

## Public health epidemiology

### Clinical epidemiology versus public health epidemiology

Epidemiology is growing, and so is the need for developing subspecialties. One subspecialty which has achieved a certain prominence is clinical epidemiology. The term had already been coined in 1938,<sup>1</sup> and although it has many different interpretations,<sup>2</sup> the growing number of textbooks providing an introduction to the area shows that it has become firmly rooted, both within epidemiology and within clinical medicine.<sup>3-5</sup> According to Feinstein, “clinical epidemiology is concerned with studying groups of people to achieve the background evidence needed for clinical decisions in patient care”.<sup>5</sup>

Where does that leave the rest of epidemiology? Historically, epidemiology has always been closely connected to public health, and a lot of epidemiological work still implicitly or explicitly aims at informing public health decisions. The title of the *Journal of Epidemiology and Community Health* is a clear illustration of this link – and of the difficulties which public health practitioners and researchers have encountered in sticking to one name for their field of work. According to a recent and widely used definition, public health is “the science and art of preventing disease, prolonging life and promoting health through the organized efforts of society”.<sup>6</sup> It is the health of communities, not of individual patients, which is being served by public health practitioners. Public health interventions usually have a collective, society-wide character.<sup>7,8</sup>

The time has come for the oldest subspecialty in epidemiology to carry its own name – public health epidemiology. It is the branch of epidemiology which, in the short or long term, aims to inform public health decisions. Public health epidemiology encompasses a wide variety of study areas: much of the work which is currently being done under the headings of infectious disease epidemiology, social epidemiology, occupational epidemiology, environmental epidemiology, and nutritional epidemiology, for example, is highly relevant to public health, and it is quite obvious that epidemiologists working in these areas will feel the need to organise themselves in “sub-specialties”. Nevertheless, the umbrella of public health epidemiology also needs to be asserted, and it is therefore to be welcomed that the European Public Health Association has decided to establish a Public Health Epidemiology Section.

### The distinctive features of public health epidemiology

One way of testing the usefulness of a subspecialty labelled public health epidemiology is to ask whether it needs its own (postgraduate level) textbook. If public health epidemiologists could learn their trade from the available introductions to general epidemiology (such as<sup>9-14</sup>) the “new” subspecialty development of this would not seem to be so urgent. The problem with the available general

introductions is, however, that those which do pay attention to public health applications<sup>9-11</sup> are too simple for postgraduate level education, whereas those aimed at the right level<sup>13,14</sup> do not emphasise sufficiently aspects which are of relevance to public health. A number of distinctive features of public health epidemiology do suggest the need for a specialised textbook. These derive from its subject matter, which itself is determined by what happens in public health. Without any attempt at being exhaustive, two groups of distinctive features will be discussed – one regarding specific techniques and one regarding general research designs.

Public health epidemiologists use many specific techniques which are not well covered by the available postgraduate level introductions to general epidemiology.<sup>13,14</sup> Studying the health of communities requires a working knowledge of a number of techniques originally developed by demographers, such as life table analysis and age-period-cohort analysis. Specific methods of exposure measurement are also necessary. Public health interventions frequently aim at a primary or secondary prevention of health problems. In order to develop successful primary prevention programmes, knowledge of the determinants of these health problems is needed. Each class of determinants poses different challenges with regard to exposure measurement. Methods for measuring the exposure to social factors, occupational factors, environmental contamination, and nutritional risk factors, for example, have been and are being refined to such an extent that a training in the general principles of epidemiology is no longer sufficient to become a successful researcher in these areas. The same applies to secondary prevention: assessing the benefits of screening is an extremely complicated enterprise for which new epidemiological techniques, such as computer models, have been developed. Public health is also concerned with the delivery of health care services, and epidemiological approaches to health services research have incorporated some of the advances of other disciplines active in this area, such as medical sociology (for example, for studying the determinants of medical consumption) and health economics (for example, for assessing the cost effectiveness of interventions).

### Research design in public health epidemiology

In addition, and perhaps more fundamentally, public health epidemiology has its own research designs. Public health deals with the health of communities, and it is only logical that public health epidemiology should use research designs which enable the researcher to study health determinants and health effects at the level of whole communities. This will sometimes (not always) require aggregate level studies, that is, studies in which groups of people instead of individuals are the units of analysis. The two epidemiological research designs which do indeed focus on groups are the ecological study and the community intervention trial. Ecological studies are observational studies in which groups of people (families, neighbourhoods, regions, countries)

form the unit of analysis, and community intervention trials are their experimental counterpart.

General epidemiological textbooks pay very little attention to these research designs. The usual taxonomy of epidemiological research designs assumes implicitly that all research should be done at the individual level, and distinguishes between observational studies (further subdivided into cross sectional, case-control, and cohort studies) and experimental studies (exemplified by the randomised controlled trial). The ecological study does not fit clearly into this taxonomy, and therefore is either not included at all,<sup>11</sup> is presented outside the basic taxonomy as a form of “descriptive” study,<sup>10,12</sup> or is included as a rather embarrassing member of the family of observational study designs.<sup>13,14</sup> Community intervention trials are frequently mentioned only in passing.<sup>12-14</sup> For public health epidemiologists, a more useful taxonomy would be one in which a distinction is first made between individual level and group level studies, and then a further subdivision within each class is made between observational and experimental studies. In the case of group level studies, the observational design then is the ecological study, and the experimental design is the community intervention trial.

Both designs are essential to public health epidemiology. The ecological study is usually regarded as an inferior study design, the results of which are threatened by the so called ecological fallacy,<sup>13,14</sup> defined as “the failure of aggregate level associations to properly reflect individual level associations”.<sup>15</sup> Recent methodological work has shown that this is a gross oversimplification.<sup>16,17</sup> In public health, not all research questions are framed in individual level terms. For example in a study of the health effects of unemployment or low socioeconomic status one might also be interested in the health effects of living in a neighbourhood with high unemployment or a high proportion of deprived households. Such contextual effects would go undetected in individual level studies. The community intervention trial, likewise, is an essential research tool. Many public health interventions (for example, fluoridation of drinking water, vaccination leading to herd immunity, health education using mass media) are aimed at groups as a whole instead of at individuals. In these circumstances, an individual level randomized controlled trial is simply impossible: no potential control subjects are available within the same community. The community intervention trial then is the appropriate research design, which thanks to a number of methodological innovations in recent years has become increasingly powerful.<sup>18,19</sup>

## By way of conclusion

Many epidemiologists still assume that epidemiology is by nature oriented towards public health applications. They have the history of epidemiology on their side, but not its future. Clinical epidemiology is rapidly developing into a core medical discipline, and quite rightly so. The quantitative analysis of the health problems of patients will prove to be extremely useful in increasing the effectiveness and efficiency of medical care. The time has come to recognize that public health epidemiology is simply a different branch which needs to assert its own identity. A textbook of public health epidemiology would be a good first step.

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