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Detecting Directional Effects in Environmental Epidemiology. G.M. Jacquez (BioMedware, 516 N. State, Ann Arbor, MI 48104)

Background: Directional effects frequently arise in epidemiologic data and have important implications for determining spatio-temporal associations between environment and health and for assessing and controlling the spread of infectious and vector-borne diseases. Objective: Develop and evaluate statistics appropriate for detecting directional effects in epidemiologic data. Methods: Statistics appropriate for quantifying directional components in (1) the chain of infection and (2) age-adjusted rates were compared using spatial Markov chain models of HIV and measles. The methods are :-A new test for directional components in the spread of a chain of infection, -Spatial autocorrelation analysis using directional correlograms, -A k-nearest neighbor test for the space-time progression of cases Null Hypotheses: Reference distributions of these statistics may be constructed under randomization or spatially restricted null hypotheses. Restricted null hypotheses account for underlying spatial structure in the data. Results: The tests were applied to simulated HIV and measles epidemics and results were compared to determine statistical sensitivity and power. The statistics quantify different aspects of the geographic spread of disease and discerned directional effects when these were modeled in the disease simulations. Conclusion: Data describing the space-time pattern of diseaseare increasingly available as the installed base of Geographic Information Systems increases. The resolution of these data often can support inquiries seeking to determine whether the pattern of cases has a geographic orientation. Once quantified, knowledge of such directional effects can be used to target intervention and control strategies. The methods described in this paper quantify directional effects and are expected to be used increasingly as data describing the space-time pattern of disease becomes commonly available.

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Internal Comparisons do not always Control for the Healthy Worker Effect. G. S. Wilkinson,* H. Morgenstern (University of Texas Medical Branch, Galveston, TX 77555 and University of California Los Angeles School of Public Health, Los Angeles, CA 90024).

The healthy worker effect is a selection bias that is often present when an employed population is compared with an external reference such as the U.S. population. This type of comparison results in underestimates of the relative rate of disease occurrence in the employed population. One way to eliminate or reduce the healthy worker effect is to conduct internal comparisons of exposed with unexposed subjects. Often subjects who were not monitored for exposure are defined as unexposed because they presumably had little potential for exposure. Defining unmonitored subjects as unexposed may introduce a selection bias which is another form of the healthy worker effect. In a study of mortality among nuclear workers, age-year adjusted mortality rates were found to differ for workers who were not tested for plutonium compared with workers who were tested but who had plutonium uptakes of < 2 nCi. For example, age-year adjusted rates per year for the blood and lymph cancers were 25.0 among untested workers, 2.1 for tested workers with plutonium uptakes < 2 nCi, and 27.2 for tested workers with plutonium uptakes of 2 nCi. Adjusted rates for all causes of death and for all cancers also differed with untested workers having the highest rates followed by those with uptakes < 2 nCi, whereas those with 2 nCi uptakes had the highest rates. These data suggest that the use of internal comparisons will not always guarantee elimination of a selection bias when unmonitored workers are used as a reference or when they are combined with monitored but unexposed subjects. Whenever possible, internal comparisons should be restricted to only those who were tested for exposure to enhance comparability of exposed and unexposed subjects.

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Vital Status Ascertainment through the Files of the Department of Veterans Affairs and the Social Security Administration. C.M. Mahan,* W.F Page, H.K. Kang (Department of Veterans Affairs, Washington, DC 20036).

Many investigators have used the Department of Veterans Affairs Beneficiary Identification and Records Locator Subsystem (BIRLS) to ascertain vital status in their epidemiological studies of veterans. With the passage of the Omnibus Budget Reconciliation Act of 1981 which reduced death benefits to veterans, funeral directors no longer have the same incentive to inquire about veteran status of the deceased. The present study was designed to assess the completeness of death reporting to the BIRLS file since passage of the act, during two time periods 1982 and 1987, and to the Social Security system. We conclude there is no downward trend in death ascertainment since enactment of the law. Furthermore when data obtained from the BIRLS system is supplemented with data from the Social Security Administration's Master Beneficiary Record, 96.3% of deaths are identified. There is no difference in deaths identified for those who served in Vietnam versus those who did not serve with 98.3% and 95.2% of deaths identified, respectively. When these combined sources are used, mortality ascertainment is not affected by year of death, 1982 versus 1987, branch of service, race, rank, underlying cause of death or state of death. Since one out of three adult males is a veteran, these results have important implications for mortality studies of the U.S. male population. Veteran research is of value to both veterans and nonveterans. Findings from research on veteran groups may be generalizable to certain groups of the general population with similar exposures or experiences.

