Perinatal Vulnerability Index (PVI) Methodology

DOMAIN DEFINITIONS

Social Stratification: Categorization of the population based on socioeconomic factors related to wealth, income, education, race and ethnicity, gender, and social status.

Environmental Context: Aspects of the community that can impact health, such as internet access, crime rate, pollution exposure, transportation convenience, and residential segregation.

Health Care Availability: Population's health insurance status as well as access to maternity care, hospitals, primary care physicians, mental health providers, and community health centers.

Behavioral Health: Emotions and behaviors that affect perinatal well-being, including substance use, mental health problems, domestic violence, and sexually transmitted infections.

Pregnancy & Birth Outcomes: Status of reproductive health in terms of fertility, adequate prenatal care, preterm births, low birth weight, and racial disparities across maternal health outcomes.

DETERMINING PVI SCORES

The determination of PVI scores can be categorized into three steps:

1. **Rescaling Indicators**
    - The PVI consists of data in the form of percentages, rates, and dollar values. In order to systematically compare these varying statistics across all 67 counties of Pennsylvania, the data had to first be rescaled to a common measure. Rescaling was conducted by taking the minimum and maximum values of each indicator and converting each dataset so it would be in a range between 0 and 100.
    - Many indicators used in the PVI vary in the direction of their correlation with vulnerability. For example, a county with the highest rate of preterm births would be indicative of high perinatal vulnerability, while a county with the lowest median family income would also be indicative of high perinatal vulnerability. To ensure all indicators were calculated in the same direction of correlation, two formulas were used in the rescaling process so that a value of 0 would consistently represent low levels of vulnerability and a value of 100 would consistently represent high levels of vulnerability.

Formula for indicators with a positive correction with vulnerability
(↓ value = ↓ vulnerability, ↑ value = ↑ vulnerability):

$$PVI\ Score = \frac{County\ Estimate - Minimum\ Value}{Maximum\ Value - Minimum\ Value} \times 100$$

Formula for indicators with a negative correction with vulnerability (↓ value = ↑ vulnerability, ↑ value = ↓ vulnerability):

$$PVI\ Score = 100 - \left(\frac{County\ Estimate - Minimum\ Value}{Maximum\ Value - Minimum\ Value}\right) \times 100$$

2. **Calculating Domain Scores**
    - Once all the data were rescaled to a range of 0 to 100 with consistent correlation directionality, a county PVI score could be deduced for each indicator.
    - The PVI consists of 58 data indicators sorted into five domains: Social Stratification, Environmental Context, Health Care Availability, Behavioral Health, and Pregnancy and Birth Outcomes. Domain PVI scores for each county were calculated by averaging the PVI scores of all indicators within that domain with equal weighting.
3. **Calculating Overall Vulnerability Scores**
    - Each county also has an Overall Perinatal Vulnerability score, used to summarize its performance across all five domains. This overall score was similarly calculated by averaging every domain PVI score with equal weighting.

INDICATOR DEFINITIONS, DATA SOURCES, & RELEVANCE

Social Stratification

Family Income	
Definition:	Median income for families with children under 18 years old
Minimum Value:	$49,487
Maximum Value:	$146,789
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Low income neighborhoods are associated with elevated family risk of preterm birth, small for gestational age, stillbirth, and neonatal and post neonatal death.[1]
Gender Pay Gap	
Definition:	Ratio of women's median earnings to men's median earnings for all full-time, year-round workers, presented as "cents on the dollar"
Minimum Value:	0.62
Maximum Value:	0.89
Year:	2017-2021
Source:	County Health Rankings using data provided by the U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates

