# THE EXPOSOME AND HEALTH EQUITY

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Environmental Influences on Children's Health Across the Life Course and Generations

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# OVERVIEW

- Exposome
- Health Disparities
- Health Equity
- Role of the Environment
- Children's Health
- Measuring Exposures
- Exposure Assessment
- Biomarkers of Exposure
- Exposures across the Life Course
- Future Directions
- Acknowledgements

# EXPOSOME

- "The measure of all the exposures of an individual in a lifetime and how those exposures relate to health.
- An individual's exposure begins before birth and includes insults from environmental and occupational sources.
- Understanding how exposures from our environment interact with our own unique characteristics such as genetics, physiology, and epigenetics impact our health is how the exposome should be articulated."
- External and Internal Environments

# HEALTH DISPARITIES

- Definition: Inequities that exist when some population groups do not benefit from the same health status as other groups
  - Race/ethnicity, gender, and age
  - Also include measures of SES, rural/urban, and place
- Measures of population health differences
  - Compared to an index group
  - Health status, outcomes, behavior
    - Incidence and Prevalence of Disease
    - Mortality
    - Life Expectancy
    - Years of Person Life Lost (YPLL)
    - Disability Adjusted Life Years (DALY)

# HEALTH EQUITY

- Health equity is achieved when every person has the opportunity to "attain his or her full health potential" and no one is "disadvantaged from achieving this potential because of social position or other socially determined circumstances."
- Goal of public health is to achieve health equity by eliminating health disparities and achieving optimal health for all Americans.
- Health equity means increasing opportunities for everyone to live the healthiest life possible, no matter who we are, where we live, or how much money we make.
- Work together to eliminate unjust differences in health and healthcare using an anti-racist approach.

# ROLE OF THE ENVIRONMENT

- Zip code is greater predictor of children's health outcomes than genetic code
  - Environment in which you live:
    - Natural environment (air, water, land)
    - Built environment (Places you live, work, play, pray, and learn)
    - Social Environment (social, political, economic)
    - Policy Environment (Federal, state, and local laws and regulations)
    - Health and Health Care (Personal health and health care)

# CHILDREN'S HEALTH

- Leading Causes of Child and Adolescent Mortality
  - Motor vehicle crashes
  - Firearm related injury
  - Malignant neoplasms
  - Suicide
  - Drug overdose
  - Drowning
  - Congenital anomalies
  - Heart disease
  - Fire or burns
  - Chronic lower respiratory disease

# MEASURING EXPOSURES

- Source of exposures
  - Chemical exposures
    - Natural and built environments
  - Non-chemical exposures
    - Social and policy environments
    - Socioeconomic conditions, psychosocial stressors
- Exposure pathways
  - Inhalation
  - Ingestion
  - Skin contact
- Characteristics of exposure
  - Duration
  - Concentration
  - Frequency

