Public Health Nutrition

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Series Foreword

The early decades of the twentieth century were a period of intense research on constituents of food essential for normal growth and development, and saw the discovery of most of the vitamins, minerals, amino acids and essential fatty acids. In 1941, a group of leading physiologists, biochemists and medical scientists recognized that the emerging discipline of nutrition needed its own learned society and The Nutrition Society was established. Our mission was, and remains, “to advance the scientific study of nutrition and its application to the maintenance of human and animal health”. The Nutrition Society is the largest learned society for nutrition in Europe and we have over 2000 members worldwide. You can find out more about the Society and how to become a member by visiting our website at www.nutsoc.org.uk

The ongoing revolution in biology initiated by large-scale genome mapping and facilitated by the development of reliable, simple-to-use molecular biological tools makes this a very exciting time to be working in nutrition. We now have the opportunity to obtain a much better understanding of how specific genes interact with nutritional intake and other lifestyle factors to influence gene expression in individual cells and tissues and, ultimately, affect our health. Knowledge of the polymorphisms in key genes carried by a patient will allow the prescription of more effective, and safe, dietary treatments. At the population level, molecular epidemiology is opening up much more incisive approaches to understanding the role of particular dietary patterns in disease causation. This excitement is reflected in the several scientific meetings that The Nutrition Society, often in collaboration with sister learned societies in Europe, organizes each year. We provide travel grants and other assistance to encourage students and young researchers to attend and participate in these meetings.

Throughout its history a primary objective of the Society has been to encourage nutrition research and to disseminate the results of such research. Our first journal, The Proceedings of The Nutrition Society, recorded, as it still does, the scientific presentations made to the Society. Shortly afterwards, The British Journal of Nutrition was established to provide a medium for the publication of primary research on all aspects of human and animal nutrition by scientists from around the world. Recognizing the needs of students and their teachers for authoritative reviews on topical issues in nutrition, the Society began publishing Nutrition Research Reviews in 1988. More recently, we launched Public Health Nutrition, the first international first journal dedicated to this important and growing area. All of these journals are available in electronic, as well as in the conventional paper form and we are exploring new opportunities to exploit the web to make the outcomes of nutritional research more quickly and more readily accessible.

To protect the public and to enhance the career prospects of nutritionists, The Nutrition Society is committed to ensuring that those who practice as nutritionists are properly trained and qualified. This is recognized by placing the names of suitably qualified individuals on our professional registers and by the award of the qualifications Registered Public Health Nutritionist (RPHNutr) and Registered Nutritionist (RNutr). Graduates with appropriate degrees but who do not yet have sufficient postgraduate experience can join our Associate Nutritionist registers. We undertake accreditation of university degree programs in public health nutrition and are developing accreditation processes for other nutrition degree programs.

Just as in research, having the best possible tools is an enormous advantage in teaching and learning. This is the reasoning behind the initiative to launch this series of human nutrition textbooks designed for use worldwide. The Society is deeply indebted to its former President, Professor Mike Gibney, for his foresight, and to him and his team of editors for their innovative approaches and hard work in bringing this major publishing exercise to successful fruition. Read, learn and enjoy.

John Mathers
President of The Nutrition Society
Preface

This book represents the third in a series of four for honors or masters level students of nutrition. The first book serves as a broad introduction, not just for nutrition students, but also for students of disciplines such as nursing, pharmacy, food science and agriculture. All the ensuing books are aimed at nutrition students. The second textbook, Nutrition and Metabolism, provides students with the biological basis of nutrition in health and disease. Thereafter, most students will make a choice to pursue either a clinical stream or a public health nutrition stream. The present book is focused on the latter, a subject that is growing in importance, taking into account the real potential to reduce the burden on noncommunicable chronic disease through diet. The Nutrition Society has championed the development of recognition of public health nutrition as a specialized discipline in the field, complementing the established specialty of clinical nutrition where the target audience is an individual patient on a one-to-one basis. In the case of public health nutrition the target audience is the population as a whole or specific subpopulations. The textbook is structured to begin with an overview taking students through a cycle of procedures, which should ideally be a feature of any program of public health nutrition. The first eight chapters of the book describe the skills needed in public health nutrition. The next six outline the major public health nutrition problems arising from overnutrition and from undernutrition. Maternal and child health issues are covered in the next four chapters, and some major diseases, cancer, diabetes, heart disease and osteoporosis, are dealt with in the final four chapters. As has been pointed out in the prefaces to the first two books in this series, there will be some overlap, but students will find the orientation different for similar subjects across texts. In some chapters, the public health nutrition element is accompanied by relevant material in clinical nutrition or in molecular nutrition, which will help students appreciate the links between all elements of nutrition.

The editors once again express their sincere thanks to their Assistant Editor Julie Dowsett and her heroic husband Greg.