Relevance:	Gender equality is significantly associated with maternal mortality, with the maternal mortality rate being lowest in countries where women have high educational attainment and equal wages with their male counterparts.[2]
Household Type	
Definition:	Rate (per 100) of single mother households with children under age 18
Minimum Value:	13.00
Maximum Value:	44.09
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Single mothers tend to have lower health statuses than married mothers due to higher levels of financial hardship and lack of social support, increasing their susceptibility to prolonged stress and illness.[3]
Housing Cost Burden	
Definition:	Rate (per 100) of households that spend 50% or more of their household income on housing
Minimum Value:	6.00
Maximum Value:	21.00
Year:	2017-2021
Source:	County Health Rankings using data provided by the U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Women who spend a high proportion of their income on housing costs have increased likelihood of severe maternal morbidity (SMM), unexpected outcomes of labor and delivery that result in significant health consequences, such as aneurysm, cardiac arrest, eclampsia, sepsis, and shock.[4]
Income Inequality	
Definition:	Statistical measure of income inequality ranging from 0 to 1 (1 indicates perfect inequality, 0 indicates perfect equality)
Minimum Value:	0.39
Maximum Value:	0.52
Year:	2013-2017
Source:	Opportunity Index using data provided by the U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Income inequality plays a significant role in explaining disparities in maternal health and birth outcomes. Women from lower levels of occupation/social classes are more likely than their higher-ranking peers to experience stillbirth, neonatal mortality, perinatal mortality, preterm birth, and low birth weight.[5]
Low Income	
Definition:	Rate (per 100) of women with births in the past 12 months living 100-199% poverty level
Minimum Value:	1.81

Maximum Value:	69.23
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Low income mothers tend to show higher rates of abortion, Cesarean delivery, preeclampsia, preterm delivery, and obstetric hemorrhage than their higher earning peers.[6]
Marital Status	
Definition:	Rate (per 100) of women with births in the past 12 months who are unmarried (never married, widowed, and divorced)
Minimum Value:	11.76
Maximum Value:	100.00
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Babies born to married women, compared to non-married women, tend to have lower risk of preterm birth, small for gestational age, and neonatal intensive care (NICU) admission. Women who are married also have a higher likelihood of having vaginal deliveries and initiating breastfeeding.[7]
Nativity Status	
Definition:	Rate (per 100) of women with births in the past 12 months who are foreign born
Minimum Value:	0.00
Maximum Value:	34.40
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Socioeconomic factors such as downward social mobility, poor access to optimal nutrition, and limited social networks create barriers and put many migrant women at an increased risk for inadequate prenatal care, adverse birth outcomes, and postpartum depression.[8]
No College Degree	
Definition:	Rate (per 100) of women with births in the past 12 months with a high school degree but no advanced degrees
Minimum Value:	4.80
Maximum Value:	73.08
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Higher educational attainment is associated with reductions in maternal morbidity by decreasing the probability of short birth intervals and unwanted pregnancies and increasing the adequacy of prenatal care.[9]
No High School Diploma	
Definition:	Rate (per 100) of women with births in the past 12 months with less than a high school degree
Minimum Value:	0.00

Maximum Value:	33.84
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Women who lack a basic education have almost three times higher the risk of maternal mortality than women who have graduated from high school.[10]
Poverty	
Definition:	Rate (per 100) of women with births in the past 12 months living below 100% poverty level
Minimum Value:	3.57
Maximum Value:	46.62
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Poverty is associated with decreased utilization of appropriate prenatal care and delivery services as well as increased risk of obesity, hypertension, diabetes, chronic stress, depression, and substance use. These risk factors put women living in poverty at an increased likelihood of experiencing poor maternal health and birth outcomes such as preeclampsia and preterm birth.[11]
Public Assistance	
Definition:	Rate (per 100) of women with births in the past 12 months receiving public assistance income
Minimum Value:	0.00
Maximum Value:	53.57
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Income assistance is linked with healthier birth weights, lower maternal stress, better childhood nutrition, higher school enrollment, higher test scores, higher high school graduation rates, and higher rates of college entry.[12]
Race & Ethnic Minority Status of Female Population	
Definition:	Rate (per 100) of female population who identifies as Hispanic or Latino, Black or African American, American Indian & other Pacific Islander, some other race, or two or more races
Minimum Value:	3.17
Maximum Value:	67.03
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	The prevalence of preterm birth, fetal growth restriction, fetal demise, maternal mortality, and inadequate receipt of prenatal care all vary by race/ethnicity. These differences in maternal health and birth outcomes are rooted in varying maternal health behaviors, genetics, and physical

