet)				
MOMHtInches	Maternal height(Inches)				
MOTHAGE	Maternal Age				
O - Obstetric Procedures		White Mothers	Percent	Black Mothers	Percent
O1	Cervical Cerclage (closure cervix prevent premature birth)	2	1%	5	3%
O2	tocolysis (meds delay delivery)	2	1%	2	1%
O3	External Cephalic Version- Successful	0	0%	0	0%
O4	External Cephalic Version- failed	0	0%	0	0%
O5	None of the above	60	30%	81	41%
Smoking		White Mothers	Percent	Black Mothers	Percent
SMKFTM	# women smoked cigarettes first three months	4	2%	2	1%
SMKLTM	# women smoked cigarettes last three months	3	2%	4	2%
SMKPR	# women smoked cigarettes three months prior	2	1%	1	1%
SMKSTM	# women smoked cigarettes second three months	2	1%	1	1%
Total number smoking		11	6%	8	4%

Characteristics of Labor & Delivery		White Mothers	Percent	Black Mothers	Percent
C1	Induction of labor	11	6%	11	6%
C2	Augmentation of Labor	9	5%	18	9%
C3	Not in a head-first position birth	5	3%	21	11%
C4	Steroids	8	4%	14	7%
C5	Antibiotics	16	8%	28	14%
C6	Clinical Chorioamnionitis	3	2%	2	1%
C7	Meconium Staining	3	2%	5	3%
C8	Fetal Intolerance of Labor	1	1%	2	1%
C9	Anesthesia During Labor	47	24%	45	23%
C10	None of the above	6	3%	18	9%
Mother's Education		White Mothers	Percent	Black Mothers	Percent
8th grade or less		1	1%		
9th -12th no diploma		1	1%	11	6%
HS graduate /GED		8	4%	25	13%
Some college		13	7%	16	8%
Associate degree		4	2%	7	4%
Bachelor's degree		19	10%	13	7%
Master's degree		9	5%	8	4%
Unknown		5	3%	9	5%
Health Insurance		White Mothers	Percent	Black Mothers	Percent
1 Private		54	27%	57	29%
2 Medicaid		5	3%	29	15%