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1
An Overview of Public Health Nutrition

Barrie M Margetts

Key messages

- Public health nutrition is the promotion of good health through primary prevention of nutrition-related illness in the population.
- Public health nutrition builds on a foundation of biological and social sciences, depends on epidemiological evidence and involves the development and implementation of programs to improve and maintain health.
- Performance as a public health nutritionist requires a specific set of knowledge- and skill-based competencies to implement all stages of the public health nutrition cycle.
- It is essential to develop appropriate knowledge, attitudes, understanding and professional skills to practice as a public health nutritionist.
- An appreciation and critical evaluation of the impact of research on the practice of public health nutrition also needs to be developed.

1.1 Introduction

The knowledge base underpinning the public health nutritionist professional is developed over years and built on a foundation of biology, biochemistry, physiology and basic nutritional sciences, as well as an understanding of social anthropology. The development of the foundations is not within the scope of this book. Many of these competencies are covered in the accompanying textbooks, particularly the Introduction to Human Nutrition and Nutrition and Metabolism. The aims of this book are to cover the skills needed in public health nutrition and to provide a coherent structure to enable the reader:

- to identify nutrition-related public health problems relevant at the local, regional, national and international levels
- to identify causes of these problems
- to develop strategies to deal with these problems
- to evaluate the impact of these strategies
- to understand the process whereby research-based evidence provides a basis for the development of public health policy
- ultimately, to improve nutrition-related health by applying evidence to action to solve problems.

Public health nutrition is about applying knowledge to the solution of nutrition-related health problems. Often when confronted with a problem, people do not know where to start, become lost in the detail, and sometimes miss the obvious and simple critical steps that will really make a difference. In this introductory chapter an attempt is made to provide a framework for the reader to think logically and systematically: to provide a template to proceed in a logical and systematic way. People often want to jump in with what they think is the solution to the problem confronting them; the aim here is to help readers to think before they jump. It is now fashionable to talk about an evidence-based approach to public health. All this really means is finding out what others already know, putting aside one’s prejudices, assessing the situation objectively, and coming up with the best and most effective solution. It may seem obvious, but there is no need to fix that which is not broken. Rather, the effort should be to try to identify the key rate-limiting step (or major
constraint to behavior) in the causal pathway and fix that. Our knowledge as to what the rate-limiting step is can never be perfect, so some judgment is required. However, the more systematically the evidence is gathered and reviewed, both in terms of the causal pathway and in terms of effective interventions, the more effective the effort will be in achieving the targeted health gains. The aim of this book is to give the student the knowledge and skills to think clearly about how to solve problems. The primary purpose of good nutrition is to maintain health and well-being. Nutrition is more than the food supply: it reflects the interaction between what we eat, and the metabolic demands of the body to maintain functional capacity. The basic, underlying and immediate causes of malnutrition are summarized in Figure 1.1. If nutrition is only thought of as the supply side of this balance this is likely to lead to a misunderstanding of the key rate-limiting steps that link good nutrition to well-being. It is also important to consider the social as well as the biological context within which individuals live and interact in society. While it is beyond the scope of this text to cover all aspects of whole-body integrated metabolism, some understanding of the underlying mechanisms that link diet and style of living to health is required to understand whether the lifestyle changes that are being suggested to improve health make sense biologically. Inevitably, good nutrition-related health is about understanding the relationships between the biological and sociological context within which individuals live and interact in society. Where food supply is limited there is a clear biological imperative to obtain enough to eat; where supply is in excess, social imperatives that restrain or limit behavior come into play. In all societies, especially those in transition, there is a complex mix of problems of overnutrition.

**Figure 1.1** United Nations Children’s Fund (UNICEF) conceptual model.
and undernutrition occurring in close proximity. The job of the public health nutritionist is to try to understand this complexity and to provide guidance as to what is best for most people. This book aims to help students in this task.

1.2 Organization of the book

There are 22 chapters in this book. The first eight chapters are designed to develop the skills required to understand how to identify and subsequently to develop approaches to address the major nutrition-related public health problems. Chapter 2 on nutritional epidemiology addresses the skills required for the design of appropriate studies, for conducting nutritional surveillance and the development of research protocols. It also reviews the analytical skills required in the use of nutritional and other relevant data and databases including the statistical issues, sampling study size and power, determination and application of appropriate statistical analytical techniques. Chapter 3 defines and describes the tools used to assess nutritional status at the individual and population levels. The emphasis in Chapter 3 is on assessment of dietary intake. Chapter 4 describes the methods and approaches used to assess physical activity. Nutritional status embraces an understanding of the dynamic between supply and demands, and increasingly it is becoming clear that, particularly in terms of understanding energy balance, it is essential to assess both intake and expenditure, and factors that affect both. Identifying the problem is only the first step in solving the problem; Chapters 5 and 6 describe the approaches to developing effective interventions in groups and individuals, respectively and Chapter 7 describes how to develop and present dietary guidelines that communicate dietary advice in the most sensible way possible, once it is clear what is the required or optimal nutritional pattern or profile. There is considerable overlap in the approaches used, broadly, the aim should be to use that approach which is most effective for most people, or different approaches for different groups if there appear to be different constraints in subgroups. Understanding the constraints on behavior and factors affecting food choice is the subject of Chapter 8.