	and social environments, as well as variability in access and quality of health care.[13]
Race & Ethnic Minority Status of New Mothers	
Definition:	Rate (per 100) of women with births in the past 12 months who identify as Hispanic or Latino, Black or African American, American Indian & other Pacific Islander, some other race, or two or more races
Minimum Value:	0.00
Maximum Value:	70.65
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	In the United States, Black women experience maternal morbidity and mortality ratios several times higher than other groups. Such racial disparities in maternal health outcomes were created by an array of historical, systemic, structural, and political forces including slavery, Jim Crow laws, and the practice of redlining. The very structure of American society has led characteristics like education, income, neighborhood demographic, housing, access to care, safety, and food stability to be social determinants of Black maternal health.[14]
Single Mother Income	
Definition:	Median income for single mother households with children under 18 years old
Minimum Value:	$18,793
Maximum Value:	$51,807
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Single motherhood is linked to reduced income, a high risk of poverty, worse maternal mental health, poor parenting practices, and a range of other disruptions, such as home and school moves and multiple family transitions.[15]
Unemployment	
Definition:	Rate (per 100) of females over age 16 who are unemployed
Minimum Value:	2.10
Maximum Value:	11.00
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Unemployment reduces household incomes, which generates financial strain and hinders access to nutritious food, good housing conditions, and safe neighborhoods. This in turn increases the likelihood of experiencing social and behavioral risk factors for adverse birth outcomes, such as exposure to unsafe environments, amplified stress, and engagement in harmful behaviors, such as smoking or drinking.[16]

Environmental Context

Broadband Internet Access	
Definition:	Rate (per 100) of households without an internet subscription
Minimum Value:	3.44
Maximum Value:	16.97
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Internet access significantly facilitates health care access in addition to mitigating the negative impact of income inequality on health care access.[17]
Car Ownership in Rural Counties	
Definition:	Percent of census tracts with low car ownership in 61 rural counties
Minimum Value:	14.29
Maximum Value:	100.00
Year:	2014-2017
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	Access to transportation is an important factor in initiation and adequacy of perinatal health care, both during and after pregnancy.[18] Since individuals who live in rural areas are more likely to depend on personal vehicles as means of traveling, it is important to look at car ownership within rural counties.
Crime	
Definition:	Rate (per 1,000 residents) of reported crimes
Minimum Value:	7.93
Maximum Value:	41.49
Year:	2016
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the Institute for Social Research, National Archive of Criminal Justice Data
Relevance:	Living in a community with high rates of crime is associated with heightened perceived stress during pregnancy, which can lead to increased likelihood of preterm birth as well as maternal morbidity and mortality.[19]
Environmental Quality	
Definition:	Average index score of potential exposure to harmful toxins (lower score indicates higher vulnerability)
Minimum Value:	20.00
Maximum Value:	97.00
Year:	2015

Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the U.S. Department of Housing and Urban Development, National Air Toxics Assessment (NATA)
Relevance:	Prenatal exposure to pollution has significant direct and indirect effects on the risk of adverse birth outcomes, including increased probability of being small for gestational age, preterm birth, and low birth weight.[20]
Low Income & Grocery Access	
Definition:	Percent of census tracts within the county with low income and low access to grocery stores
Minimum Value:	0.00
Maximum Value:	50.00
Year:	2015
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the United States Department of Agriculture (USDA)
Relevance:	Food insecurity during pregnancy has been linked to numerous adverse health outcomes for mothers, including increased likelihood of obesity, gestational diabetes, hypertension, and maternal depression.[21]
Public Transit in Urban Counties	
Definition:	Performance score based on access to public transit in 6 urban counties (Delaware, Chester, Montgomery, Bucks, Philadelphia, and Allegheny)
Minimum Value:	2.40
Maximum Value:	9.00
Year:	2016
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the Center for Neighborhood Technology
Relevance:	Access to transportation is an important factor in initiation and adequacy of perinatal health care, both during and after pregnancy.[22] Since individuals who live in urban areas are more likely to depend on public transportation as means of traveling, it is important to look at access to public transit options within urban counties.
Residential Segregation	
Definition:	Residential segregation between Black and White residents (higher score indicates greater segregation)
Minimum Value:	34.00
Maximum Value:	76.00
Year:	2014-2018
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimate
Relevance:	Residential segregation of Black and White residents is considered a fundamental cause of racial health disparities in the United States, with segregated neighborhoods being linked to increased violence, low educational attainment, reduced employment opportunities, limited