Figures

Figure 1. Delaware County and Pennsylvania IMR 1999-2022

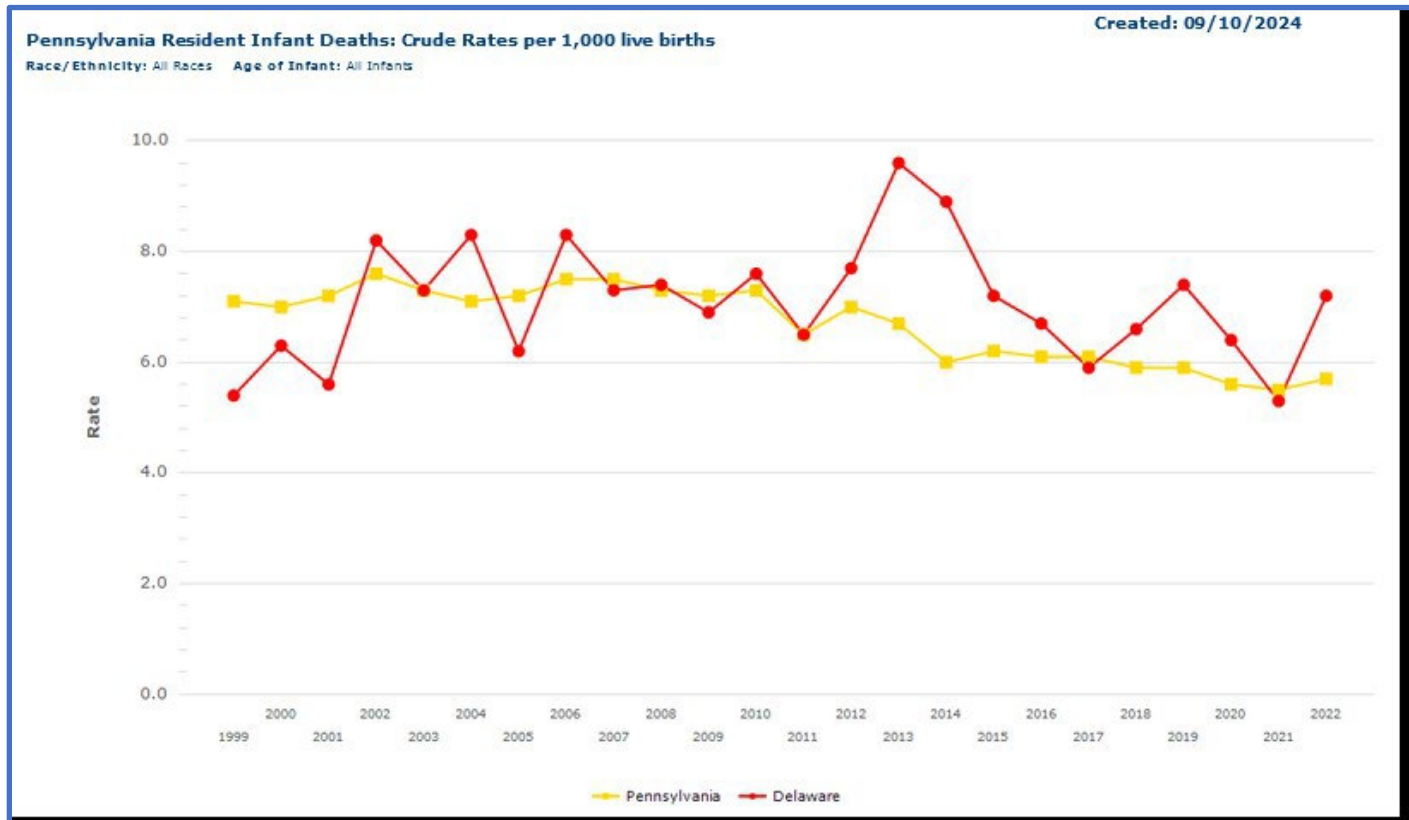


Figure 2. Frequency Times Higher Black IMR Compared to White IMR, PA and Delaware County