Chapters 9–14 describe different aspects of malnutrition. Chapters 9 (overnutrition) and 10 (undernutrition) describe the development of aspects of what might be termed macronutrient malnutrition, while Chapters 11–13 describe specific micronutrient malnutrition deficiencies. Increasingly, it is becoming clear that undernutrition and overnutrition occur in different groups of people in the same countries, and that macronutrient and micronutrient imbalances can occur in the same people. Chapter 14 describes the complex area of eating disorders, which lead mainly to undernutrition of both macronutrients and micronutrients, but with different causes, and tending to affect different groups within a society, from those described in Chapters 9–13.

Chapters 15–18 describe different aspects of maternal and child health; Chapter 15 focuses on aspects of cognitive development, Chapter 16 focuses on the importance of infant feeding, Chapter 17 focuses on adverse outcomes of pregnancy in relation to folate and related B-group vitamins, and Chapter 18 describes the concepts that underpin fetal programming. Taken together, these chapters highlight the importance of achieving the optimal nutrient supply at the critical time to enhance and maintain function. This may be considered a key part, or first step of a life-course approach, recognizing that what happens after certain critical events is constrained by these earlier events and interacts with current behavior. Current health and well-being cannot be fully explained by current behavior alone, and early events (programming, early exposure) influence the way in which an individual and society react to what appears to be the same exposure. This may be described as explaining the sources of heterogeneity within a population, which may be also a mix of different levels of the expression of genes, gene–nutrient and nutrient–gene interactions.

Chapters 19–22 describe the main chronic disease that affect large numbers of people around the world; Chapter 19 describes cardiovascular diseases, Chapter 20 diabetes, Chapter 21 cancer and Chapter 22 osteoporosis. Already these chronic diseases affect more people in developing than in developed countries, and it is likely that this will increase as the nutrition transition continues in developing countries and rates of chronic diseases decline in developed countries.

There is no specific chapter on communicable or infectious diseases; the impact of these is covered extensively in the chapters on undernutrition. The aim has been to use major health problems as a way of illustrating approaches and ways of thinking that should help the reader to think about how to understand and address specific problems.
1.3 Definitions used in public health

**Public health nutrition**

A public health nutrition approach focuses on the promotion of good health (the maintenance of well-being or wellness, quality of life) through nutrition and the primary (and secondary) prevention of nutrition-related illness in the population. Public health nutrition is built on a foundation of basic and applied sciences, operates in a public health context, and uses the skills and knowledge of epidemiology and health promotion. The World Health Organization (WHO) defines health as a state of complete mental, physical and social well-being, and not merely the absence of disease or infirmity. Public health is defined as the collective action taken by society to protect and promote the health of entire populations. Alternatively, it can be defined as the art and science of preventing disease, promoting health and prolonging life through the organized efforts of society. Epidemiology provides a rigorous set of methods to study disease occurrence in human populations.

**Public health**

The approach to public health may be summarized as being either broad or narrow (Table 1.1).

**The narrow approach**

The narrow approach focuses on disease prevention and cost containment, with health defined as the absence of disease. The underlying theory is that the way in which individuals live their lives (what they eat, what they do, whether they smoke or drink or engage in risky behavior) is the main cause of disease, and that the motivation to change behavior is based on reducing risk at an individual level. The evidence base comes from clinical and molecular epidemiology; research is undertaken that identifies differences in risk factors, and on the basis of that information, advice is given to the public that if they change their behavior they will reduce their risk of developing the disease (cancer or heart disease, etc.). This approach links an individual’s own behavior to risk of disease. The burden of prevention and health promotion lies with the individual and it is seen as their responsibility to address their risk behavior. The approach is aimed at identifying immediate and obvious problems now and addressing them now. The disadvantage of the narrow approach is that it may miss fundamental threats within society that may be outside the individual’s control (basic and underlying causes such as the wider socioeconomic factors, education and access to services, environmental factors, and the overarching values in society).

**The broad approach**

The broad approach defines health as more than the absence of disease. It considers well-being in terms of mental and physical health and also includes a sense of having some control over your life. The approach links public health science with policy: the action and structures agreed by society aimed at improving and maintaining health. The underlying theoretical model is sociocultural; it focuses on the wider environment and seeks to understand the factors that enable individuals to make healthy choices, or inhibit them. The motivating concern is about addressing the underlying sociostructural factors such as poverty, global issues and structures at a local, regional, national and international level that affect health. The evidence base for a broad approach comes from epidemiology as well as other approaches more suited to exploring the sociostructural context. The broad approach takes a more long-term view of causes and solutions, addressing