	access to quality health care, and overall restriction to upward mobility.[23] Black and Hispanic women living in high-segregated Black communities also have higher odds of experiencing severe maternal morbidity (SMM) than their counterparts living in less segregated communities.[24]
SNAP Accessibility	
Definition:	Number of stores (per 1,000 families) authorized to accept Supplemental Nutrition Assistance Program (SNAP)
Minimum Value:	2.65
Maximum Value:	15.84
Year:	2012
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the United States Department of Agriculture (USDA)
Relevance:	Mothers with access to SNAP during pregnancy have fewer adverse birth outcomes, such as babies born with low birth weight, and have a decreased likelihood of experiencing depressive symptoms.[25]
WIC Accessibility	
Definition:	Number of stores (per 1,000 families with children under age 6) authorized to accept of Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
Minimum Value:	1.35
Maximum Value:	47.62
Year:	2012
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the United States Department of Agriculture (USDA)
Relevance:	WIC participation is associated with an increase in birth weight and length of gestation, as well as decrease in the probability of low birth weight, prematurity, and Neonatal Intensive Care Unit (NICU) admission.[26]

Health Care Availability

Community Health Centers	
Definition:	Rate (per 100,000 residents) of federally qualified community health centers (FQHCs) and related organizations
Minimum Value:	0.00
Maximum Value:	44.52
Year:	2018
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration (HRSA)
Relevance:	Community health centers often deliver affordable, accessible, and high-quality primary health care services to vulnerable groups.[27] Community-based approaches like community health centers improve maternal

	health outcomes and reduce racial inequities in maternal morbidity and mortality by providing perinatal care to populations most at risk for poor maternal health and birth outcomes, including people of color and those with low income.[28]
Health Insurance Status	
Definition:	Rate (per 100) of females ages 19 to 54 without health insurance
Minimum Value:	3.57
Maximum Value:	13.59
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	In the United States, women who lack health insurance are three to four times more likely to die from pregnancy-related complications than their insured counterparts.[29]
Hospitals	
Definition:	Rate (per 1,000 residents) of hospital beds
Minimum Value:	0.00
Maximum Value:	42.52
Year:	2016
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration (HRSA)
Relevance:	The unequal distribution of hospitals is essential in the conversation about childbirth and maternity care in the United States.[30] Inadequate access to care during childbirth can increase the risk mortality and morbidity of both the mother and baby due to possible obstetric complications that could have otherwise been prevented.[31]
Maternity Care Desert	
Definition:	Any county without a hospital or birth center offering obstetric care and without any obstetric providers (1 = Access to Maternity Care, 2 = Moderate Access to Care, 3 = Maternity Care Desert)
Minimum Value:	1.00
Maximum Value:	3.00
Year:	2020
Source:	March of Dimes, PeriStats using data provided by the U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration (HRSA)
Relevance:	Maternity care deserts are associated with low access to appropriate preventive, prenatal, and postpartum care, which can lead to inadequacies in care and an increased risk of maternal morbidity and mortality.[32]
Mental Health Providers	
Definition:	Ratio of population to every one mental health provider
Minimum Value:	170.00

