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Using an Exposome Framework to Test Hypotheses on Contributions from the Built, Natural, Physical and Social Environmental on Learning and Development in Pre-K children in Urban and Rural Day Care Settings in Tennessee

Abstract

The public health exposome can be utilized to inform the influence of the built, natural, physical, and social environment on disparate health outcomes in low-income populations. Additionally, information can be gleaned in the areas of, access to food, hospitals, and other much-needed resources. The exposome encompasses all general and specific environmental factors and non- genetic environmental exposures that a human is exposed to, beginning at conception. To put it simply the exposome is an integrated function of exposure on our body, including what we eat and do, our experiences, and where we live, work, play and pray. There are also chemical or exo-exposomes that can have negative impacts on health. These chemical stressors include exposure to dietary factors, pollutants, and other chemical and non-chemical stressors. This concept and framework were developed and refined to direct attention to the need for a more enlightened, comprehensive, and rigorous socio-ecological approach to characterizing exposures.

We will assess the relationship between environmental pollutants, socio-demographic parameters, and daycare locations throughout the State of Tennessee. Child-care and/or day care centers were located using a PPGIS MapplerX portal and mapped for vulnerable census tracts using the USEPA EJSCREEN tool. Data were collected at the census tract level from variables in the built, natural, physical, and social environment in the *Public Health Exposome*

4.0 database. For example, in the built and physical environment parameters such as; road networks, manufacturing, mining and construction, energy, transit service, broadband internet availability, home sales, housing prices, disaster declarations, locations of hospitals, and critical access hospitals, medically underserved areas, counts and rates of health resources, business and residential vacancy, households receiving housing subsidies, rental rates, housing affordability, museums and libraries, health care facilities, sub-standard housing, housing quality, home ownership, public transit, childcare access, supermarket access, food deserts, mental health treatment facilities, locations of drug and alcohol treatment facilities were assessed for proximity within a 1-mile radius from each child-care and/or day care center. The PHE is anchored to a natural environment proxy as PM 2.5 which is particulate matter with a diameter of fewer than 2.5 m and an indicator of a chemical stressor toxic air pollutant. Child- care and/or day care centers located in traditionally urban areas (Memphis, Nashville, and Knoxville) were analyzed in EJSCREEN for a subset of the indicators above and compared to rural counties in Tennessee.

Therefore, we hypothesize that metropolitan cities will have a lower lead paint percentile but a higher PM 2.5 percentile due to increased traffic congestion, public transport, access to highways, and population density compared to rural counties. The results demonstrated no significant county-wide associations between these environmental indicators, which shows we may need to analyze the data on a smaller scale, or that there are possibly confounding variables present. Additionally, the results found that there were similarities in; levels of lead, PM 2.5, and low-income populations in the three cities. The same did not hold true for data from rural counties where inconsistencies in lead paint levels, PM 2.5, and income level were variable. In conclusion, future studies will use our data that will be linked to the PHE 5.0 dataset where EJSCREEN is nested to further characterize the neighborhood context of the child-care and/or day care centers in terms of the relationship and associations between the many placed- based variables listed above and impacts on pre-K learning and development.