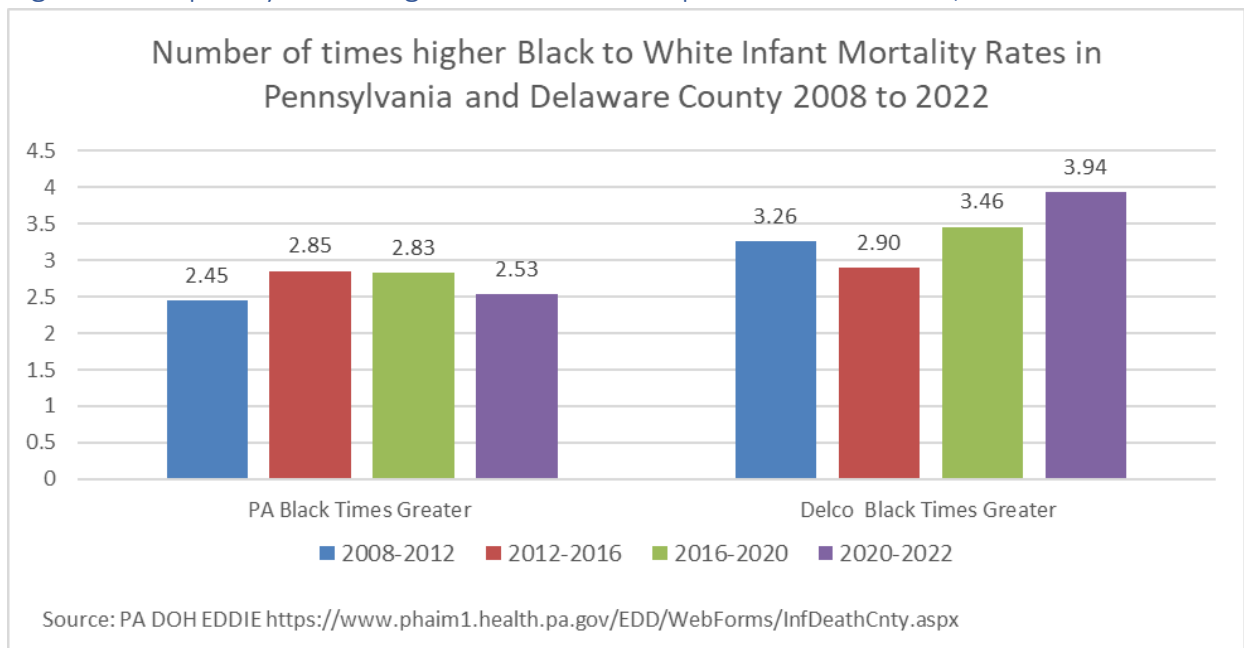
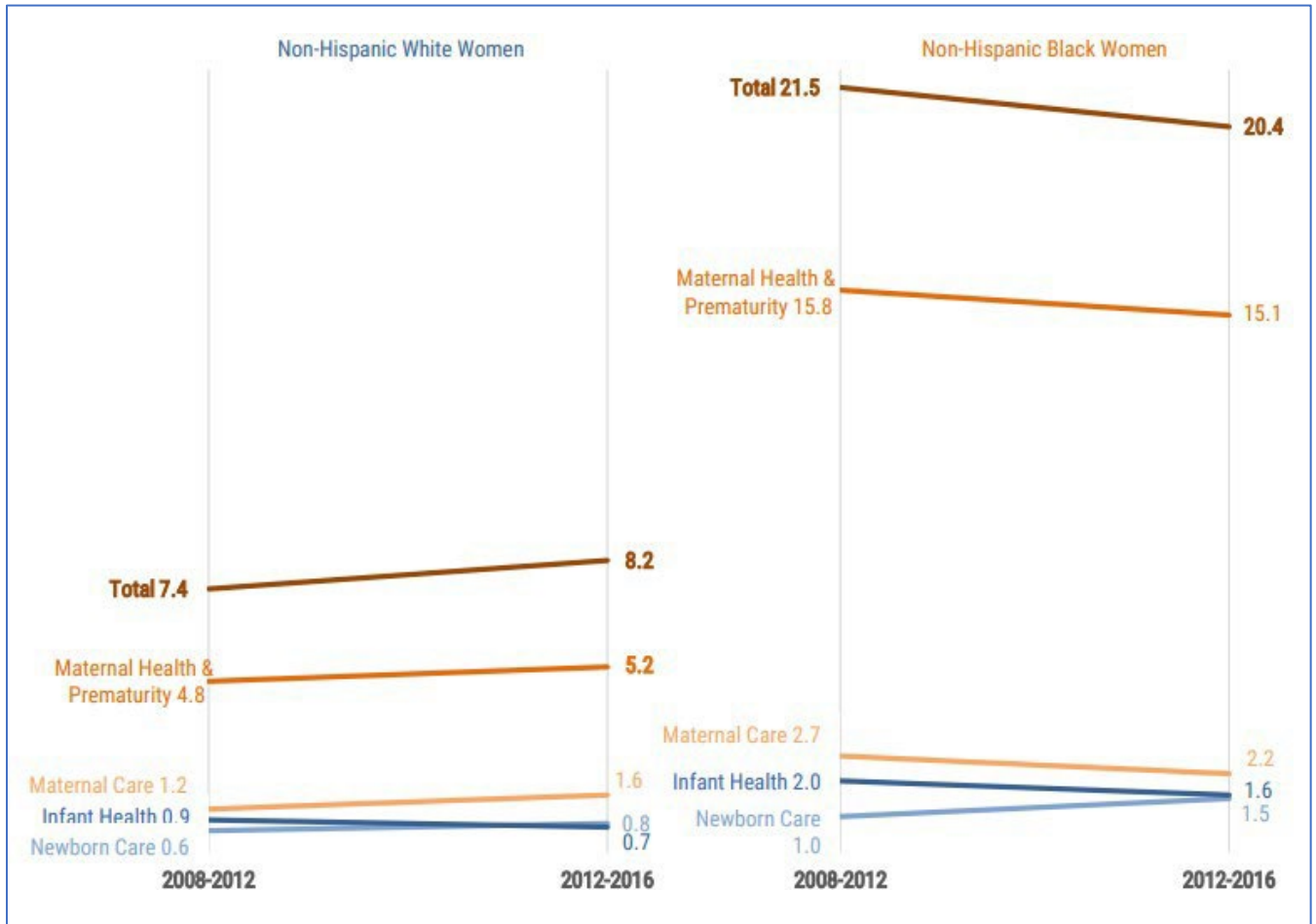


