Pathway diagrams for housing, transportation, education and employment
HPIO draft for review at August 2017 Advisory Group meeting

Purpose
Pathway diagrams are commonly used in Health Impact Assessments to explore, describe and prioritize the direct and indirect ways that non-health factors affect health outcomes and equity. For this project, the purpose of these diagrams is to illustrate the complex connections between each social determinant of health topic (housing, transportation, education and employment) and the leading causes of infant mortality.

The dark blue boxes along the left side of each diagram provide general categories for the ways that housing characteristics, for example, affect health. We will use these categories when we identify policy recommendations by, for example, exploring policies to address housing affordability. The dark blue boxes generally align with the public policy and community levels of the social-ecological framework, including underlying factors that cause inequities such as structural racism.

The light blue boxes represent intermediate outcomes that are risk factors for the leading causes of infant mortality, including access to care, health behaviors and exposure to toxins. These boxes generally align with the community, organizational, interpersonal and individual levels of the social-ecological framework. The relationships between these factors are complex and multi-directional; poverty and persistent stress are consistent elements across all four diagrams.

The red boxes represent the leading causes of infant mortality: poor birth outcomes, sudden unexplained infant death and accidents and injuries. The red arrows indicate that the literature review identified credible research connecting an intermediate outcome to a leading cause of infant mortality.

Process
These diagrams were informed by HPIO’s draft literature review and will accompany the literature review narrative in the final report. The Housing and Transportation diagrams build upon previous work by HPIO sponsored by the Ohio Commission on Minority Health. The research citations for the four topic-specific literature reviews are included in the literature review narratives which will be shared at the Advisory Group meeting.
HPIO staff consulted peer-reviewed studies (journal articles) and grey literature (e.g. reports from government agencies, policy organizations, etc.). Some articles and reports described results of quantitative research studies, while others described qualitative studies, practice-based research, theoretical models, conceptual frameworks or historical context of inequities. In addition to topic-specific search terms (such as “housing affordability”), HPIO used the following search terms: infant mortality, low birth weight, pre-term birth, premature birth, birth outcomes, sudden infant death, sleep-related death, birth defects, SIDS and SUID. HPIO used PubMed to identify journal articles (search tool from the U.S. National Library of Medicine, National Institutes of Health).

In order to be eligible for inclusion in the review, HPIO prioritized the following types of literature:
- Systematic reviews and meta-analyses, when available
- Research done in the U.S. (although systematic reviews may include international studies) and articles published in English
- Literature published from 2010 to 2017, when possible
- Literature that addresses disparities or inequities, including findings specific to African American/Black women or other women of color

**Next steps**
HPIO will revise the draft pathway diagrams and literature reviews based on feedback from Advisory Group members at the August 17 meeting. This work will then be used to inform exploration of policy recommendations.

HPIO plans to develop similar pathway diagrams to describe the potential impact of policies and programs on reducing infant mortality or leading causes of infant mortality, including a description of the strength of available research evidence. (See the logic model on page 6 of this report from a Washington State Health Impact Review for an example of this type of pathway diagram.)

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Relationship between housing and infant mortality

Housing challenges and inequities

Affordability
- Lack of income for necessities

Discriminatory housing policy and practice
- Historically racist housing policy and segregation
- Discriminatory rental, lending and eviction practices

Stability
- Forced moves
- Informal rental agreements
- Abusive/violent living situations

Quality
- Poor house maintenance or construction
- Overcrowding

Neighborhood conditions
- Low opportunity (education, jobs, etc.)
- High crime and violence

Negative effects on health and equity

Food insecurity and poor nutrition

Poor maternal health
- Physical health
- Mental health

Disrupted, uncoordinated or inadequate pre-conception, prenatal and post-natal care

Poverty

Persistent stress

Unhealthy behaviors such as alcohol, tobacco and other drugs

Exposure to toxins and pests (lead, environmental tobacco smoke, etc.)

