**Cradle to Grave Longitudinal Study of Social Determinants of Health in US Children and Adults: Big Data integration of Linked NHANES Cycles and Medicaid-Medicare Merged Data with Claritas, ACS, AHRF and US Census**

**Objectives:** To analyze over time the environmental determinants of health, social determinants of health (SDOH) affecting childhood and adult health. The other objective is to focus on those determinants that are modifiable or intervenable, after non-modifiable determinants are held constant.

**Methods:** Wewill use two major national multiyear datasets that were recently linked longitudinally across the years in each cycle (NHANES) or the linked Medicaid-Medicare datasets. These data will be merged with SDOH datasets (Claritas, American Community Survey, Area Health Resource Files) containing more than 10,000 elements including air and water quality. The ten most costly chronic diseases include: (1) high blood pressure, (2) Alzheimer's disease or other dementias, (3) heart disease, (4) depression, (5) arthritis, (6) osteoporosis, (7) diabetes, (8) COPD and allied conditions, (9) cancer, and (10) stroke. Among children, the top chronic conditions include: (1) asthma, (2) cystic fibrosis, (3) diabetes, (4) epilepsy, and (5) developmental disabilities, including (5a) ADHD, cerebral palsy, and (5b) autism spectrum disorders.

We will encode the NHANES and Medicaid-Medicare data to similar indicators, and use the raw data and the indicators to develop multivariate AI models driven by Cox regression with time dependent and functional covariates and other survival failure analysis of childhood and adult diseases. Childhood and adult diseases will be modeled using the common data elements to augment information available. Cross validation techniques will be used for model verification.

**Results:** We will be able to conduct longitudinal analyses on adult and child disease natural history. Rich SDOH data sources that vary over time will be merged at the row level, enhancing predictive ability. Specific chronic diseases will be modeled within sex (male, female) and age groups (children, adults, elders).

**Conclusions:** Each disease’s natural history will be analyzed using standard clinical measures. The novel aspect is analysis over time of SDOH predictors, focusing on modifiable risk factors and holding constant non-modifiable risk factors.

The results of this project may lead to a better understanding of the natural history of diseases in adults and children. The novel addition of time-varying and functional SDOH data will likely discover new associations of modifiable risk factors that may be used to plan policy for improving population health.