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Preface

Epidemiology is the basic discipline of public health research. Over the past few decades, it has provided the description and analysis of population health as a basis for public health forecasts and health policy. Moreover, modern epidemiology has become a respected academic discipline and has acquired a sound theoretical basis. Yet, for the epidemiologist working in everyday public health practice, an integrated view on the discipline is not easily available. This book aims to fill that gap and focuses on the role the epidemiologist can play in agenda setting, programme development, implementation and evaluation of interventions in public health practice. It aims to help epidemiologists to play their role in the public health arena of policy, practice and research.

Rooted in public health, modern epidemiology has developed clear concepts and methods to address bias and precision, confounding and effect modification and internal and external validity. Many epidemiologists have a medical background by training, relevant to their role in clinical practice. Therefore, translation of the epidemiological concepts and methods into prevention and health promotion in public health practice, deserves attention in training and education. To this end, the book is built around the challenging concept of the public health cycle, a roadmap to locate the contributions epidemiology can bring to public health.

Epidemiology became an established discipline in the 1960s and 1970s when the first professors in epidemiology were installed at Dutch universities. Inspired by developments in epidemiology in the US and stimulated by public means and charities, epidemiology in the Netherlands began growing steadily in the 1980s, mainly at medical universities. In this period, the Netherlands Epidemiological Society was established and now totals more than 1,400 registered epidemiologists. The growth of epidemiology was further favoured by the Public Health Act 2008 which was preceded by the Collective Prevention Act (1989), that required community health services to employ epidemiologists. In 2006, 'ZonMw', the Netherlands Organisation for Health Research and Development, initiated a programme to establish Academic Collaborative Centres Public Health to further develop the public health profession by joining academic and practice-based research and training. Many authors of this book are involved in this programme and they enthusiastically joined forces to share their expertise.

Of course, this book is necessarily biased by the experience of its authors. At the same time, this increases the relevance for epidemiologists in similar settings. The book does not specifically address the role community health services play in acute disasters or infectious disease management, such as epidemics of H1N1 or Q-fever; it puts the emphasis on the contribution of epidemiology to prevention of lifestyle-related diseases as part of the 'art and science' of public health. The issues addressed in this book are not unique to the Netherlands. On the contrary, in order to benefit public health, a strengthening of the interaction between academic research and public health practice is of lasting global relevance. Based on Dutch experiences, the book addresses this interaction from an epidemiologic perspective for a western European audience. We hope the framework provides a basis for further development of research and practice to benefit public health.

Ferd Sturmans

Emeritus Professor of Epidemiology

Preface to the second edition

It has been more than six years since the first edition of the book *Epidemiology in Public Health Practice* was published. The book is extensively used in a variety of courses for (future) public health professionals and researchers. Based on the feedback of students over the years and lively discussions between practitioners and researchers the content of the book is revised.

What has changed? In the book as a whole, the focus has shifted from the national context in the first edition, in which the experiences of the newly established Dutch Academic Collaborative Centres Public Health were central, to an international context in the second edition. With this shift, we aim to make the book more attractive to a wider audience. In Part II and III more attention is paid to proper alignment with the needs of practitioners and policy makers. Essential to research in practice is that it requires the ability to deal with influences of an ever changing context.

The needs assessment in Chapter 5 and 6 of Part II is more clearly described along the four categories of the data-information-knowledge-wisdom hierarchy. This data transfer to contextualised knowledge facilitates knowledge utilisation in policymaking. In Chapter 9, the

quasi-experimental study designs are updated and natural experiments are introduced here. Chapter 10 emphasizes more particularly the importance of a process evaluation and describes the systematic data collection on the implementation process of public health interventions in a real-world context. Finally, Chapter 11 is completely revised and describes the analysis of effects, costs and process and the integration of evaluation findings.

Chapter 12 in Part III is an illustration of the institutional architecture of public health for the Netherlands that has drastically changed in the past few years. Chapter 13 and 14 on policy and health promotion, two adjoining areas epidemiologists work closely together with in the public health cycle, are updated and extended with useful theories and methods.