Unsafe sleeping practices

Birth outcomes:
- Preterm birth
- Low birth weight
- Birth defects
- Maternal complications of pregnancy

Accidents, injuries and violence

Sudden unexplained infant death

Poverty

Difficulty paying for medical care

Difficulty getting to jobs, education, child care and medical providers

Intimate partner violence

Homelessness

Unauthorized moves

Sudden unexplained infant death

Disrupted infant care
Relationship between transportation and infant mortality

Transportation challenges and inequities

Access and connectivity
- Limited transit services
- Low rates of car ownership due to poverty and discriminatory practices
- Inadequate regional planning
- Historically racist transportation and land-use policies (slum clearance, urban renewal, etc.)

Active transportation
- Low walkability and unsafe pedestrian access to bus stops
- Sprawl (low density development, car dependence)

Air quality
- Proximity to major roadways
- High number of vehicle miles traveled and traffic congestion
- Inefficient vehicles

Traffic safety
- Low seat belt/car seat use
- High rate of crashes
- Distracted driving
- Unsafe roadway design

Negative effects on health and equity

Difficulties getting to healthcare providers
Inadequate pre-conception, prenatal and postnatal care

Difficulties getting to jobs, post-secondary education and child care
Poverty

Difficulties getting to grocery stores, parks and other places to access healthy food and physical activity
Poor maternal health
- Physical health
- Mental health

Persistent stress

Lack of physical activity

Exposure to poor outdoor air quality (high level of particulate matter)

Unsafe conditions for drivers and pedestrians

Leading causes of infant mortality

Birth outcomes:
- Preterm birth
- Low birth weight
- Birth defects
- Maternal complications of pregnancy

Sudden unexplained infant death

Accidents and injuries (motor vehicle crashes*)

*Note: Motor vehicle crashes cause a relatively small number of infant deaths.
Relationship between education and infant mortality

Education challenges and inequities

- Educational attainment
  - Grade-level reading
  - High school graduation
  - Post-secondary education

- Education system quality
  - Early childhood
  - K-12
  - Post-secondary
  - School segregation

Negative effects on health and equity

- Income
  - Limited employment opportunities
  - Low earnings potential

- Health literacy
  - Poor knowledge of healthy behaviors and practices
  - Limited ability to successfully interact with healthcare providers and follow medical advice

- Social capital
  - Low rank in society
  - Social network norms

- Personal control and self-efficacy
  - Low self-confidence
  - Belief that external forces, rather than personal decisions and actions, impact life

- Poverty
  - Inadequate access to healthy foods and opportunities for physical activity

- Persistent stress
  - Disrupted, uncoordinated and inadequate pre-conception, prenatal and post-natal care, including access to contraception

- Unhealthy behaviors such as alcohol, tobacco and other drug use

- Lack of breastfeeding

- Unhealthy relationships, abuse and violence

- Poor maternal health
  - Physical health
  - Mental health

- Unplanned pregnancies, including teen pregnancies and inadequate birth spacing

Leading causes of infant mortality

- Birth outcomes:
  - Preterm birth
  - Low birth weight
  - Birth defects
  - Maternal complications of pregnancy

- Sudden unexplained infant death

- Accidents, injuries and violence
Relationship between employment and infant mortality

Employment challenges and inequities

Income
- Low wages
- Underemployment
- Unemployment

Working conditions
- Occupational hazards
- Physically demanding work
- High demand, low control
- Discriminatory practices
- Breastfeeding and leave policies (maternal, sick leave, etc.)
- Health insurance coverage

Negative effects on health and equity

Poverty
Inadequate access to healthy foods and opportunities for physical activity
Persistent stress

Poor maternal health
- Physical health
- Mental health

Birth outcomes:
- Preterm birth
- Low birth weight
- Birth defects
- Maternal complications of pregnancy

Disrupted, uncoordinated and inadequate pre-conception, prenatal and post-natal care, including access to contraception

Unhealthy behaviors such as alcohol, tobacco and other drugs

Lack of breastfeeding

Sudden unexplained infant death