### Table 1.1 Different approaches to public health

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Broad</th>
<th>Narrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major public health activities</td>
<td>Link public health science with policy</td>
<td>Cost-containment, disease prevention</td>
</tr>
<tr>
<td>Place of epidemiology</td>
<td>Balanced by other methods</td>
<td>Clinical and molecular epidemiology</td>
</tr>
<tr>
<td>Advantages</td>
<td>Long term, global</td>
<td>Short</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>Risk of failure because of breadth</td>
<td>Miss fundamental threats</td>
</tr>
<tr>
<td>Define health</td>
<td>Foundations for health</td>
<td>Absence of disease</td>
</tr>
<tr>
<td>Underlying theory</td>
<td>Sociostructural</td>
<td>Lifestyle</td>
</tr>
<tr>
<td>Motivating concerns</td>
<td>Inequalities, poverty, global</td>
<td>Individual risks</td>
</tr>
</tbody>
</table>
structural issues in society that make it more difficult for individuals to make optimal choices. The disadvantage of a broad approach is that because the approach is so broad it may never address the key rate-limiting steps in a timely manner.

The broad public health approach has been taken up and developed by UNICEF into a conceptual model. The UNICEF model is now widely used, at least in research and development in developing countries\(^1\) (this term is used in the sense of gross domestic product, rather than social and cultural development, and is not meant to imply a hierarchy or judgment about better or worse than a developed country) (see Figure 1.1). This conceptual model acknowledges that while the immediate causes of undernutrition may be a lack of food, often coupled with a high burden of infection, the provision of adequate education and health care has an important impact on health. The provision of these underlying factors is determined by basic causes such as the resources that are available in a society, and decisions about how these resources will be used. The model acknowledges that dealing only with the immediate causes will never lead to long-term improvements, which are dependent on the societies’ view as to how resources will be used and distributed in society to maximize the health and well-being of all members of society. These arguments do not apply only to developing countries; how governments prioritize the use of taxation is a function of the underlying values of the society (as expressed through the election of governments that reflect the popular view); for example, the balance of spending priorities between education, health and defense, or priorities for agricultural policies that subsidize farmers but not manufacturing industry. Policy decisions as to the priorities on spending are complex and reflect a balance of tensions and pressures that often pull in different directions. Policy will be discussed in more detail later in this chapter.

In reality, in most countries there is a recognition that a narrow (individual and immediate cause oriented) approach needs to be balanced with addressing, at least to some extent, the basic and underlying (broad) causes. Most governments acknowledge that there are differences in health outcomes in different sectors of society and that state resources should be used to try to redress these differences. The food supply is regulated in all countries, even if the regulation is restricted to issues of food safety. Many of the first efforts in public health were about developing regulations to protect the public against the adulteration of staple foods. It has always been recognized that freedom of choice does not operate in a vacuum. Many countries have regulations about the accuracy of information contained in labels. There are few countries where the government does not intervene in the food supply to some extent, either through legislation to recommend the fortification of foods or to subsidize the production of some foods, such as in the Common Agricultural Policy in Europe and farming subsidies in the USA and elsewhere.

In developing a public health perspective it is important to balance the narrow with the broad. Striking the right balance is difficult and influenced by philosophical and political considerations. As a public health nutritionist, when trying to solve a local or national problem, it is important that both the narrow and broader determinants of behavior are considered and that it is not assumed that knowledge and individual choice are all that matters.

Recently, the UK Faculty of Public Health has agreed the key concepts that underpin public health. These reiterate to some extent the debate about broad versus narrow approaches to public health (Box 1.1). The key issues are a population approach to promoting and protecting health and well-being. They also highlight the importance of information.

**Epidemiology**

Nutritional epidemiology underpins Public Health Nutrition. This is covered in Chapter 2. It provides a

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\(^1\)The preferred terminology for developed and developing countries is North and South, or low, medium and higher income groups.
scientific basis for the development of the evidence upon which public health action can be implemented. It also provides guidance on the approaches as to the best way to evaluate and monitor the effectiveness of programs designed to improve health. Epidemiology is the only setting in which it is possible to ask questions about what factors affect processes in the whole population. The questions that are asked in epidemiological studies need to emerge from metabolic and clinical research; it is important to have some sense of the underlying mechanisms and processes involved in the way the body seeks to maintain optimal function. It is also essential to understand that the biological processes that maintain functional capacity in humans do so in a wider context. As mentioned above, epidemiology is not the only source of information essential to a public health perspective.

**Health promotion**

Health promotion is defined as any process that enables individuals or communities to increase control over the determinants of their health. The Ottawa Charter for health promotion (www.who.int/hpr/archive/docs/Ottawa.html) outlines an internationally accepted framework for health promotion that includes five approaches:

- building healthy public policy
- creating supportive environments
- developing the personal skills of the public and the practitioners
- reorienting health services
- strengthening community action.

Figure 1.2 summarizes Beattie’s model of health promotion. This model further highlights the implications of the different underlying philosophical basis of public health discussed above. The two axes of the level at which promotion operates (individual to group/society) and the approach (authoritative to negotiated) highlight the range of options available. Often a range of approaches will be used. The key point is to use the approach that is going to be most effective and sustainable. In order to be effective, it is important that the strategy to be used has been shown to be effective in the target group, and that it addresses the most important constraints or rate-limiting steps, be they knowledge, attitudes, access or intentions. Understanding what the rate-limiting step is requires an understanding of the balance of factors that affect why people eat what they eat (see Chapter 8). In some circumstances, a legislative approach, which requires no action at the individual level, may be the most effective way to achieve the desired health gain. A simple example is the decision to fortify flour in the USA with folic acid (see Chapter 17).