Figure 3. Earlier Delaware County PPOR Analyses



Supplemental Information on Low-Birthweight Babies

Medical Risk Factors for Having a Low-Birthweight Baby

- **Preterm labor.** This is labor that starts too soon, before 37 weeks of pregnancy.
- **Chronic health conditions.** These are health conditions that last for a long time or that happen again and again over a long period of time. Chronic health conditions need to be treated by a health care provider. Chronic health conditions that may lead to having a baby with low birthweight include high blood pressure, diabetes and heart, lung and kidney problems.
- **Taking certain medicines to treat health conditions,** such as high blood pressure, epilepsy and blood clots. Tell your provider about any prescription medicine you take. You may need to stop taking a medicine or switch to one that's safer during pregnancy.
- **Infections.** Certain infections, especially infections of the internal reproductive organs during pregnancy, can slow a baby's growth in the womb. These include cytomegalovirus, rubella, chickenpox, toxoplasmosis and certain sexually transmitted infections.
- **Problems with the placenta.** The placenta grows in the uterus and supplies the baby with food and oxygen through the umbilical cord. Some problems in the placenta can reduce the flow of oxygen and nutrients to the baby, which can limit the baby's growth.
- **Not gaining enough weight during pregnancy.** Pregnant people who don't gain enough weight during pregnancy are more likely to have a low-birthweight baby than those who gain the right amount of weight. If you have an eating disorder or have been treated for an eating disorder, tell your provider. Your provider can check on you and your baby carefully throughout pregnancy to help prevent complications and make sure you're both healthy.
- **Having a baby who was born too early or who had low birthweight in the past.**
- **Being pregnant with multiples (twins, triplets or more).** More than half of multiple birth babies have low birthweight.
- **Smoking, drinking alcohol, using street drugs and abusing prescription drugs.** Pregnant people who smoke are more than 3 times as likely to have a baby who weighs too little at birth than people who don't smoke. Smoking, drinking alcohol, using street drugs, and abusing prescription drugs during pregnancy can slow the baby's growth in the womb and increase the risk for preterm birth and birth defects.
- **Exposure to air pollution or lead**
- **Being a member of a group that experiences the effects of racism and health disparities.**
- **Domestic violence.** This is when your partner hurts or abuses you. It includes physical, sexual and emotional abuse.
- **Age.** Being a teen (especially younger than 15) or being older than 35 makes you more likely than other parents to have a low-birthweight baby.

Does a low-birth-weight cause problems for the baby?

Yes. Babies who weigh less than they should at birth are more likely than babies whose weight is normal to have health problems. Some need special care in a hospital's newborn intensive care unit (also called NICU) to treat medical problems. These include:

- **Breathing problems, such as respiratory distress syndrome (also called RDS).** Babies with RDS don't have a protein called surfactant that keeps small air sacs in a baby's lungs from collapsing. Treatment with surfactant helps these babies breathe more easily. Babies who have RDS also may need oxygen and other breathing help to make their lungs work.
- **Bleeding in the brain (also called intraventricular hemorrhage or IVH).** Most brain bleeds are mild and go away on their own. More severe bleeds can cause pressure on the brain that can cause fluid to build up in the brain. This can cause brain damage. In some cases, a surgeon may insert a tube into the baby's brain to drain the fluid.
- **Patent ductus arteriosus.** Patent ductus arteriosus is when an opening between 2 major blood vessels leading from the heart does not close properly. This can cause extra blood to flow to the lungs. In many babies who have patent ductus arteriosus, the opening closes on its own within a few days after birth. Some babies need medicine or surgery to close the opening.
- **Necrotizing enterocolitis.** This is a problem in a baby's intestines. The intestines are long tubes that are part of the digestive system. The digestive system helps the body break down food. Necrotizing enterocolitis can be dangerous for a baby and can cause feeding problems, swelling in the belly, and other complications. Babies who have necrotizing enterocolitis are treated with antibiotics and fed through an intravenous, or IV, tube. Some babies need surgery to remove damaged parts of intestine.
- **Retinopathy of prematurity.** This eye disease is what happens when a baby's retinas don't fully develop in the weeks after birth.
- **Jaundice.** This is a condition that makes a baby's eyes and skin look yellow. It's caused when there's too much of a substance called bilirubin in the blood.
- **Infections.** The immune system protects the body from infection. In a baby who is born too early, the immune system may not be fully developed and may not be able to fight off infection.

Supplemental information excerpted directly from March of Dimes and NCBI:

[Low birthweight | March of Dimes, https://www.marchofdimes.org/find-support/topics/birth/low-birthweight#:~:text=Chronic%20health%20conditions%20that%20may,pressure%2C%20epilepsy%20and%20blood%20clots](https://www.marchofdimes.org/find-support/topics/birth/low-birthweight#:~:text=Chronic%20health%20conditions%20that%20may,pressure%2C%20epilepsy%20and%20blood%20clots)

[SUMMARY AND RECOMMENDATIONS - Preventing Low Birthweight - NCBI Bookshelf, https://www.ncbi.nlm.nih.gov/books/NBK214456/](https://www.ncbi.nlm.nih.gov/books/NBK214456/)