New insights and experiences are brought together in this second edition that will be published on paper and online. We hope that this book will contribute to fruitful interdisciplinary collaboration in the public health domain and that many students and professionals benefit from it in their future career or daily work.

Annemien Haveman-Nies
Wageningen, March 2017

Key messages

- Epidemiology, as we know it today, was developed by those who were eager to learn about contemporary health issues and who were willing to act accordingly, in the times and places in which they lived.
- Epidemiology has developed from social medicine and statistics, and can be characterised by 'population thinking' and 'group comparisons'.
- Historical descriptions of epidemiology distinguish a pre-formal phase, early epidemiology, classical epidemiology and the current phase of modern epidemiology.
- Modern epidemiology has developed formalised theories that integrate study design with methods of data analysis, descriptive statistics and causal thinking in biomedical sciences.
- In the evolution of epidemiology, descriptive studies and interventions have gone hand in hand with unravelling aetiology and conducting preventive actions, successively relevant to infectious diseases, nutritional deficiencies and chronic disease aetiology.
- The dominance of lifestyle-related health issues in Western societies calls for the further development and application of descriptive and aetiological studies in order to improve and test the effectiveness of preventive and health promoting strategies.
- To further develop public health epidemiology, professionals in this discipline require skills and expertise to integrate the local and (trans) national social context with the policies, practice and research in their local situation.

1.1 Introduction

This chapter provides a bird's eye view of the history of epidemiology. It highlights several historic figures and studies that made significant contributions to the evolution of epidemiologic thinking. In line with the title of Abraham Lilienfeld's booklet (Lilienfeld, 1980), 'times, places and persons' have interacted uniquely during the history of epidemiology and made significant contributions to the evolution of epidemiology in public health practice. Epidemiology and public health have common health objectives and interdependencies: they share partially complementary

History of epidemiology knowledge. Section 1.2 is not meant to be a comprehensive history of epidemiology but serves as a background for understanding the current challenges in public health practice from an epidemiologic perspective.

State of health Subsequently, Section 1.3 outlines the main features of the state of health in the present-day Western world, as brought about by environmental and social factors that have conditioned individual lifestyles and health. It is likely that the search for the causes and prevention of human diseases will remain an important driving force for epidemiologists in public health practice (Morabia, 2004). In Section 1.4 the implications for the role of the epidemiologist working in the context of a public health organisation are outlined.

1.2 Times, places and persons in the evolution of epidemiology

Epidemiology, ‘the study of what is upon the people’, is derived from the Greek terms *epi* (upon, among), *demos* (people, district) and *logos* (study, word, discourse), suggesting that it applies only to human populations. According to Morabia (2004) epidemiology is characterised by the combination of population thinking and group comparisons aiming to discover the determinants of human health. In the fifth century BC, Hippocrates was the first to suggest that the development of human disease might be related to the external as well as the personal environment of an individual and he coined the terms ‘endemics’ (for diseases usually found in some places but not in others) and ‘epidemics’ (for diseases that are seen at some times but not others). However, it was not until the middle of the 17th century that population thinking and group comparisons were combined. From that point onwards, the historical development of epidemiology spans almost four centuries and is best described as slow and unsteady. The evolution of the definitions of epidemiology reflects its process of differentiation from other scientific disciplines (Morabia, 2004). Along with contemporary health issues, the set of methods (study design) and concepts (measures of disease occurrence, confounding, interaction and bias) have evolved since the 17th century.

Initially, the relationship between the environment and human health was almost uniquely of concern to medical doctors, followed by public institutions that quantitatively counted the health phenomena in their states (‘state-istics’), and finally by biostatisticians and interdisciplinary scientists who developed a common theoretical ground for the study design and analysis. In line with Morabia (2004), the following sections describe

Evolution of epidemiology this evolution of epidemiology in four phases (pre-formal, early, classical and modern), that can be characterised by qualitative leaps in formalisation and abstraction of the methods and concepts. Biographical information obtained from Morabia (2004) and several other sources is used to illustrate these developments.