Nutbeam and Harris (1999) have summarized the theoretical models that underpin a health promotion approach. It is beyond the scope of this chapter to review all the models and theories described, and they are covered in more details in Chapters 5 and 6. The main point to emphasize here is that at whatever level one operates, there is a theoretical model that has been developed and should be considered as a basis for organizing the planning of work. A summary of models relevant for the different levels at which health promotion works is shown in Table 1.2.

A health promotion planning and evaluation cycle has been described and involves seven steps:

- problem definition
- solution generation
- resource mobilization
- implementation
- impact assessment
- immediate outcome assessment
- outcome assessment.

For all but the last step in the cycle, theories have been developed as to how to perform each step most
effectively: to identify targets for intervention; to clarify how and when change can be achieved in targets, and how to achieve organizational change and raise community awareness; to provide benchmarks against which actual can be compared with ideal programs; and to define outcomes and measurements for use in evaluation. The precede–proceed model is another way that has been used to encapsulate the steps in a health promotion cycle and this will be described in more detail in Chapter 6. These ideas have been taken and used as a basis for the development of the public health nutrition cycle, which is described in more detail later in this chapter.

### 1.4 What are the key public health problems?

The chapters in the latter part of this book cover in detail the public health problems that have the greatest public health impact. Here, the aim is to give a broad overview of the overall balance of global nutrition-related health problems, and to highlight, in particular, the double burden of both overnutrition and undernutrition that many transitional countries suffer (Figures 1.3–1.6, Table 1.3; http://www.who.int/whr/previous/en/). Data are presented in two ways, which are important to distinguish; Figures 1.3 and 1.4 present the proportion of deaths attributable to each major cause, whereas Figure 1.5 and Table 1.3 show the absolute numbers of deaths or disease burden. From a public health perspective the total burden of disease gives a sense of the demands placed on the health services and infrastructure. Figure 1.3 and 1.4 show the burden of infectious diseases in developing countries compared with developed countries; Table 1.3 shows the high burden of human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) in sub-Saharan Africa. Although cancer, as a percentage of overall deaths, is lower in developing than developed countries, in absolute terms (Figure 1.4) more people die of cancer in developing countries. In Africa and south-east Asia (Figure 1.5) the burden of communicable diseases is high, compared with Europe; in south-east Asia the burden of noncommunicable diseases is nearly as high as communicable diseases and is also higher than in Europe. The higher burden of cancer in developing countries may be a function of both a higher underlying incidence and poorer case finding and treatment (owing to limited access to health facilities). The impact of HIV on overall mortality and life expectancy is illustrated in Figure 1.6, which shows that in a number of African countries life expectancy has actually fallen since the late 1980s, after a steady rise from the 1950s to 1985.

In addition to the burden of death and disability the burden of chronic undernutrition is heavy in many developing countries. It is a stark figure, but 14 000 children die every day from malnutrition-related

**Table 1.2** Summary of models relevant for the different levels at which health promotion works (from Nutbeam and Harris, 1999)

<table>
<thead>
<tr>
<th>Area of change</th>
<th>Theories or models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theories that explain health behavior change by focusing on the individual</td>
<td>Health belief model, Theory of reasoned action, Transtheoretical (stages of change) model, Social learning theory</td>
</tr>
<tr>
<td>Theories that explain change in communities and community action for health</td>
<td>Community mobilization: Social planning, Social action, Diffusion of innovation</td>
</tr>
<tr>
<td>Theories that guide the use of communication strategies for change to promote health</td>
<td>Communication for behavior change, Social marketing</td>
</tr>
<tr>
<td>Models that explain changes in organizations and the creation of health-supportive organizational practices</td>
<td>Theories of organizational change, Models of intersectoral action</td>
</tr>
<tr>
<td>Models that explain the development and implementation of healthy public policy</td>
<td>Ecological framework for policy development, Determinants of policy making, Indicators of health promotion policy</td>
</tr>
</tbody>
</table>
causes. Among those who survive, the effects on growth and development are profound and long-lasting. A quarter of all babies born in south Asia weigh less than 2500 g at birth (UNICEF, http://www.unicef.org/statis/2001). In India (44%) and Africa (29%) many children are underweight, while the proportion of the adult population becoming obese is also rising. Food insecurity continues to be a major problem for many people around the world, and not just in developing countries (see http://www.euro.who.int/Nutrition for European data and http://www.nlm.nih.gov/pubs/cbm/nutritionsummit.html#51 for US
Figure 1.5 Burden of disease in disability-adjusted life-years by WHO Region. Reproduced with permission from the United Nations Population Division. (http://www.who.int/whr/previous/en/).

