Thursday, January 22, 1:30-3:00PM
Concurrent Breakout Session

GIS and Spatial Analysis

Moderator: Phil Cross, Congenital Malformations Registry, New York State Department of Health, Troy, NY

Detecting clusters and determining the neighborhood characteristics of infants who experience low birth weight, early death and birth defects using new statistical technology and geographic information systems

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The statistical technology of disease cluster detection and mapping has dramatically improved in the last few years. Tools are now available for the non-specialist public health practitioner. Advances in the geocoding of public health records and the availability and increased usability of geographic information systems (GIS) allows public health agencies to carry out sophisticated spatial analyses of untoward birth event incidence in relation to environmental exposures and the socioeconomic environment of the parents. This is important in order to develop a deeper understanding of disease processes as well as to help develop cost effective interventions. Ninety-eight percent of the birth and infant death certificates for 1989 to 2000 were geocoded to the street level for Pierce, King and Snohomish Counties, the largest counties in WA accounting for 51% of births. The socioeconomic characteristics from census data at the block group level were assigned to each birth using a geographic information system (GIS). This allowed the characterization of the birth event in terms of covariates on the birth and death certificates such as age of the mother, marital status, birth weight, gestational age, and cause of death in relation to the possible impact of socioeconomic, temporal, and geographic factors. Distances from maternal residence to EPA designated potentially hazardous sites was measured. Rates were calculated and adjusted using empirical Bayes smoothing. Also a spatial scan statistic and a variety of cluster detection methods were applied to identify neighborhoods where low birth weight, infant death and birth defects rates are elevated. The result is a GIS based atlas of rates and clusters both in space and time presented in the context of the most well known risk factors as well as new ones best represented in a geographical context.

Keywords: Geographic Information Systems, Infant Mortality, low birth weight, birth defects, cluster detection, spatial scan statistic

Related Web page: fttp:\\epiqms.doh.wa.gov

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Monitoring Temporal and Spatial Variations in Birth Defects in Atlanta

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The Metropolitan Atlanta Congenital Defects Program (MACDP) is a population-based birth defects surveillance program that has been collecting and analyzing birth defects surveillance data since 1968. MACDP actively monitors major birth defects among infants born to residents of five counties of metropolitan Atlanta. In analysis of temporal variations in the occurrence of birth defects, MACDP has faced a number of challenges, including: 1) changes in diagnostic procedures; 2) time to diagnosis and classification of cases; and 3) prenatal diagnosis and pregnancy terminations. Inclusion of prenatal clinics as another source of case ascertainment since 1994 has helped to address in part the latter challenge. Recent geocoding of MACDP data now is enhancing our monitoring capabilities by making possible spatial and temporo-spatial analyses of the occurrence of birth defects. Preliminary analyses of spatial data, however, have identified additional data gaps in addressing questions of interest, namely: 1) lack of accurate latitude and longitude data for relevant exposure windows; 2) lack of geocoded data for a comparison group; and 3) lack of environmental databases with adequate temporal and spatial resolution. Examples of analyses of temporal and spatial variations in the occurrence of birth defects in Atlanta will be presented to illustrate some of these challenges and issues.

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Use of Spatial and Temporal Analysis in the Surveillance of Congenital Malformations in New York State

Steven P Forand, Geographic Research and Analysis Section, Center for Environmental Health, New York State Department of Health, Troy, NY

The New York State Department of Health has used a variety of analysis methods to assess the spatial and temporal variation in the prevalence of birth defects across the state. The results of these efforts have been mixed. Though there are a number of methods to choose from for detecting clustering of birth defects it remains a challenge applying these techniques when the health events are rare, poorly diagnosed or not adequately reported by hospitals. For example some spatial analysis methods are used to determine where the mostly likely cluster of birth defects occurs. However, these methods are often unable to detect clustering when many small clusters occur. Methods such as nearest neighbor tests can be used to answer the question of whether the birth defects are clustered; however, these methods do not show where the clusters occur. There are also several challenges in detecting changes in the prevalence of birth defects over time. For instance changes in diagnostic procedures can lead to changes in the number of birth defects reported to birth defect registries. Several of the techniques used to evaluate spatial and temporal variability will be presented and specific examples will be provided for each. The strengths and weaknesses of each of these approaches will be discussed as we assess their utility in the surveillance of congenital malformations.