1.2.1 Pre-formal epidemiology

Definition of epidemiology In the pre-formal phase (Morabia, 2004), epidemiology was discovered intuitively by scientists, most of all physicians, but ‘epidemiologists’ themselves were still unclear about what epidemiology was. What we call epidemiology nowadays, developed in close interaction with health issues that emerged along with the social inequalities in growing cities in Western Europe or became apparent along with the exploitation of the overseas colonies, the predecessors of today’s urbanisation and globalisation. Social and environmental factors were investigated and recognised as relevant to the health of populations, often by persons with a background in contemporary medicine. John Graunt, William Farr and John Snow were Infectious diseases three key figures inspired by the occurrence of infectious diseases such as the plague and cholera epidemics in the 17th to 19th century in London.

In 1662, John Graunt, a professional haberdasher and serious amateur scientist, published his book entitled ‘Natural and Political Observations made upon the Bills of Mortality’ (Graunt, 1662), which may be considered as the first solid contribution to ‘epidemiology and public health statistics’. Kenneth J. Rothman, founder of the term ‘modern epidemiology’ has written a laudatory commentary on Graunt’s contribution: ‘With this book, Graunt added more to human knowledge than most of us can reasonably aspire to in a full career’ (Box 1.1).

In the 19th century, cholera was the infectious disease causing major health problems in the city of London. Although William Farr and John Snow had different views on the aetiology of cholera, John Snow built on the descriptive data provided by William Farr, which led him to support the hypothesis that cholera was waterborne and not airborne, as was still believed in those days.

William Farr qualified as a doctor in 1832 (Halliday, 2000). He gradually developed an interest in the field of medical statistics. Later he joined the General Register Office, where his primary responsibility was to collect medical statistics in England and Wales and to maintain the collected data. He contributed to the organisation of government data and he systematically

Box 1.1. Know your ancestors: Ken Rothman's appreciation of John Graunt.

'Graunt was the first to report that more boys than girls are born. He presented one of the first life tables. He reported the first time trends for many diseases, taking into account changes in population size. He described new diseases and noted others that seemed to increase over time only because of changes in classification. He offered the first reasoned estimate of the population of London, demonstrating its rapid growth and showing that most of the growth came from immigration. He proffered epidemiologic evidence refuting the theory that the plague spreads by contagion (he also refuted the notion that plague epidemics are coincident with the reign of a new king). He showed that the large population decreases in plague years were offset by large increases in births in subsequent years. He showed that physicians have twice as many female as male patients, but that more males than females die. He produced the first hard evidence about the frequencies of various causes of death. And, presaging our present-day paranoia, he tried to allay unwarranted anxiety about risks that were feared far out of proportion to their likelihood of occurrence. His recognition of the value of routinely collected data in providing information about human illness forms the basis of modern epidemiology' (Rothman, 1996).

Causes of death recorded the causes of death in England and Wales. These records helped the government to compare the mortality rates prevailing at different occupational levels for the first time. John Snow studied in York, worked as a surgeon in the mines, became a member of the Royal College of Surgeons of England, studied medicine in London and became a member of the Royal College of Physicians in 1850. Apart from his work on cholera, he developed an interest in the properties of ether, which at that time was newly adopted in America as an anaesthetising agent (Box 1.2).

Nutritional diseases Apart from variation of health over time (epidemics like cholera), the variation in space (endemics) became prominent to people who experienced widely different environmental conditions because they travelled the world. James Lind and Adolphe Vorderman provide illustrative examples. James Lind was the first to use an intervention study to discover the cause and prevention of scurvy. His work advanced the practice of preventive medicine and improved nutrition. Nowadays, among the lay public, vitamin C-rich food has become almost synonymous with 'healthy food'. Building on the epidemiological work of Adolphe Vorderman, Christiaan Eijkman, a Dutch physician, received the Nobel Prize for having established that beriberi was a nutritional disease, due to a deficiency of vitamin B₁ (Box 1.3).