Figure 1.6 Changes in life expectancy in selected African countries with high HIV prevalence, 1950–2000. Reproduced with permission from the United Nations Population Division.

The double burden of problems of communicable and noncommunicable diseases, related to malnutrition (overnutrition and undernutrition) in the widest sense, was extensively described by Popkin (2002), who summarized the stages of the health, nutritional and demographic transitions (Figure 1.7). Many countries in the developing world have subpopulations in different stages of these transitions, which makes national data difficult to interpret. The complexity also places a particular burden on health services with limited resources.

### 1.5 Food and nutrition policy

Nutbeam and Harris (1999) highlight that a key area for achieving change is to understand where policies come from, so that they may be influenced to address a particular problem. Policies develop in a dynamic way that is influenced by many factors, one of which is the scientific evidence (Figure 1.8). Although an individual public health nutritionist may feel that it is outside the scope of his or her capacity or job to be able to influence policy, it is important to have a sense of what factors and forces influence policy. One of the aims of his chapter and book is to give a sense of where individual public health nutritionists fit into the grand scheme of things, and that there is actually a bigger picture. This does not mean becoming a lobbyist and involved in policy, but to recognize that policies are developed that influence the priorities in society that

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**Table 1.3 Leading causes of mortality in sub-Saharan Africa, 1999**

<table>
<thead>
<tr>
<th>Rank</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20.6</td>
</tr>
<tr>
<td>2</td>
<td>10.3</td>
</tr>
<tr>
<td>3</td>
<td>9.1</td>
</tr>
<tr>
<td>4</td>
<td>7.3</td>
</tr>
<tr>
<td>5</td>
<td>5.9</td>
</tr>
<tr>
<td>6</td>
<td>4.9</td>
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<tr>
<td>7</td>
<td>3.4</td>
</tr>
<tr>
<td>8</td>
<td>3.2</td>
</tr>
<tr>
<td>9</td>
<td>3.0</td>
</tr>
<tr>
<td>10</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Reproduced with permission from the WHO.

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**Figure 1.7 The stages of demographic epidemiological and nutrition transitions in public health nutrition. Reproduced from Popkin (2002) with permission from The Nutrition Society.**
affect the work of public health nutritionists and their capacity to do their job. It is important to separate out the process and principles of gathering evidence, and the subsequent judgment that arises from that evidence as to what to do or not do about what the evidence implies for health.

There are several key players in the development of policy:

- policy holders (usually government politicians)
- policy influencers (lobby groups representing vested interests)
- the public
- the media.

The key determinants of policy development are:

- the social climate
- identifiable parties that influence policy
- what the interested parties will gain from the policy
- the ability of those interested parties to make their voices heard.

A policy about a particular issue may or may not develop because the social climate is not right, there are competing interests or priorities, or the case has not been properly organized to justify the policy. In simple terms, politicians, who make policy, need to see that if they develop a policy it will achieve what they want and in a way that will give them the credit (or that works). In public health nutrition this means that to move policy in a way that we believe is desirable for improved health requires:

- that the profession has its act together and can be effective in presenting its case
- that when asked it can deliver.

Without policy level commitment, it will be difficult to achieve change. It has been easier to gain support for policies around ensuring that the food supply is safe, and today most countries follow internationally agreed recommendations, mainly summarized in Codex Alimentaris. Policies about what to eat to maximize health are more complex than policies to ensure safety. Moreover, there is considerable debate amongst stakeholders and a wider range of vested interests that contribute to this debate, making politicians less likely to support nutrition policies related to health. Without policies that define goals and targets it is often difficult to mobilize support for action.

**Food and nutrition policy**

There is lack of clarity about the differences, and drivers for, food compared with nutrition policies. Food policy is concerned about how the food is grown and made available to consumers. It is mostly driven by concerns about agricultural practices and food production, manufacture and distribution. Nutrition policy is driven by a consideration of the impact of the food supply on health. A great deal more is written about food than about nutrition policy. From a public health nutrition perspective it should be clear that the primary question to be asked when considering policy issues is: “Will it make any difference to improving health, particularly in those with the greatest burden of poor health, usually the poorest in society?”

**Advocacy and evidence-based policy**

It is relevant to discuss briefly and to be able to distinguish between advocacy and evidence-based policy. Advocacy may be defined as the active support of an action or a cause and therefore an advocate is someone who upholds or defends that action or cause. Advocacy for a policy or action is usually based on a mix of values, beliefs and judgments that the course of action or policy is the right thing to do. The extent to which it is supported by evidence may depend on the underlying beliefs of the advocate. It is important that a clear distinction is drawn as to where the evidence stops and where judgments based on other factors start. The decisions that are made in society and from which policies and action arise do not do so in
a vacuum, and even if something appears to be obvious and important, this does not mean that it will be supported and implemented.