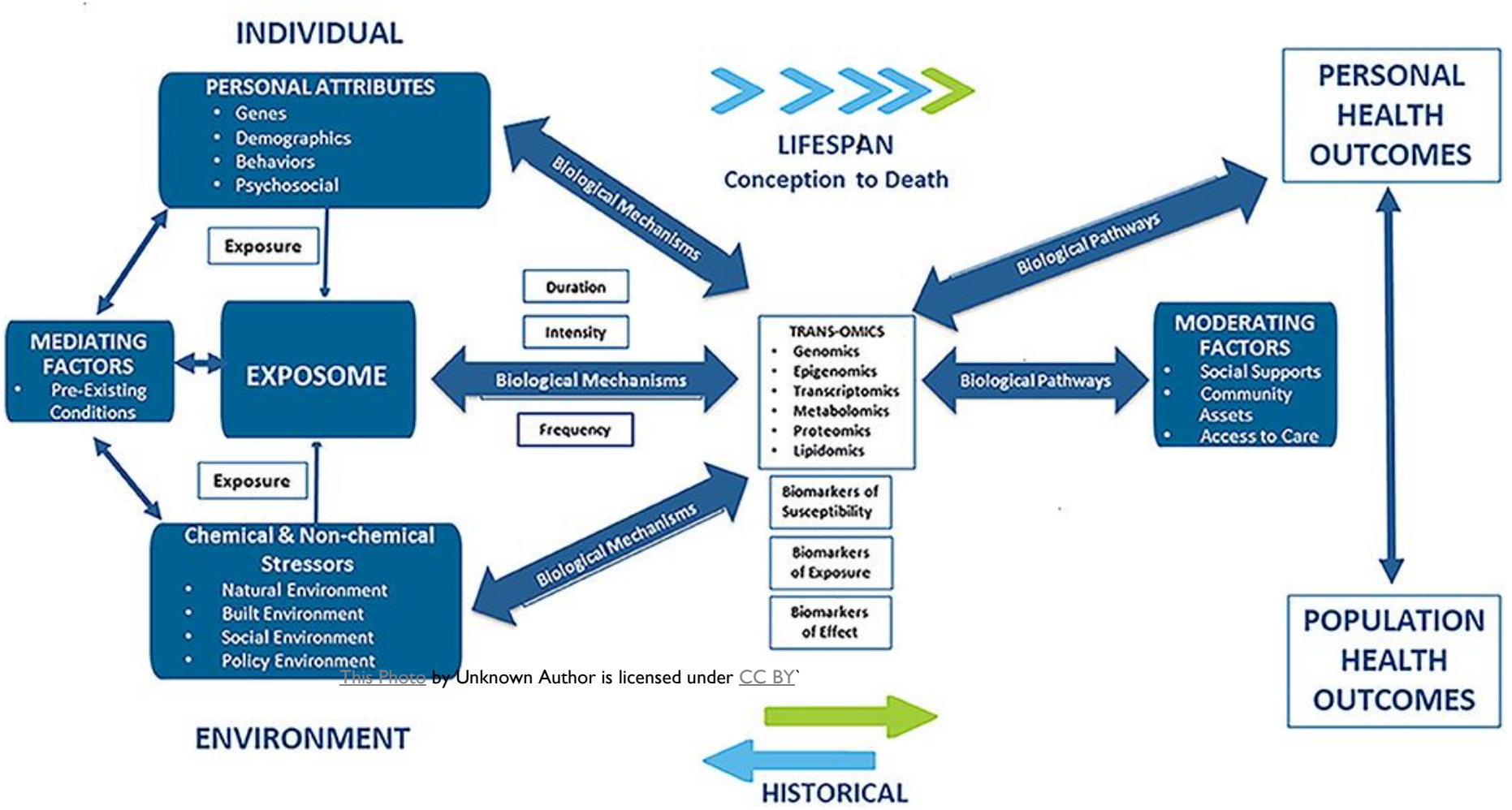
# EXPOSURE ASSESSMENT

- Alignment of external environmental exposures and internal biomarkers of exposure, effect, and disease
  - Spatial measures
    - Geo-political units
    - Residential and occupational places
    - Activity space
    - Personal sensors
  - Temporal measures
    - Historical
    - Life stage
    - Activity patterns
    - Single, intermittent,  or continuous chronic exposures/trajectory
    - Lag between exposure and effect

# BIOMARKERS OF EXPOSURE

- NIEHS definition: Anatomical, physiological, and biochemical responses of an organism which indicate exposure to and/or effects of a stressor
- **Chemical stressors**
  - Pesticides
  - Organic compounds
    - Natural, synthetic, semi-synthetic
    - Consumer products, drugs, fuels components, explosives,
    - Dioxins, furans, PCBs, flame retardants, hydrocarbons, PFCs, phthalates and bisphenol A
  - Inorganics and fibers
    - Ammonia, most elements including nutrients
- **Non-chemical stressors**
  - Socio-economic
    - Poverty, housing conditions, health insurance, food deserts
  - Psycho-social
    - Racism, food insecurity, violence, adverse childhood exposures (ACEs)

# EXPOSURES ACROSS THE LIFE COURSE



# FUTURE DIRECTIONS

- Consensus on standardized ontology for assessing external environment
- Consensus on spatial and temporal measures of external and internal exposures
- Alignment of external exposures and internal biomarkers of exposure, effect, and disease
- Measures of chemical and non-chemical exposures at key developmental periods and over the life course
- Multiple measures of biomarkers over the life course
- Human "exposome" project

# ACKNOWLEDGEMENTS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