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Underascertainment of Deaths Using the Social Security Administration Death Master File. T. Schnorr,* K. Steenland (National Institute for Occupational Safety and Health, Cincinnati, OH 45226).

In 1988 the Social Security Administration (SSA) began providing access to data on deceased individuals in the SSA Death Master File. Prior to that date, different and more complete data on vital status were provided to researchers. Completeness of the SSA Death Master File was examined by comparing the number of recorded deaths with those in the U.S. Vital Statistics records and by searching the SSA Death Master File for known decedents from seven cohorts which were followed for vital status prior to the change in the SSA procedures for providing death information. These data show that the SSA Death Master File missed 46% of U.S. deaths since 1940 and 95% of U.S. deaths from 1940-1960. In the cohort studies, the SSA Death Master File missed 25% of the deaths known to us from either the National Death Index (NDI) or SSA record searches prior to 1988. The greatest underascertainment occurred in the earlier decades. After restricting deaths to those determined from SSA Death Master File and the National Death Index, the two most commonly used sources of death information by U.S. researchers, re-analysis of two cohorts resulted in 20-35% decreases in both standardized mortality ratios (SMRs) and dose-response trends. The current SSA Death Master File is inadequate for vital status determination. This under-ascertainment of deaths will affect primarily cohorts recently assembled in which a substantial number of deaths occurred prior to the availability of NDI data in 1979. In studies in which exposure increases mortality, the effect of exposure may be missed or underestimated due to this underascertainment.

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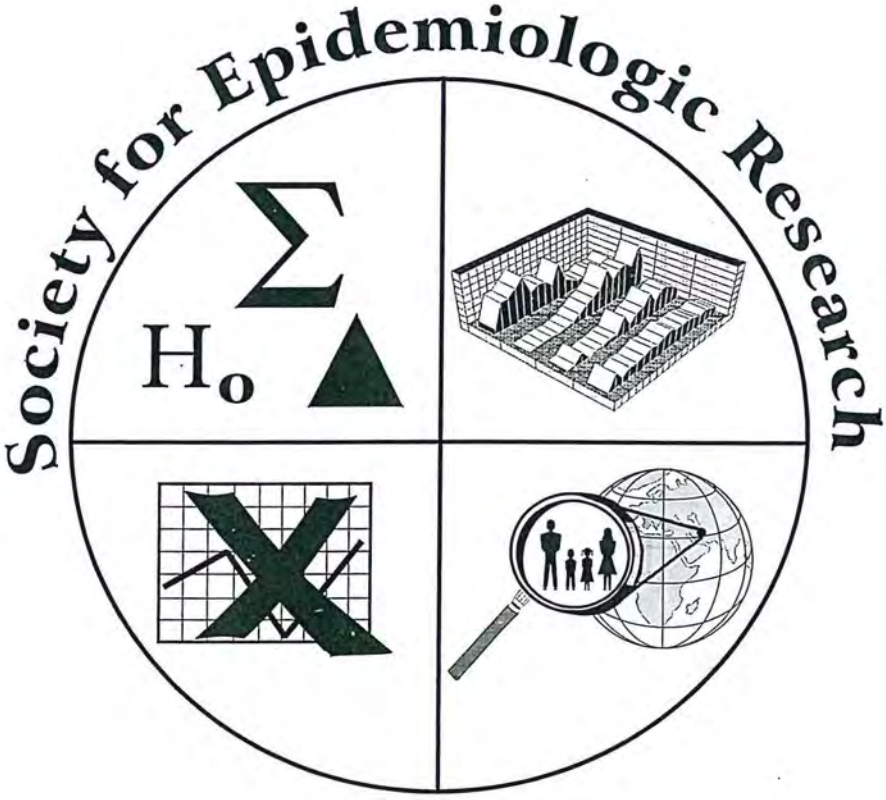

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