LOCAL NEIGHBORHOOD DEPRIVATION: NEW METHODS TO DEFINE NEIGHBORHOODS AND MEASURE DETERMINANTS OF POVERTY IN THE FRESNO ASTHMATIC CHILDREN'S ENVIRONMENT STUDY (FACES)

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Background and Aims: Previous studies have demonstrated an association between neighborhood deprivation (often measured by the US Census), exposure to air pollution and asthma outcomes. However, what constitutes a neighborhood and how best to characterize local environments is subjective and evolving. A neighborhood is defined by a geographic boundary and thus, the appropriate scale and aggregation units must be considered in epidemiologic analyses. We aim to create individual neighborhoods based on walking distances from children's residences in the Fresno Asthmatic Children's Environment Study (FACES) and to describe quantitatively neighborhood deprivation at the individual level.
Methods: This study uses a geographic information system (GIS) to define neighborhoods and measure local, area-level deprivation in Fresno, CA from 2000-2008. Markers of deprivation in FACES include low grocery store availability, high density of alcohol outlets and cigarette sales permits, lack of schools and parks, inadequate public transit, lack of daycares, and eight census-derived variables. We use item response theory (IRT) with maximum likelihood estimation to develop a deprivation scale for study subjects' neighborhoods (n=518) where geographic attributes are converted to positive and negative neighborhood influences.
Results: The median IRT score for FACES participants is 0.16 (where scores range from -5 to 5 for low to high deprivation). The scores are correlated positively with census defined poverty (Spearman correlation rho=0.2) and may give a more complete picture of area-level deprivation than the census.
Conclusions: IRT helps summarize multiple GIS inputs and describe more precisely local deprivation with a composite score. The advantage of using individual neighborhoods defined by walking distances versus census defined boundaries is that the individual neighborhoods partly solve the problem of non-identifiabilty, an issue of insufficient covariate overlap that plagues neighborhood research. Our future research will employ the IRT scores to determine if there is a relation between neighborhood deprivation and exposure to traffic and lung function among asthmatics in FACES.