Seven epidemiological steps in the public health cycle

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Key messages

- Several models exist for planning public health policies and programmes. Three important ones are: the Precede-Proceed model, the Five-Stage Community Organisation model and the Intervention Mapping model.
- These models provide a detailed insight into the processes that take place during the four stages of the public health cycle.
- Analysis of these models results in the following seven epidemiological steps that contribute to the public health cycle: conduct a needs assessment, support priority setting, formulate aims and objectives, construct a logic model, develop an evaluation plan, perform quality control and analyse processes and outcomes.

4.1 Introduction

In Part I of this book, the public health cycle is introduced and the contribution of the epidemiologist in each of the four stages is outlined. Due to growing interest in evidence-based public health, there is a great need for applied epidemiological methods. In Part II, these methods are presented as seven epidemiological steps placed along the public health cycle. The seven steps are identified based on an analysis of a variety of planning models that are applied in public health. First in Section 4.2, a selection of planning models is described in more detail. Subsequently, in Section 4.3, it is explained in what way epidemiology can contribute to the planning process. Then, for each step theories and concepts as well as traditional and more recent methods are described in Chapters 5 to 11. The epidemiological steps in the public health cycle illustrate how epidemiologists can contribute to agenda setting, programme development, implementation and evaluation, the four stages of the public health cycle. Moreover, by describing the epidemiological capabilities, strengths and limitations we hope to contribute to successful collaboration with other disciplines in the public health cycle.
4.2 Models for planning public health policies and programmes

Planning models

In the domain of public health many different planning models have been developed to guide the process from flagging up a public health issue to performing adequate actions to address these issues and reflect on their contribution to public health. These planning models cover several, and sometimes all, stages of the public health cycle. The word ‘planning’ refers to the systematic approach that all planning models have in common. Examples of these models are the public health nutrition cycle of Margetts (Margetts, 2004), the 7-stage planning and evaluation cycle of Ewles and Simnett (Ewles and Simnett, 2003), the Triple A planning cycle (AAA: assessment, analysis and action) used by e.g. UNICEF and governments (Margetts, 2004), the Precede-Proceed model of Green and Kreuter (2005), the Five-Stage Community Organisation model of Bracht (1999), and the Intervention Mapping approach developed by Bartholomew et al. (2006). These models have their roots in policy, practice and research and are composed for a wide variety of users and consequently elaborate on a specific part of the planning process. In this section three commonly used planning models are described. They each focus on different stages of the planning process and give a clear description of activities that are performed within each specific stage.

Firstly, the Precede-Proceed model has its basis in epidemiology and has incorporated knowledge from other disciplines, like health promotion and policy, over the years. It includes an extensive assessment of determinants of health that is connected with different evaluation levels. The strength of this model lies in the assessment and evaluation stage.

Secondly, the Five-Stage Community Organisation model has a basis in the social sciences. It emphasises community involvement and programme maintenance. Participation of community members and organisations is therefore integrated in every stage of the model as it is seen as a precondition for a sustainable and effective programme. The third planning model, the Intervention Mapping model, has its roots in health promotion. It was developed to guide the health promoter through all necessary steps for designing, implementing and evaluating an intervention. Intervention Mapping facilitates the creative process of developing a mix of intervention components to achieve desired outcomes. It emphasises the formulation of specific objectives by making use of theories of behavioural and social change which are particularly needed in the programme development stage. Below, these three models will be explained in detail. By combining
these three models, a complete picture of existing planning processes is obtained and the most common activities in the four stages of the public health cycle are identified. Therefore, the other planning models are not discussed in this chapter. The interested reader is referred to the suggested reading at the end of this chapter.

4.2.1 The Precede-Proceed model

The Precede-Proceed model has the longest history, as the first publication originates from 1974 (Green and Kreuter, 2005). At that time the model was limited to the ‘Precede’, part. The strength of the first edition of the model is expressed in the meaning of the acronym Precede: predisposing, reinforcing and enabling constructs in educational diagnosis and evaluation. It comprises a thorough diagnosis of the behavioural determinants of a health or social problem. Over a period of 30 years the model evolved to the current Precede-Proceed model that blended ecological (social environmental aspects) and educational approaches to a community diagnostic and capacity-building strategy for population health programmes.