1.6 The public health nutrition cycle

Public Health Nutrition is about solving problems. A public health nutrition (PHN) cycle has been developed to help to achieve this aim (Figure 1.9). This cycle has been designed to identify the key steps required to develop a logical approach to the best way to go about solving problems. At each step in the cycle it is important not to lose sight of the purpose of the efforts and activity. Individuals or society should not be asked to change unless there is good evidence that that change will be beneficial. Producers and retailers should not be asked to change the food supply if that change is not going to improve health and well-being. The government should not be asked to develop policies and programs of work that will not benefit the health of the population. Programs of work should certainly not be recommended that increase inequalities within a society. In other words, whatever is done needs to have the most benefit for the most people in the most efficient way possible. This may involve a combination of approaches that combine a broad and narrow approach to health. Ideology should not be allowed to hinder doing what is best.

The PHN cycle resembles a generic policy cycle. Several international organizations and governments use the "Triple A" (AAA: assessment, analysis and action) planning cycle (e.g. UNICEF and the South African Department of Health).

The Triple A cycle has a number of steps:

1. Assessment: situation analysis; identify problems and select opportunities for improvement (Where are we now?)
2. Define the problem operationally (Where do we want to go?); goals, indicators and objectives.
3. Identify who needs to work on the problem.
4. Analyze and study the problem to identify major causes.
5. Develop solutions and action for quality improvement (How will we get there?)
6. Implement and evaluate quality improvement efforts (How do we know when we arrive?)

The PHN cycle is used here to encapsulate an iterative, continuous process that starts from an identification of the public health problems in a population (be it local, national or regional level) and leads to a program of work that is designed to solve the problem. Progress through each step in the cycle should be evidence based. This includes an evidence-based approach to target setting, program development and evaluation. This cycle provides a helpful guide through the related but various aspects of public health nutrition. Sections 1.7–1.13 describe the seven steps involved in the PHN cycle.

1.7 Step 1: Identify key nutrition-related problem

The purpose of public health nutrition is to solve problems. Therefore, one should start by checking what the key nutrition-related problems are within the relevant area of work or country. The following questions should be asked before proceeding to action.

What are the big public health problems in your country/region?

Consider how to answer this question. What information is needed? Is this information available at the required level?
Measuring health and quality of life, mortality and morbidity, incidence and prevalence

International agencies produce a great deal of data that can be used to give some indication of the burden of poor health in a country. These data are generally freely available on the world wide web. Routine data have been most widely available for overall mortality, or broad groupings of causes of mortality, for most countries. These estimates, which are compiled centrally, are based on locally collected data and caution must be exercised in drawing conclusions from such data. Ideally, estimates of health burden should be derived using data from high-quality, purpose-specific surveys.

Routine data on morbidity are much less readily available than data on mortality. If one is interested in a specific cause of illness (morbidity) or death, in some countries there will only be limited data from which to assess whether it really is a public health problem. Incidence data give an indication of new cases emerging over a particular time-frame, whereas prevalence estimates are a function of the underlying incidence and the duration of the illness. For many chronic diseases the estimates of the incidence and prevalence of mortality will be adequate. For infectious diseases with a short duration, incidence data will be required.

In some countries where a person dies a death certificate, with underlying causes of death, must be signed by a medical practitioner. However, in most developing countries, particularly in remote areas, when a person dies very often the underlying cause of death is not recorded by a medical practitioner and therefore may not be noted. It is important when comparing countries to be aware that differences may be attributed to differences in the way data are obtained. Always check the assumptions before using routinely collected data.

The WHO in its World Health report in 2002 used healthy life expectancy (HALE) as a summary measure of the level of health (www.who.int/whr/en). Although there have been several similar composite measures of health in the past, the universal use of HALE — calculated centrally by means of standard methodology using internally consistent estimates of levels of health — is a major advance. HALE is designed to be sensitive to changes over time and differences between countries in the overall health situation. Nevertheless, HALE based on self-reported health status information may not always be comparable across countries, owing to differences in survey instruments and methods, differences in expectations and norms for health, and cultural differences in reporting health.

In 2003 the WHO launched the Surveillance of Risk Factors related to noncommunicable diseases (www.int/mediacentre/factsheets/2003/fs273/en/). This lists all available data for eight risk factors: tobacco and alcohol use, patterns of physical activity, low fruit/vegetable intake, obesity (body mass index), blood pressure, cholesterol and diabetes (blood glucose), broken down by age groups and gender for all member states. The data are available on a compact disk, which includes details of the study populations and methods used to gather the data for each country. Appendix 3 of the report lists the data available by country. Of the 46 countries listed in Africa none has data on all eight risk factors: South Africa and Seychelles have information on seven risk factors, and only Nigeria and Cameroon have data on diet. In Europe data on all eight risk factors are available for 10 out of the 51 countries. In the Americas data for all eight risk factors are available for Brazil, Canada, Chile, the USA and Uruguay. India is the only country in south-east Asia that has data on all eight risk factors. Data are presented with a measure of the uncertainty of the estimates for each member state.