Maximum Value:	5870.00
Year:	2022
Source:	County Health Rankings using data provided by the U.S. Centers for Medicare and Medicaid Services, National Provider Identifier (NPI)
Relevance:	Access to mental health services plays an essential role in perinatal health during and after pregnancy. Pregnant women experiencing depression or anxiety are more likely to have gestational hypertension and hemorrhaging, preterm birth, low birth weight, and having babies who are small for their gestational age. Untreated postpartum depression is also associated with poor child developmental outcomes and increased risk of suicide, a leading cause of maternal mortality in the United States.[33]
Obstetric Providers	
Definition:	Rate (per 10,000 births) of obstetricians, certified nurse midwives, or certified midwives
Minimum Value:	0.00
Maximum Value:	994.80
Year:	2019
Source:	March of Dimes, PeriStats using data provided by the U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration (HRSA)
Relevance:	Obstetric providers are not equally distributed across the United States, with nearly 40% of all counties lacking a single obstetrician or certified nurse midwife. Maternal care workforce shortages lead to barriers such as longer distances and wait times for care, leading to increased out of hospital births and preterm births.[34]
Primary Care Physicians	
Definition:	Ratio of population to every one primary care physician
Minimum Value:	170.00
Maximum Value:	6150.00
Year:	2020
Source:	County Health Rankings using data provided by the American Medical Association (AMA)
Relevance:	An increase in the density of primary care physicians significantly improves perinatal health in terms of fewer fetal deaths, increased birth weight, and decreased maternal mortality.[35, 36]

Behavioral Health

Abuse Against Pregnant and Postpartum Women	
Definition:	Rate (per 100) of diagnosed abuse among Medicaid-enrolled pregnant women or women who gave birth in the past 3 years
Minimum Value:	0.00
Maximum Value:	10.30

Year:	2016
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by Pennsylvania Department of Health (DOH), Bureau of Health Statistics and Registries; and Pennsylvania Department of Human Services (DHS), Office of Medical Assistance Programs (OMAP)
Relevance:	Abuse during pregnancy can cause miscarriage and vaginal bleeding, as well as preterm birth, low birth weight, and other injuries to the mother and baby.[37]
Domestic Violence	
Definition:	Rate (per 100) of domestic violence-related deaths among females ages 15 to 50
Minimum Value:	0.00
Maximum Value:	1.50
Year:	2005-2019
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the Pennsylvania Coalition Against Domestic Violence (PCADV)
Relevance:	Intimate partner violence (IPV) is significantly associated with many adverse maternal and birth outcomes, including poor weight gain during pregnancy, preterm delivery, and low birth weight among newborns.[38, 39]
Maternal Depression	
Definition:	Rate (per 100) of diagnosed depression among Medicaid-enrolled women who were pregnant or gave birth in the past 3 years
Minimum Value:	3.03
Maximum Value:	18.39
Year:	2016
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by Pennsylvania Department of Human Services Office of Medical Assistance Programs, Medicaid Claims, Birth Certificate Records; and Pennsylvania Department of Health, Bureau of Health Statistics and Research
Relevance:	Maternal depression has significant negative impacts on mothers' psychological health, quality of life, and interactions with their infant, partner, and relatives. The accumulation of these elements creates an environment that is not conducive of optimal child development.[40]
Maternal Tobacco Use	
Definition:	Rate (per 100) of births to mothers who used tobacco during pregnancy
Minimum Value:	3.48
Maximum Value:	37.50
Year:	2020
Source:	KIDS COUNT Data Center Using data provided by the Pennsylvania Department of Health (DOH), Division of Health Informatics

Relevance:	Smoking during pregnancy increases the likelihood of preterm labor, ectopic pregnancy, vaginal bleeding, and problems related to the placenta such as placental abruption and placenta previa. It can also cause babies to be born prematurely, have birth defects like a cleft lip, have low birth weight, or even die before birth from miscarriage or stillbirth.[41]
Poor Mental Health	
Definition:	Rate (per 100) of adults reporting 14 or more days of poor mental health per month
Minimum Value:	14.00
Maximum Value:	18.00
Year:	2020
Source:	County Health Ranking using data provided by the Behavioral Risk Factor Surveillance System (BRFSS)
Relevance:	Poor maternal mental health is a risk factor for preterm birth and low birth weight in offspring.[42]
Poor Physical Health	
Definition:	Rate (per 100) of adults reporting 14 or more days of poor physical health per month
Minimum Value:	8.00
Maximum Value:	12.00
Year:	2020
Source:	County Health Ranking using data provided by the Behavioral Risk Factor Surveillance System (BRFSS)
Relevance:	Health behaviors such as appropriate nutrition, adequate physical activity, vitamin intake, regular perinatal care, and health care utilization are essential for healthy pregnancies. Poor physical health can otherwise lead to a wide range of adverse effects on maternal and child health, including preterm labor, obesity and overweight status of the mother, low birth weight of the baby, preeclampsia, hypertension, miscarriage, stillbirth, and emergency cesarean delivery.[43]
Postpartum High-Risk Opioid Use	
Definition:	Rate (per 100) of mothers receiving 2 or more opioid prescriptions among Medicaid-enrolled mothers who delivered live births in the past 2 years
Minimum Value:	2.50
Maximum Value:	20.48
Year:	2017
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by Pennsylvania Department of Human Services Office of Medical Assistance Programs, Medicaid Claims; and Pennsylvania Department of Health, Bureau of Health Statistics and Research, Birth Certificate Records

