SECOND EDITION

SURVEY METHODS IN COMMUNITY MEDICINE

J. H. Abramson

CHURCHILL LIVINGSTONE

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AN INTRODUCTION TO EPIDEMIOLOGICAL AND EVALUATIVE STUDIES

J. H. Abramson
Professor of Social Medicine
The Hebrew University-Hadassah Medical School
Jerusalem

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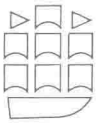

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Survey Methods in Community Medicine

To Sidney L. Kark

Preface

The purpose of this book is to provide a simple and systematic guide to the planning and performance of investigations concerned with health and disease and with health care, whether they are studies designed to widen the horizons of scientific knowledge or whether they have more directly practical aims, such as the provision of information needed as a basis for immediate decisions and action. It is not a compendium of detailed techniques of investigation or of statistical methods, but an ABC to the design and conduct of studies.

For this new edition the text has been thoroughly revised and somewhat enlarged; three chapters have been added. The main topics that are dealt with in more detail than in the first edition are the planning of evaluative studies, methods of analysing data, and problems in interpreting the findings of a study. Mention is made of commonly-used statistical indices and methods (mainly in footnotes), so that the reader who is unschooled in statistics can, if he so wishes, acquire at least a nodding acquaintance with these techniques. All technical terms are included in the index.

It is hoped that the book will be helpful to doctors and others planning investigations of groups and populations, such as medical surveys, comparisons of cases and controls, prophylactic and therapeutic trials, studies of the use of medical services, and other epidemiological and evaluative research. While the emphasis is on investigations in community medicine, the book may be found useful in the planning of other kinds of medical and public health research.

Despite the title, consideration is given to experimental as well as to survey methods. The more correct title of *Research Methods in Community Medicine* was avoided in order not to repel readers who, while they are interested in conducting investigations aimed at pragmatic purposes, conceive of 'research' as an ivory-tower activity far removed from their own mundane activities.

Jerusalem, 1979 J.H.A.

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First steps

The purpose of most investigations in community medicine, and in the health field generally, is the collection of information which will provide a basis for action, whether immediately or in the long run. The investigator perceives a problem which, in his view, requires solution, decides that a particular study will contribute to this end, and embarks upon the study. If he is blessed with a creative turn of mind and a modicum of luck, and if he plans his study soundly, the findings may well be of wide scientific interest. If he is less inspired, but selects a problem of practical importance, and if he plans his study soundly, the findings will be useful ones, though of less wide interest. If he concerns himself with a problem without theoretical or practical significance, his findings may serve no end but self-gratification; only in this instance may sound planning be unnecessary.

Before planning can start, a problem must be identified. It has been said that 'if necessity is the mother of invention, the awareness of problems is the mother of research'.[1] The investigator's interest in the problem may arise from a concern with practical matters or from intellectual curiosity, from an intuitive 'hunch' or from careful reasoning, from his own experience or from that of others. Inspiration often comes from reading, not only about the topic in which the investigator is interested, but also about cognate topics. An idea for a study on alcoholism may arise from the results of studies on smoking (conceptually related to alcoholism, in that it is also an addiction) or delinquency (both it and alcoholism being, at least in certain cultures, forms of socially deviant behaviour).

While the main purpose is to collect information which will contribute to the solution of a problem, investigations may also have an educational function, and may be carried out for this purpose. A survey can stimulate public interest in a particular subject (the interviewer is asked: 'Why are you asking me these questions?'), and can be a means of stimulating public action. A community self-survey, carried out by participant members of the community, may be set up as a means to community action (but such surveys cannot usually collect very accurate or sophisticated information).

First steps

1. Clarifying the purpose
2. Formulating the topic

The first step then, before the study is planned, is to clarify its purpose — the 'why' of the study. (We are not speaking here of the researcher's psychological motivations — a quest for prestige, promotion, the gratifications of problem-solving, etc. of which he may or may not be aware, and is sometimes better off unaware). Is the purpose, for example, to obtain information which will be a basis for a decision on the utilization of resources, or is it to identify persons who are at special risk of contracting a specific disease in order that preventive action may be taken; or to throw light on a specific aspect of aetiology; or to educate the public about defined aspects of infant feeding, etc.? If an evaluative study of health care is contemplated, is the motive a concern with the welfare of the people who are served by a specific practice, health centre or hospital, or is the main purpose to see whether a specific treatment or kind of health programme is good enough to be applied in other places also? The reason for embarking on the study should be clear to the investigator. In most cases it will in fact be clear to him from the outset; but sometimes the formulation of the problem to be solved will be less easy. In either instance, if an application is made for facilities or funds for the study he may have to describe this purpose in some detail, so as to justify the performance of the study. He will need to review previous work on the subject, describe the present state of knowledge, and explain the significance of the proposed investigation. This is the 'case for action'.