This Precede-Proceed model can be divided into the following components: the first four stages include a series of planned assessments referred to as the Precede component, followed by stages five to eight indicated as the Proceed component (Table 4.1). The process of setting priorities on the basis of causal importance, prevalence and changeability is important in each of the first four stages. The fifth stage is marked by the strategic implementation of multiple actions based on what was learned from the

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assessments in Precede. A final series of three evaluation stages follows the implementation stage. Although the evaluation stages are mentioned at the end of the planning process, evaluation is an integral part of all the Precede and Proceed components and serves as the primary vehicle to ensure the quality of the total planning process.

The first stage consists of two processes: social assessment and situational analysis. The essential starting point is engaging people in defining their social conditions and quality of life concerns. This approach works both ways; it provides insight into the social problems of the community, sheds light on the community’s strengths and weaknesses, and engages the community as active partners. The initial task in the second stage ‘epidemiological assessment’ is to identify the specific health problems that may contribute to, or interact with, the social problems noted in stage 1. Secondly, determinants of health are identified and grouped into behavioural patterns, environmental conditions and genetic components.

Stage 3, the educational and ecological assessment, involves identifying, sorting and selecting predisposing (i.e. knowledge, attitude), enabling (i.e. skills, barriers) and reinforcing (i.e. received rewards) factors that seem to have the greatest potential to influence a given health-related behaviour and conditions of living (and possibly genetic effects). In stage 4 and 5, previous assessment results are converted into a programme plan and subsequently into action. These stages consist of some final steps in diagnostic planning and some initial steps in implementation. The fourth assessment is designed to answer the question ‘What programme components and interventions are needed to affect the changes specified in previous stages?’ Firstly, programme components are selected and aligned with priority determinants of change assessed in previous stages. Then organisational readiness (resources, policies, abilities and time) is assessed to facilitate the implementation of the specified programme. Stages 6 to 8 are indicated as process evaluation, impact evaluation and outcome evaluation. Process evaluation focuses on the implementation of the programme. Impact evaluation assesses the immediate effects of the programme on target behaviours and environmental factors, and their predisposing, enabling and reinforcing determinants. Outcome evaluation measures the programme’s effect on the health and social situation.

### 4.2.2 The Five-Stage Community Organisation model

The Five-Stage Community Organisation model (Table 4.2) focuses on the organisation of health promotion and builds upon principles developed...
through years of field experience and research in many disciplines (Bracht, 1999). Influences that shaped the model’s development include practical experience with community organisation work, general principles of social and community change, elements of organisational development and strategic planning and community empowerment theory. The basic idea behind the model is that individuals and groups in communities need to feel in control. Therefore, participation is a keyword and plays a role in all stages of the model.

The first stage of the Five-Stage Community Organisation model is indicated as ‘community analysis’. In this stage health-related information from the community is collected and integrated, an inventory of the current level of health promotion activity (i.e. programmes, key leaders, organisational structure, availability of skilled personnel, programmatic and financial resources) is made and the potential for increasing activity is assessed by analysing barriers or restraining forces. Furthermore, readiness for change among top decision makers as well as in the community itself is assessed. Data from all the above sources is summarised and decisions are made in interaction with citizens and key community leaders. This approach lays the basis for community support and organisation. Following community analysis and the identification of local priorities, the design aspects for a community intervention begin to emerge. In the second stage, a formal project structure is developed that, on the one hand, shapes collaborating processes and clarifies roles and responsibilities and, on the other hand, facilitates the development, implementation and evaluation of the programme components. The result of this work is a project plan with a common goal.

The third stage comprises a comprehensive and co-ordinated effort using multiple strategies that have the potential to contribute to healthy choices. Throughout the implementation process, there must be continuing effort
to reach out to people and encourage their participation to maximise the use of available community resources and adapt to local constraints and values. The desirable mix of interventions, staff and volunteers willing to spend time on carrying out activities, estimated finances and equipment need to be described in a work plan in order to smooth the implementation process. In addition, a registration system needs to be set up for monitoring intervention activities. The collected data will be used to inform staff members about the progress of the implementation process.

The fourth stage is called ‘programme maintenance-consolidation’. During this stage, community members and staff gain experience with the programme. The organisation is developing a solid foundation in the community and interventions are gaining acceptance. Programme elements are being more fully incorporated into the established structures of the community and community ownership is taking place. In the last stage of the Community Organisation model, special attention is given to dissemination of information and reassessment of the total programme. Disseminating information on project activities is an ongoing process and essential for maintaining high visibility and achieving community-wide acceptance and involvement. A formal assessment is performed near the end of the project in order to summarise what has been learned and to determine future directions. Input for this reassessment is delivered by sub-evaluations of activities throughout the various stages, an updated community analysis and an analysis of the effectiveness of the intervention programme.