Relevance:	Prescription opioids are commonly used prenatally for the management of pain, despite being associated with poor fetal growth, preterm birth, birth defects, and neonatal abstinence syndrome.[44]
Pregnancy and Postpartum Substance Use Disorder	
Definition:	Rate (per 100) of substance use disorder among Medicaid-enrolled mothers who were pregnant or delivered live births in the past 3 years
Minimum Value:	2.41
Maximum Value:	15.03
Year:	2016
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by Pennsylvania Department of Human Services Office of Medical Assistance Programs, Medicaid Claims; and Pennsylvania Department of Health, Bureau of Health Statistics and Research, Birth Certificate Records
Relevance:	Substance use during pregnancy has been linked to a wide range of detrimental effects, including increased risks of miscarriage, stillbirth and infant mortality, congenital anomalies, low birth weight, reduced gestational age, preterm delivery, and small for gestational age. There is also increased likelihood of long-term adverse fetal outcomes related to cognitive, motor, language, and psychosocial development that can lead to reduced attention and executive functioning skills, poor academic achievement, and behavioral problems.[45]
Sexually Transmitted Infections	
Definition:	Rate (per 100) of newly diagnosed chlamydia cases
Minimum Value:	0.83
Maximum Value:	10.00
Year:	2020
Source:	County Health Rankings using data provided by the National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP)
Relevance:	Chlamydia is the most common sexually-transmitted bacterium in the United States and the majority of infected do not have symptoms. Untreated chlamydial infection during pregnancy has been linked to preterm labor, premature rupture of membranes, and low birth weight. Newborns may also become infected during delivery as the baby passes through the birth canal, which can result in eye and lung infection.[46]

Pregnancy & Birth Outcomes

Breastfeeding	
Definition:	Percentage of mothers who initiated breastfeeding in the hospital after giving birth
Minimum Value:	57.70
Maximum Value:	93.20

Year:	2016
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by Pennsylvania Department of Health (DOH), Bureau of Health Statistics & Registries
Relevance:	Breastfeeding is associated with positive outcomes related to both maternal and child health. Breast milk provides babies with nutrition that supports ideal growth and development and lowers their risks of asthma, type 1 diabetes, sudden infant death syndrome (SIDS), and other illnesses and diseases by sharing antibodies that help prosper strong immune systems. Breastfeeding can also reduce mother's risk of breast and ovarian cancer, type 2 diabetes, and high blood pressure.[47]
Cesarean Births	
Definition:	Percentage of births delivered via c-section
Minimum Value:	21.90
Maximum Value:	36.50
Year:	2018-2021
Source:	March of Dimes, PeriStats using data provided by Centers for Disease Control and Prevention, National Center for Health Statistics, Final Natality Data
Relevance:	Cesarean delivery, also known as a c-section, is a surgical procedure in which a baby is delivered through an incision in the mother's abdomen often because vaginal delivery would put the baby or mother at risk. C-sections are associated with significantly higher risk of severe maternal morbidity and mortality.[48]
Early Prenatal Care	
Definition:	Rate (per 100) of mothers receiving prenatal care in the 1st trimester
Minimum Value:	56.33
Maximum Value:	86.84
Year:	2020
Source:	KIDS COUNT Data Center using data provided by Pennsylvania Department of Health (DOH), Division of Health Informatics
Relevance:	Prenatal care is most effective when it starts early and continues throughout the entire pregnancy and can help prevent and address health problems in both mothers and babies.[49]
Fertility	
Definition:	Rate (per 100) of women with births in the past 12 months ages 15 to 50
Minimum Value:	3.06
Maximum Value:	11.21
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates
Relevance:	High fertility poses health risks for children and their mothers, detracts from human capital investment, slows economic growth, and exacerbates environmental threats.[50]

