

# STATISTICAL PROBLEMS AND STRATEGIES IN ENVIRONMENTAL EPIDEMIOLOGY

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## 1. Introduction and definitions

The purpose of this contribution is to outline a series of problems encountered mostly in work on air pollution health effects and to a lesser extent in studies on health effects of water pollution, and of noise, as well as in the field of chronic disease epidemiology. The presentation is in terms intended to help design statistically satisfactory studies of the association of environmental factors with the well being of human populations.

This report is in three parts, general problems in environmental epidemiology, prototypical problems, and statistical strategies. Emphasis is placed on problems and strategies, rather than on the critical evaluation of results. The critical evaluation of results in terms of well planned research is the essence of scientific analysis in the field, and not necessarily the introductory material which this article essentially treats.

“Environmental epidemiology” is a subdivision of epidemiology, deriving historically from chronic disease epidemiology. The derivation is traced in a previous paper [9]. The main fallout of significant contributions of chronic disease epidemiology to health appears to be in the identification and better management of environmental factors; it was this plus the experience with studying the components of chronic respiratory disease morbidity, including symptoms of cough, shortness of breath, and alterations in respiratory function, which led to the conviction that the association of environmental factors could be studied with such health parameters, even though the study of such parameters was not necessarily equivalent to the study of the epidemiology of disease. Accordingly environmental epidemiology does not depend only on the determination of the presence or absence of a disease, but may include the alteration of health associated with environmental exposures.

There are four essential requirements for the conduct of effective work in environmental epidemiology. These are: (1) a suitable set of statistical strategies; (2) the capacity to design, carry out, and report the necessary procedures for dependable research; (3) access to populations of sufficient size and appropriate characteristics for study; and (4) an adequate support base in resources and in personnel for carrying out the necessary work. This paper and this meeting are