### 4.2.3 The Intervention Mapping model

According to the authors of Intervention Mapping, this approach (Table 4.3) is the product of their frustration in teaching health education students the processes involved in planning an intervention (Bartholomew et al., 2006). Although the literature provides helpful theoretical models, it lacks comprehensive frameworks for programme development. This model aims to provide a framework that makes it possible to use theories of behaviour and social change for designing an intervention.

The first stage of the Intervention Mapping model starts with initiating a planning group, including potential programme participants. The tasks performed are rather similar to those described in the first stages of the model of Green and Kreuter (2005) and Bracht et al. (1999). Firstly, a needs assessment is conducted using the Precede component and this is balanced with an assessment of community capacity. Finally, desired programme outcomes are established. Bartholomew et al. (2006) stated...
that ‘it is perfectly legitimate to begin in the middle of the Precede model with a behavioural or environmental risk as long as there is strong epidemiological evidence for the causal relation between the risk and one or more health problems’. Stage 2 provides the foundation for the intervention conceptualisation and programme development: the formulation of performance and change objectives with matrices. This stage includes refinements of the assessment stages specified in Precede. To add specificity to health-related behaviours and environmental conditions identified in stage 1, two questions should be answered: (1) what do the participants of this programme need to do to perform the health-related behaviour? and (2) what does someone in the environment need to do to accomplish the environmental condition? The answers to these questions form a list of performance objectives that needs to be analysed for its relevance and changeability. Subsequently, behaviour-oriented and environment-oriented theories are used to translate performance objectives into change objectives.

In stage 3, intervention methods are selected that correspond to the change objectives developed in stage 2. This procedure demands sufficient understanding of the theory behind the method and consultation with the intended participants. The translation of selected methods (persuasion, modelling) into action is completed through the development of strategies (meetings, role model stories). A challenge of the fourth stage is to produce creative programme components and materials and organise them in a way that the methods and strategies are adequately (and sometimes brilliantly) operationalised. To ensure that the final programme fits with both the populations to whom it will be delivered and the contexts in which it will be performed, this stage also comprises pretesting and pilot testing of programme materials. After the effectiveness of the programme has been demonstrated on a small scale, specific interventions to influence

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**Table 4.3. The six stages of the Intervention Mapping model (Bartholomew et al., 2006).**

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<tr>
<td>1. Needs assessment</td>
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<td>2. Preparing matrices of change objectives</td>
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<td>3. Selecting theory-informed intervention methods and practical strategies</td>
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<tr>
<td>4. Producing programme components and materials</td>
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<td>5. Planning programme adoption, implementation and sustainability</td>
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programme adoption and implementation are developed as part of stage 5. These interventions are directed to the gatekeepers of organisations who will adopt the new programme and to the programme deliverers who will implement it. For the development of these interventions, stage 2 to 4 are repeated in which performance objectives specifically for adoption and implementation purposes are defined and appropriate methods and strategies are created. In stage 6 the evaluation, that has actually started in the needs assessment and developed along with the intervention map, is completed. Evaluation is used to answer the question whether the intervention was successful in meeting programme goals and objectives (effect) and why the intervention was or was not successful (process).

**4.2.4 Combining the three models**

Together, the planning models contribute to the process of signalising health problems and developing, implementing and evaluating policies and programmes in order to achieve health effects in the long term. The Precede-Proceed model gives a clear overview of the different planning stages of public health policies and programmes. It highlights the assessment and evaluation stages at the beginning and end of the planning process. As a complement, the Five-Stage Community Organisation model stresses the importance of community participation in all stages of the planning process. Community involvement in the assessment stage gives a more complete picture of public health needs and generates support for intervention activities later on in the planning process. Related to this, much attention is given to programme maintenance and dissemination of information in the final planning stages. The strength of Intervention Mapping lies in the detailed description of the programme development stage in the middle of the planning process. Combining these planning models and using the different perspectives does justice to the complex nature of the domain of public health. However, Green and Kreuter (2005) mention in their book that one has to pay a price for embracing this way of working. ‘If we accept the notion that everything influences everything else and carry that notion to its logical extreme, one might argue that an average health practitioner would have good reason to shake his head and find himself in an overwhelming situation. There is no getting around the reality that crafting an effective health programme will almost always require you to sift and sort through many factors. But, with the right tools, that process, instead of being confusing and overwhelming, can be a productive undertaking and a rewarding challenge’. In the next section it will be explained how epidemiologists can make a significant contribution in this sifting and sorting process.
4. Seven epidemiological steps in the public health cycle

