

TITLE

Analysis of Childhood Asthma and Hazardous Emission Sites in Utah

THEME

Advance Environmental Public Health Science and Research

KEYWORDS

childhood asthma, spatial analysis, Utah

BACKGROUND

Asthma is a multifactorial disease. Intrinsic susceptibility includes family history, respiratory infections in early childhood, sex, age, race, and socioeconomic status. Factors related to the atmosphere that can trigger an asthmatic attack include climatic and weather conditions such as temperature, humidity, and air pressure; allergens such as airborne pollens, mold spores, and dander; and natural and anthropogenic pollutants such as tobacco smoke, exhaust, oxides of nitrogen and sulfur (NO_x , SO_x), ozone (O_3), and particulate matter (PM_{10}). Several studies have evaluated the effects of air pollution on health in Utah, primarily in Utah Valley and neighboring communities. Five of these studies looked specifically at effects of air pollution in children. The results generally demonstrated an association between PM_{10} levels and adverse health effects. However, the results were inconclusive, and the studies were sensitive to alternative explanations. None of the studies used GIS or spatial methods.

OBJECTIVE(S)

This study was designed to examine the effect of residential proximity to hazardous emission sites on the spatial and temporal variation of hospitalization rates for childhood asthma in four Utah urban counties (Weber, Davis, Salt Lake, and Utah).

METHOD(S)

Rates of hospitalization for asthma in children aged 0–14 years were examined by year and census tract to determine whether the rates increased because of residential proximity to hazardous emission sites during 1990–1999. Hazardous emission sites included Environmental Protection Agency National Priorities List (NPL) sites; Comprehensive Emergency Response, Compensation, and Liability Information System (CERCLIS) sites; Resource Conservation and Recovery Act (RCRA) facilities; Toxic Release Inventory (TRI) sites; and Utah Division of Air Quality Point Source Emissions (PSE) sites. Geographic Information System (GIS) and spatial statistical methods were used to analyze the association of asthma clusters with the hazardous emission sites.

RESULT(S)

During at least one of the years in the study period, 16 census tracts had significantly elevated numbers of children hospitalized for asthma. Of those, 13 census tracts formed two clusters in close proximity to each other (one cluster in the southern part of Davis County and the other in the northern part of Salt Lake County). Of the total sources of hazardous

materials, an average of 52.2% had significant spatial associations with the distribution pattern of census tracts that had elevated annual incidence rates of children admitted to the hospital for asthma. Spatial analysis of the distribution pattern of the hazardous materials sources did not conclusively identify individual isolated sites with causal relationships. Instead, sites identified with significant spatial association were situated around the clusters of census tracts that had elevated incidence of hospitalization rates for asthma. The number of hazardous emissions sources within a census tract standardized to area was a predictor of census tracts that had elevated incidences of children admitted to hospitals for asthma. Four census tracts showing significant elevations were located in Salt Lake County within a one-mile radius of 1 of 3 NPL sites. Socioeconomic factors associated with increased childhood asthma hospitalization rates in these census tracts included low income, low education, and living in old, inexpensive housing.

DISCUSSION/RECOMMENDATION(S)

Study results suggest a possible use of ecologic methods to identify high-risk populations for asthma hospitalizations and using proximity to hazardous emissions sites along with socioeconomic and behavioral risk factors as predictors. Once the high-risk populations are identified, studies of individual risks are required to identify the most productive intervention activities for that population. (This study is supported by Cooperative Agreement Number U50/ATU887580 from the Agency for Toxic Substances and Disease Registry)

AUTHOR(S)

Wayne Ball, M.P.H., Ph.D.
Program Manager
Environmental Epidemiology Program
Utah Department of Health
P.O. Box 142104
Salt Lake City, Utah 84114-2104
801-538-6191
wball@utah.gov

Sam LeFevre, M.S., D.Sc.
slefevre@utah.gov