Specific groups affected: age, socioeconomic group, geographical region, ethnic group

National data may mask regional, local or within-household variation. If the burden of poor health falls
only on a subsector of a society it is important to know because this may influence the approach to solving that problem. Data are rarely available in sufficient detail (and with power) to be certain about exactly which subgroups are most at risk.

Evidence-based review of link between nutrition and the problem

If one believes that there is a problem, the next stage is to check whether there is any evidence that links nutrition to that problem. This requires a systematic review of all available evidence and a critical appraisal of the studies. From a public health perspective the aim of this review is to identify nutrition risk factors for which the evidence is sufficiently strong and consistent to suggest a causal relationship and therefore justifies action. This review should also identify whether the risk is in all groups, or only in specific subgroups, either because of specific nutritional factors that only operate in that group, or because there are other basic or underlying differences that may confound or interact with nutrition.

It is a good idea to check whether government or some other agencies have already reviewed the evidence and made some specific recommendations about changes in diet and activity. Even if the nutritionist’s review does not agree with these recommendations, it is important to know what has been recommended.

Developing critical appraisal skills is an essential part of developing a scientific approach to evidence-based public health nutrition, or any other aspect of research. The checklist in Box 1.2 may be useful to begin with.

Are the nutrition risk factors identified relevant to the target population?

Does the research identify levels of consumption that may be harmful or beneficial? Can the risk estimates be translated into consumption levels?

Often, the epidemiological study will present an estimate of the risk associated with one level of consumption compared with another. This is known as a relative risk of, for example, consumption in the highest third of intake compared with the lowest third of intake. It is not always presented in absolute terms. For example, the risk of colon cancer may be 0.5 in those in the highest third of vegetable consumption compared with those in the lowest third, but this does not indicate how much vegetable consumption there is in each third. What is more helpful is a measure of the population attributable risk; this gives a sense of the likely impact on health if the population changed their exposure from the lowest to the highest third of intake.

The public health impact also depends on how common the health outcome is: if it is common a small reduction in risk will affect many people; if it is relatively uncommon, even a large relative risk will have only a small impact on the population burden of ill-health. Ideally, the targets for intervention should be those exposures that have the biggest effect on health, and on health problems that place the biggest burden on the target society.

What is the level of consumption in the target population?

If individual country level data are not available from either routine surveillance or specific studies, a crude estimate of average intake can be made from food balance sheet data, produced for all countries by the FAO. The FAO data are crude in that they are a measure of the gross movement of food moving into and out of a country divided by the population. Both the numerator and the denominator may be inaccurate in
many countries. These data will give an estimate that may be useful, but will not give data about variation within a country or for individual levels of consumption. Where more detailed individual-level data are available, the concern will be as to whether these data are collected from a representative sample of the target population. If the epidemiology suggests that a particular group of people is at risk, are the data available relevant for that at-risk group?

Is consumption within the range that suggests possibility for beneficial change?
If the level of consumption in the target population is already above the level considered beneficial, then there is no need for a program to try to improve consumption. It may be that at a national level consumption appears adequate, or at least availability may seem adequate, but that the specific target group of interest does not achieve the national average. If the target group is below the desired level (from the epidemiological evidence) it is important to ask why. Is the supply rate limiting or is it some other aspect of the sociostructural environment?

Is it plausible that level of consumption could change from the current level to the level suggested to convey benefit?
In public health terms the estimates of risk need to be translated into levels of consumption. If, for example, the level of consumption associated with a 50% reduction in risk was 10 servings per day, and the average daily consumption in your target population was one serving per day, is it realistic to expect a 10-fold increase in consumption? It may be helpful to look at trends in intake and assess whether, and by how much, they have changed over the past 10 years. If intake has been relatively flat, and particularly if there have been many campaigns aimed at increasing intake, it is unlikely that big changes can be achieved. However, if a change of one serving a day could lead to a 5% reduction in risk, and if the risk (outcome) affects many people, then this level of change may still be very worthwhile trying to achieve. It is important to be realistic and to consider the cost–benefit of the effort required to achieve the desired change in the diet and ultimately the health outcome.

Theoretical models of relevance
At this stage it may help to begin to think about what the major constraints to change might be. The relevant theories to consider at this stage may relate to individual beliefs about the proposed intervention, social norms, or issues of institutional or societal organizational practices. If the evidence suggests fundamental changes in dietary practices in society, it is important to consider whether the social, cultural and political environment is likely to be amenable to the changes that appear to be required.

1.8 Step 2: Set goals and broad aims
Unless there are clear goals and broad aims it will not be possible to measure the impact of any programs aimed at improving health. It should be clear that the aims of public health nutrition programs are to improve nutrition-related health outcomes. The success of programs against this quantitatively defined background of work should be judged. No matter how programs may appear to be delivered, the key measure of impact is a measurable change in health outcome. These goals inform and direct government policy at the highest level. These are the broad statements that politicians sign up to and use to argue for fiscal support and political leverage to achieve them. They need to be clear and concise and integrated into the overall health and other relevant policies of the government. They set the tone of the approach and highlight the government’s priorities. The way in which these goals are achieved will vary depending on political ideology,