In Section 4.2, three planning models were examined in order to obtain a more complete picture of existing processes within the public health cycle. The next step is to identify where epidemiologists might contribute to these processes. Over the past decades, epidemiology has made a relevant contribution to public health by signalising health problems and analysing its determinants. Relevant epidemiological knowledge and skills concern descriptive as well as analytical understanding and techniques. However, recent developments, as described in Part I, urge epidemiologists to undertake roles in more stages of the public health cycle. Epidemiologists can assist in the formulation of realistic changes to be achieved by public health programmes in the short and long term, based on their insight into the magnitude and scope of health problems and the determinants of health. In order to link the programme objectives with intervention activities in a logical order, they might combine data-driven knowledge from epidemiologic studies with theory-driven knowledge about behavioural and organisational changes from disciplines like psychology, health promotion or social sciences. Epidemiologists can contribute to developing an evaluation plan because of their expertise in research methodology. During programme implementation, epidemiologists might act as a ‘quality controller’ and use data to improve, change or adapt interventions to local circumstances or to communicate interim results to stakeholders and participants to encourage their participation. To conclude, the core expertise of epidemiologists in analysing relationships between cause and effect can be used to assess the effectiveness of public health programmes, hereby contributing to evidence-based public health. This type of work resembles the work of the founding fathers in epidemiology as described in Chapter 1. Over time, the nature of the diseases changed from communicable and deficiency diseases into more non-communicable or Western diseases. However, the developed set of epidemiological methods (study design) and concepts (measures of disease occurrence, interaction, confounding and other biases) is still appropriate, although it needs further development to be able to evaluate complex public health interventions.

Based on the skills and experiences of epidemiologists working at the interface of policy, practice and research as mentioned above, seven epidemiological steps are identified and positioned in the public health cycle (Figure 4.1). This section explains how epidemiologists can contribute to the planning process at these seven points in the public health cycle. In the following seven chapters (Chapters 5 to 11) relevant theories, concepts,
methods and tools for each step will be described in more detail, in order to empower epidemiologists in public health practice.

Moving from the ‘agenda setting’ to the ‘evaluation’ stage, seven steps are identified by which epidemiologists make a greater or smaller, decisive or supporting contribution to the development, implementation and evaluation of public health policies and programmes.

In step 1, ‘conduct a needs assessment’ (Chapter 5), epidemiologists traditionally play an important role in providing information on population health status, trends and prognosis, determinants of health and at-risk populations, based on regional and (inter)national data. Descriptive as well analytical epidemiological studies are very important in this stage, and can be combined with qualitative research. Moreover, reviews with or without meta-analyses can be used to summarise and aggregate research evidence. Together with data of the community analysis, which are gathered by other public health disciplines, policy makers receive a complete picture of relevant health problems and possible solutions.
### Support priority setting

In step 2, ‘support priority setting’ (Chapter 6), the collected evidence is integrated, presented and communicated in such a way that policy makers are supported in health policy making. The scientific knowledge has to be contextualised to the specific situation of the policy makers. This integrated knowledge enables policy makers to set priorities for the public health agenda, and support them in making well-founded choices about which health problems need to be addressed. This step shows that the role of the public health epidemiologist is extended from a knowledge provider to a knowledge broker and knowledge seller.

### Formulate aims and objectives

In the stage of programme development, epidemiologists might contribute with step 3, ‘formulate aims and objectives’ (Chapter 7). In this step, health priorities are translated into programme objectives focusing on (determinants of) health as well as organisational or societal aspects. Using the results of the needs assessment, epidemiologists can assist in the formulation of realistic changes to be achieved by public health programmes in the short and long term. Objectives are preferably formulated specific, measurable, achievable, realistic and time-bound (SMART). Prioritisation of objectives should be based on scientific evidence and, especially when it concerns complex interventions, intensive dialogue with all stakeholders.