Preconceived ideas introduce a possibility of biased findings, and the researcher should be honest with himself in clarifying his purposes. If he proposes to study a health service because he thinks the service is atrocious, and he wants to collect data that will help him to condemn it, he should subsequently take special care to ensure objectivity in the collection and interpretation of information. In such a case he would be well advised to 'bend over backwards' and consciously set out to seek information to the credit of the service.

With a clear purpose in mind the investigator can formulate the topic he proposes to study, in general terms. In many cases this is easily done and almost tautological. For example, if the reason for setting up the study is that infant mortality is unduly high in a given population and there is insufficient information on its causes for the

planning of an action programme, the topic of the study can be broadly stated as 'the causes of infant mortality in a defined population in a given time period'. If the reason for the investigation is that health education on smoking has been having little effect, and that it is considered that certain new methods may be more effective, the investigation will be a comparative study of defined educational techniques for the reduction of smoking.

In other instances the formulation of the topic may be less easy, since the researcher may have difficulty in deciding precisely what study is needed to solve the research problem, taking account of practical limitations. As an illustration, a problem arose in a tuberculosis programme; the extent of public participation in X-ray screening activities fell short of what was desired, and there were indications that the tuberculosis rate was higher among persons who did not come for screening than among those who did. It was decided to carry out an investigation in order to obtain information which would help to improve the situation, but considerable thought was required before a study topic could be formulated. The alternative topics were the reasons for nonparticipation and those for participation. For a variety of reasons it was decided that the latter approach would be more useful.[2] As a further example, a researcher wishing to discover whether there is a relationship between infectious mononucleosis and the subsequent development of Hodgkin's disease has two alternative approaches: to determine the previous occurrence of infectious mononucleosis among patients with Hodgkin's disease, or to determine the subsequent occurrence of Hodgkin's disease among patients with infectious mononucleosis. His decision will be based, *inter alia*, on such considerations as the ease and accuracy with which the respective information can be obtained.

At this early stage, the decision on the topic of study may be regarded as a provisional one. When planning and the pretesting of methods get under way, it frequently happens that unpredicted difficulties come to light, requiring a change in the topic or even leading to a decision that there is no practical way of solving the research problem.

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Types of investigations

Before going on to discuss the detailed planning of an investigation, we must explain a number of terms commonly used in referring to various types of investigations.

Surveys and experiments

Investigations may be divided into surveys and experiments. Since a survey is most easily defined negatively, as 'a nonexperimental investigation', we will start by defining an experiment.

An *experiment* is an investigation in which the researcher, wishing to study the effects of exposure to or deprivation of a defined factor, himself decides which subjects (persons, animals, towns, etc.) will be exposed to, or deprived of, the factor. If he compares subjects exposed to the factor with subjects not exposed to it, he is conducting a *controlled experiment;* the more care he takes to ensure that the two groups are as similar as possible in other respects, the better controlled is his experiment (see pp. 51–56). In a controlled experiment on the effect of vitamin supplements, for example, he will himself decide who will and who will not receive such supplements; in a survey, by contrast, he would compare persons who happened to be taking vitamin supplements with persons not taking such supplements. If in his experiment the researcher tries to enhance objectivity by making his observations of effects without knowing who has had supplements and who has not, this is a *'blind' experiment.* If, in addition, the subjects themselves do not know whether they have had vitamins (which might be achieved by the use of 'dummy' tablets), it is a *'double-blind' experiment.* In a double-blind experiment to test the efficacy of prayer, some patients were prayed for and others not; to avoid biased findings, the patients were not told of the prayers, and the physicians appraising their clinical progress did not know for which cases divine intercession had been requested.[1]

For a variety of reasons, a study may fall short of being a true experiment. The researcher may not, for example, have the power to decide who will be exposed to or deprived of the factor under study; or

there may be no controls, or no assurance that the experimental and control groups are similar. Such studies may be referred to as *'quasi-experiments'*.[2]