So far, this section has emphasised the temporal and spatial variation of disease. Many of the key persons were medical professionals by training

3

Public health cycle as framework for public health professionals

Annemien Haveman-Nies and Maria Jansen

Key messages

- Notwithstanding the disconnections in work cycles of policy, practice and research, there are important similarities that create chances for collaboration.
- The main similarities are working towards a common goal, using a systematic approach and legitimating decisions. These similarities lay a powerful basis for collaboration in the four stages of the public health cycle.
- The public health cycle emphasises these similarities in a shared model for use by the three fields of policy, practice and research. The four stages of the public health cycle are: agenda setting, programme development, implementation and evaluation.
- Epidemiologists should work in an interdisciplinary way in all stages of the public health cycle to put health promotion and disease prevention on a higher level.

3.1 Introduction

In Chapter 2, the three work cycles of the professional activities within the fields of policy, practice and research are described. As stated in Chapter 2, the work cycles showed 13 disconnections, illustrating how the fields differentiate in, for example, their influence on the agenda setting process, use of theory and evidence in programme development and the average lifespan. Knowledge of these disconnections facilitates collaboration between policy, practice and research in the domain of public health, as all fields make use of the same information and working procedures, work with the same disciplines and organisations and target their goals at the same population. Based on the similarities, a common work cycle is presented in which the four prominent stages of the separate work cycles of policy, practice and research are integrated. In this chapter the shared model, entitled the ‘public health cycle’, will be introduced and characteristics will be described. Examples of activities within each stage of the cycle are given and collaboration processes are illustrated.

3.2 The public health cycle: a shared model for policy, practice and research

In this chapter the different work cycles of policy, practice and research will be integrated in one cycle, called the public health cycle (Figure 3.1). The public health cycle brings these fields together and can be used as a shared frame of reference which is recognised as such by professionals with different backgrounds. It emphasises that professional activities of policy makers, practitioners and researchers are related and acknowledges that they can work together on health promotion and disease prevention by using a shared way of working to achieve added value and quality improvement in public health. A shared model is an important condition, especially in the domain of public health, where the success of intervention programmes strongly depends on proper planning and good teamwork. Therefore, it is important to identify the joint characteristics of this public health cycle.

Common goal First of all, one of these joint characteristics is that the public health cycle is used for working towards a common goal. Policy makers, practitioners and researchers in the domain of public health have the same focus: the improvement of the health and well-being of all people. Although public health professionals have the same final goal, it is only sensible to admit

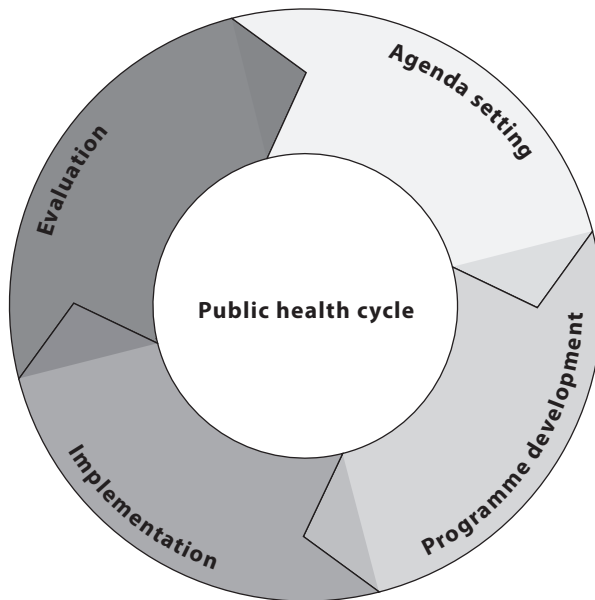


Figure 3.1. The public health cycle and its four stages.