Inadequate Prenatal Care	
Definition:	Rate (per 100) of prenatal care beginning in the 5th month of pregnancy or later or less than 50% of the appropriate number of visits for an infant's gestational age
Minimum Value:	8.40
Maximum Value:	32.10
Year:	2018-2021
Source:	March of Dimes, PeriStats using data provided by Centers for Disease Control and Prevention, National Center for Health Statistics, Final Natality Data
Relevance:	Poor prenatal care utilization due to late onset of care, low frequency of care visits, or combinations of the two significantly increases the risks of maternal insufficient gestational weight gain, prenatal smoking, premature ruptured membranes, precipitous labor, no breastfeeding, postnatal underweight, and postpartum smoking.[51]
Late or No Prenatal Care	
Definition:	Percentage of mothers not receiving prenatal care until the 3rd trimester or at all
Minimum Value:	3.40
Maximum Value:	18.10
Year:	2018-2021
Source:	March of Dimes, PeriStats using data provided by Centers for Disease Control and Prevention, National Center for Health Statistics, Final Natality Data
Relevance:	Babies of mothers who do not get prenatal care are three times more likely to have a low birth weight and five times more likely to die than those born to mothers who do get care.[52]
Low Birth Weight	
Definition:	Percentage of births weighing less than 2,500 grams
Minimum Value:	3.57
Maximum Value:	11.09
Year:	2020
Source:	KIDS COUNT Data Center using data provided by Pennsylvania Department of Health (DOH), Division of Health Informatics
Relevance:	Low birth weight (LBW) often results from preterm birth, intrauterine growth restriction, or a combination of the two. LBW not only reflects the malnutrition and poor health status of the mother, but also predicts future information about the survival, development, and long-term health of the baby.[53]
Medicaid Births	
Definition:	Rate (per 100) of births with principal payment source of Medicaid
Minimum Value:	3.50
Maximum Value:	57.09

Year:	2020
Source:	KIDS COUNT Data Center using data provided by Pennsylvania Department of Health (DOH), Division of Health Informatics
Relevance:	Compared to women with private insurance, those on Medicaid have been shown to be a high-risk group for adverse birth outcomes due to increased likelihood of smoking, illicit drug use, and late enrollment into prenatal care.[54]
Multiple Deliveries	
Definition:	Rate (per 100) of twins, triplets, and higher order births
Minimum Value:	1.99
Maximum Value:	4.01
Year:	2018-2021
Source:	March of Dimes, PeriStats using data provided by Centers for Disease Control and Prevention, National Center for Health Statistics, Final Natality Data
Relevance:	Being pregnant with twins, triplets, and other multiples increases the risk of complications that can negatively impact mothers and their babies. Mothers of multiples are more likely to experience preterm labor, anemia, gestational diabetes, hypertension, preeclampsia, miscarriage or stillbirth, postpartum depression, and postpartum hemorrhage. Babies also have a higher chance of birth defects, growth problems, low birth weight, and neonatal death.[55]
Neonatal Abstinence Syndrome	
Definition:	Rate (per 1,000) of births of babies experiencing withdrawal from certain drugs exposed in the womb
Minimum Value:	3.20
Maximum Value:	76.00
Year:	2016-2017
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by the Pennsylvania Health Care Cost Containment Council (PHC4)
Relevance:	There have been substantial increases in national rates of maternal opioid disorder (OUD) as well as neonatal abstinence syndrome (NAS), a postnatal withdrawal syndrome commonly attributed to prenatal opioid exposure. Opioid use during pregnancy is associated with numerous adverse outcomes for both mothers and infants, including maternal mortality, longer and more complicated hospital stays after delivery, and long-term developmental delays.[56]
NICU Admissions	
Definition:	Percentage of live births admitted to the neonatal intensive care unit (NICU)
Minimum Value:	3.53
Maximum Value:	20.69