In experiments that test the benefits or hazards of a treatment or other procedure (*clinical trials*), the need to decide to whom the treatment will be administered and from whom it will be withheld raises ethical problems.[3] However beneficial the experiment may be to humanity at large, it may prove harmful to either the experimental subjects or the controls. The subjects should therefore know of their inclusion in the experiment and its possible consequences, and give their free consent. In some countries 'informed consent' is essential, unless there are valid contraindications, such as qualms about alarming patients with possibly fatal illnesses with doubts about effective treatment. Bradford Hill has stated that in this ethical field there is only one Golden Rule, namely 'that one can make no generalization . . . the problem must be faced afresh with every proposed trial'.[4] Objections usually fall away if controls are given a good established treatment and there is genuine doubt about the relative value of the new treatment. Today many institutions have ethical committees that review and sanction proposed studies of human subjects. It has been pointed out that there are also ethical problems in *not* performing a clinical trial, since this may lead to the use of an ineffective or hazardous treatment,[3] and in the *way* the trial is performed — 'Scientifically unsound studies are unethical. It may be accepted as a maxim that a poorly or improperly designed study involving human subjects — one that could not possibly yield scientific facts (that is, reproducible observations) relevant to the question under study — is by definition unethical. Moreover, when a study is in itself scientifically invalid, all other ethical considerations become irrelevant. There is no point in obtaining "informed consent" to perform a useless study.'[5]

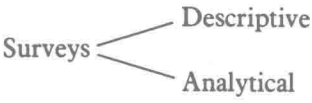
Manipulations of animals or human beings are not an essential feature of an experiment. An investigator who studies bacteriuria in pregnancy by needling the bladders of pregnant women through their abdominal walls in order to collect urine for examination is conducting a survey, not an experiment.

The term *natural experiment* is often applied to circumstances where, as a result of 'naturally' occurring changes or differences, it is easy to observe the effects of a specific factor. For example, if a famine strikes one region of a country, this may facilitate the study of the effects of starvation. 'Natural experiments' are surveys, not experiments. They may also be termed 'experiments of opportunity'.

As stated above, a *survey* is an investigation in which information is

systematically collected, but in which the experimental method is not used. To stress this feature, the term 'observational study' is sometimes used — a term which is better avoided, both because observational techniques are used in experiments, and because techniques other than observation are used in surveys.

Types of investigations



Surveys may be descriptive or analytical. A *descriptive survey* sets out to describe a situation, e.g. the distribution of a disease in a population in relation to sex, age and other characteristics. An *analytical survey*, or explanatory survey, tries to explain the situation, i.e., to study the determinative processes (Why does the disease occur in these persons? Why do certain persons fail to make use of health services? Can the decreased incidence of the disease be attributed to the introduction of preventive measures?). This is done by formulating and testing hypotheses that may help to explain the situation; these hypotheses may be based, *inter alia*, on inferences drawn from the results of previous descriptive surveys. The distinction between a descriptive and analytic survey is not always clear, and a single survey can combine both purposes. A broad descriptive survey may be so planned, for example, that it also provides information for the testing of a specific hypothesis. An analytical survey may be used to explain a local situation in a specific population in which the researcher is interested, or to obtain results of more general applicability, e.g. new knowledge about the etiology of a disease.

Surveys, whether descriptive or analytic, are sometimes usefully categorized as cross-sectional or longitudinal. A *cross-sectional* ('instantaneous', 'static', 'prevalence', 'naturalistic') survey provides information concerning the situation at a given time, while a *longitudinal* ('follow-up', 'dynamic') survey provides data concerning more than one point in time. A study of children's weight growth, for example, may be performed either by comparing the weights of children of different ages, each child being weighed once (cross-sectional), or by comparing the weights of the same children as

they grow older, each child being weighed more than once (longitudinal). A longitudinal study in which a group of individuals is followed up for some time, particularly with reference to their health status, may be referred to as a *cohort* ('incidence') study. Note that the term 'cohort study' is also used with other connotations; this use should not be confused with 'cohort analysis'[6]. If the group comprises persons born in a defined period, the study is a *birth-cohort study*.

Epidemiological studies

Epidemiology[7] is the science concerned with the occurrence, distribution and determinants of states of health and disease in human groups and populations. Epidemiological studies, therefore, are concerned with the health of population groups. They may deal with the distribution of diseases or health-relevant characteristics in groups (descriptive surveys) and with the factors influencing this distribution (analytic surveys and experiments).