### Construct a logic model

In step 4, ‘construct a logic model’, the programme objectives are put in a logical order (Chapter 8). The logic model is a roadmap that can be used to achieve consistency between objectives and related intervention activities. Logic models show how and why results of interventions are expected by visualising the causal pathways between interventions and outcomes. Epidemiologists can contribute by clarifying the causal pathway and filling in the determinants of health and underlying factors in the logic model. Moreover, they can stimulate discussions between stakeholders about how the intervention strategies contribute to the achievement of intervention objectives.

### Develop an evaluation plan

Step 5, ‘develop an evaluation plan’ (Chapter 9) concerns the development of a plan for evaluating the processes and effects of public health interventions, based on the products from previous steps. The evaluation plan translates the aims and objectives via the logic model to specific and measurable indicators. The selection of adequate methods and evaluation design, whether this is the randomised controlled trial or an alternative design, is considered a specific strength of epidemiology. Depending on the type of intervention, its developmental stage and the results aimed at, ‘light research’ or a complete evaluation design may be selected.
Perform quality control

During the implementation stage, epidemiologists register data on the intervention activities and perform interim analyses. This is step 6, ‘perform quality control’ (Chapter 10). In general, the role of the epidemiologist is underestimated in this stage. The data gathered during implementation can be used to describe the implementation process, to improve or adapt interventions depending on their developmental stage. The aim of these evaluative activities is to control the quality of the intervention during its delivery, in order to enhance its chances of effectiveness.

Analyse processes and outcomes

Step 7, ‘analyse processes and outcomes’ (Chapter 11) takes place in the evaluation stage of the public health cycle. The data gathered during implementation are analysed, in order to conclude whether the intervention has achieved its aims and objectives, to understand why the desired results were (not) achieved, and gain insights into the necessary preconditions for successful implementation. Before data on programme activities can be disseminated to other settings, the external validity needs to be assessed. For this, information on applicability and accountability is required. By supporting policy decisions on the merit of a specific programme for a specific (local) context, the public health cycle is closed to stage 1.

The seven epidemiological steps are embedded in the joint working process of several public health disciplines from policy, practice and research. In the stage of agenda setting for example, policy makers have a leading role and are responsible for the priority areas on the public health agenda. Their decisions might be supported by epidemiological evidence (Chapter 6). Likewise, in the stage of programme development the programme planner is leading, for example a health promotion officer or manager. During this stage a complete intervention plan is being developed, including e.g. a problem definition, aims and objectives, target groups, setting, theoretical background, strategies and activities, collaboration or partners, organisation, evaluation, planning and budget. The epidemiological steps in this stage refer to three elements: formulating aims and objectives (Chapter 7), relating them to intervention activities using a logic model (Chapter 8) and developing an evaluation plan (Chapter 9). In the stage of implementation only one epidemiological step is being described (perform quality control, Chapter 10) while during this stage the major task of delivering the intervention programme is being made by the intervention organisers and practitioners. Evaluation is probably the stage where the role of the epidemiologist is most prominent because of the analyses that have to be conducted (Chapter 11). This epidemiological step is followed by decisions taken by policy makers about discontinuing, adapting, sustaining or extending the intervention programme.
When reading the following chapters, it is important to bear in mind everything that is happening in the specific stage of the public health cycle (based on the description of the planning models in Section 4.2) and to be aware of the contribution of the epidemiologist in relation to the activities of other disciplines. The domain of public health is very complex, as a result of the numerous determinants that affect the health status of the population, our limited understanding of the causal web, and the long time lag before beneficial health changes may become visible. Epidemiologists involved in the public health cycle should be sensitive to this complexity. However, for didactical purposes, the information in Chapters 5 to 11 is presented in a systematic and structured way. The steps presented must be seen as a tool that is helpful in organising your work; it is not an instruction manual or cookbook that can be followed and guarantees success.

4.4 Conclusion

In this chapter, seven epidemiological steps in the public health cycle are introduced. The steps are derived from a variety of planning models used in the domain of public health and describe the contribution that epidemiologists can make to the planning process. In the following Chapters 5 to 11 each step is explained in more detail and relevant theories, concepts, methods and tools are presented. Even though programme planning in real life is not a linear process and also includes additional feedback loops, the steps are presented in a linear order. Moreover, readers should be aware that the epidemiological steps do not cover the full planning process but are embedded in the whole range of activities that are undertaken by other public health disciplines. Knowledge of adjacent disciplines facilitates successful interaction at all stages of the public health cycle. Therefore in Part III the readers will be introduced to the public health disciplines of health promotion, policy making and primary care.

Suggested reading

References