Year:	2016
Source:	2020 Family Support Needs Assessment (FSNA) Report using data provided by Pennsylvania Department of Health (DOH), Bureau of Health Statistics & Registries, Birth Records
Relevance:	Babies are admitted to NICUs to receive additional specialized medical care due to factors such as preterm birth, birth defects, breathing and feeding problems, infections, or other medical conditions.[57] Major maternal risk factors for NICU admission include advanced age, twin pregnancy, low gestational age, preeclampsia, and peripartum infection.[58]
Preterm Births	
Definition:	Rate (per 100) of live births born before 37 weeks of pregnancy
Minimum Value:	3.95
Maximum Value:	12.68
Year:	2020
Source:	KIDS COUNT Data Center using data provided by Pennsylvania Department of Health (DOH), Division of Health Informatics
Relevance:	Preterm delivery is among the most common adverse birth outcomes caused by maternal risk factors. Not only is preterm birth indicative of poor maternal health, but it is significantly associated with maternal morbidity and mortality.[59]
Racial Disparity in Early Prenatal Care	
Definition:	Ratio of Black mothers receiving prenatal care in the 1st trimester to that of White mothers
Minimum Value:	0.53
Maximum Value:	1.14
Year:	2020
Source:	KIDS COUNT Data Center using data provided by Pennsylvania Department of Health (DOH), Division of Health Informatics
Relevance:	Seeking early prenatal care is associated with better health outcomes for women and infants, however, notable disparities in prenatal care access persist among U.S. women, particularly among younger, less educated, geographically isolated, and racial/ethnic-minority maternal populations.[60]
Racial Disparity in Low Birth Weight	
Definition:	Ratio of low birth weight in births born to Black mothers to that in births born to White mothers
Minimum Value:	0
Maximum Value:	5.87
Year:	2020
Source:	KIDS COUNT Data Center using data provided by Pennsylvania Department of Health (DOH), Division of Health Informatics

Relevance:	Non-Hispanic (NH) Black mothers are nearly twice as likely as NH White mothers to give birth to a low birth weight baby. This disparity is largely caused by social determinants of health (the justice system, physical and social environment, income and wealth, housing, transportation, and education) that exist within a health care system reinforced by institutional racism.[61]
Racial Disparity in Medicaid Births	
Definition:	Ratio of Medicaid births born to Black mothers to that of Medicaid births born to White mothers
Minimum Value:	1.43
Maximum Value:	5.27
Year:	2020
Source:	KIDS COUNT Data Center using data provided by Pennsylvania Department of Health (DOH), Division of Health Informatics
Relevance:	Women of color are disproportionately enrolled in Medicaid during the perinatal period, with the majority being uninsured before pregnancy and again by six months postpartum. Biases embedded in algorithms, clinicians' screening tools, and underrepresentation of minorities in the provider workforce demonstrate that structural racism is embedded in every aspect of the United States health care system, leading to many maternal health disparities including mortality.[62]
Racial Disparity in Preterm Births	
Definition:	Ratio of preterm births born to Black mothers to that born to White mothers
Minimum Value:	0.00
Maximum Value:	5.00
Year:	2020
Source:	KIDS COUNT Data Center using data provided by Pennsylvania Department of Health (DOH), Division of Health Informatics
Relevance:	Persistent Black-White disparity in the prevalence of preterm birth is a complex issue with many different components. While genetic factors combined with maternal stress are thought to play a small role, racism is the only factor that directly and indirectly explains such disparities in preterm birth outcomes. Historical and contemporary systemic racism leads to unequitable socioeconomic opportunities that differentially expose African Americans to lifelong financial stress and associated health-harming conditions.[63]
Teen Births	
Definition:	Rate (per 100) of births to female population ages 15 to 19
Minimum Value:	0.30
Maximum Value:	3.00
Year:	2017-2021
Source:	U.S. Census Bureau, American Community Survey (ACS) 5-Year Estimates

Relevance:	Teenage pregnancy is associated with a higher risk of socioeconomic disadvantage, mental health problems, and substance use during pregnancy, which can indirectly lead to adverse birth outcomes.[64]

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