Epidemiological studies have three main uses. First, they serve a diagnostic purpose. Just as the doctor caring for an individual requires a diagnosis of the state of health of his patient, so the doctor or other health worker caring for a community (or other defined group of people) requires a *community diagnosis*[8] or *group diagnosis*. Epidemiological studies provide the required information about the determinants of health in this specific community or group. Secondly, epidemiological studies can throw light on etiology and on the natural history of disease. Such knowledge is of more general interest, and has far wider applicability than in a specific local situation. And thirdly, epidemiological studies contribute to the evaluation of health care both in specific local situations (How well is this tuberculosis case-finding programme working?) and in general (Does this vaccine prevent disease?).

All three of these uses have a clear relevance to community medicine. Epidemiological studies have an obvious role in answering what Kark has called the cardinal questions that face practitioners of community medicine:[9]

What is the state of health of the community?

What are the factors responsible for this state of health? — why and how did it happen?

What is being done about it by the community and, more specifically, by the health service system?

What can be done, and what is the expected outcome?

What measures are needed to continue health surveillance of the community and evaluate the changes taking place?

Surveys of population health, it has been said, 'can be both the alpha and omega of health care by being the vehicle for both the

discovery of need and the evaluation of the outcome of care and treatment'.[10]

Epidemiological and evaluative studies lend an organized structure to the practice of community medicine, and can be aptly referred to as *SHAPE* activities (Surveillance of Health And Programme Evaluation).

Types of epidemiological studies

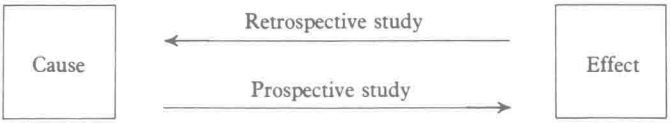
1. Descriptive surveys
2. Analytic surveys
   Group-based
   Individual-based — Cross-sectional / Retrospective / Prospective
3. Experiments: intervention studies

Descriptive epidemiological surveys may be cross-sectional or longitudinal. They may be based on vital statistics or other data obtained in a routine manner, or on special surveys.

Analytic studies may be group-based or individual-based. *Group-based* analytic studies are comparisons of groups of populations; they have been called studies of 'groups of groups'.[11] For example, we can take a group of countries and compare them with respect to their coronary heart disease rates and their average consumption of animal fats or dietary fibre. In the same way we can compare data for the same population at different times, e.g. by analysing the changing incidence of schizophrenia in relation to measurable changes in the social environment. Inferences drawn from such comparisons are often misleading, and are usually regarded as hints rather than definite conclusions. If we find that populations with a high consumption of beer tend to have a high death rate from cancer of the rectum,[12] this does not necessarily mean that *individuals* who drink more beer are prone to develop this tumour; this should be tested in an individual-based survey, or maybe in a rather pleasant experiment.

Individual-based analytic surveys are of course, like all epidemiological studies, surveys of groups; but they utilize

information about each individual in the group. These surveys are of three types, which sometimes occur in hybrid forms: cross-sectional, retrospective and prospective. In their simplest form, such surveys are performed to test a hypothesis that a specific factor ('cause') is related to a specific disease ('effect'), by measuring each individual's exposure to the cause and the presence of the disease in each individual. In a *cross-sectional study*, cause and effect are measured simultaneously, and both measurements relate to the same point in time; a study of the relationship between body build and hypertension is an example. A *retrospective study* is 'backward-looking', in that it starts with the effect and goes back to the postulated cause; that is, persons with the disease are compared with controls free of the disease, to determine whether they differ in their past exposure to the causative factor. A *prospective study*, on the other hand, starts with the cause and goes forward to the effect; persons who are, respectively, exposed and not exposed to the factor are followed up to determine the subsequent development of the disease; this is a form of cohort study. A hypothesis that influenza during pregnancy is a cause of congenital anomalies could be tested retrospectively by comparing the illness histories of mothers of malformed and normal babies, or prospectively by comparing the subsequent occurrence of malformations among the offspring of women who do and do not have influenza during pregnancy. Both these investigations are longitudinal surveys, since they are based on data referring to more than one point in time.



The terms 'retrospective' and 'prospective' unfortunately engender much confusion, since these connotations differ from the everyday meanings of the words. A prospective study is not necessarily a study carried out in the future; it can be carried out on records made in the past — for example, a comparison of the mortality experience of obese and nonobese persons, based upon their weights when they originally took out life-insurance policies, and their survival since then until the present; a study of this sort may be called a *historical prospective study*.[13] On the other hand, if a researcher freezes large numbers of samples of blood serum, with the intention of performing virus antibody tests on specimens belonging to persons who subsequently develop a specific neoplasm, for comparison with stored specimens taken from control persons who do not develop the neoplasm, he is