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Preface

The changing diet of humans through our history is subject to a great deal of contention. However, what is not in dispute is that our diet has changed significantly in both a qualitative and quantitative sense as we have moved through periods as hunter-gatherers or subsistence farmers to a situation today where we are now consumers of highly processed and ready-prepared foods. At the same time our patterns of physical activity have also changed from the demands of high activity necessary for survival and strenuous occupations to those of limited physical burdens and sedentary occupations or leisure pursuits. For most of history, humans have experienced food shortages, hunger and under-nutrition as they struggled each day to secure sufficient food to meet their needs. However, with improved agricultural processes, mechanisation, improved storage and processing of foods we are now in a situation where a significant proportion of the world’s population now has more food energy than is necessary to meet their reduced requirements. As a consequence conditions associated with over-nutrition and excess weight gain are now dominating human health and well-being.

Obesity has become a major public health and economic problem of global significance. According to World Health Organization (WHO) estimates, more than 1.4 billion adults aged 20 and older (or 35% of the world’s population) were overweight in 2008. Of these over 200 million men and nearly 300 million women were obese. Prevalence rates continue to rise rapidly in all areas of the world, including low-income countries, and obesity associated illness is now so common that it has replaced the more established public health concerns, such as under-nutrition and infectious disease, as the most significant contributor to global ill health.

Obesity impacts on both quality and length of life and is associated with a wide range of chronic conditions such as diabetes, hypertension, cardiovascular disease and many cancers, as well as non-life-threatening but debilitating conditions such as arthritis, back pain and breathlessness. Obesity also places enormous financial burdens on governments and individuals and accounts for a significant proportion of total health care expenditure in developed countries. Obesity is now the sixth most important contributor to premature death in the world.

In recent years, our knowledge of the epidemiology and causation of obesity has improved dramatically but we still have an incomplete understanding of the drivers of obesity. We know that obesity results from a prolonged period of energy imbalance where the energy intake from food and drink exceeds energy expenditure for metabolic processes and physical activity. However, there are many aspects of our current diet and lifestyle that have potential to contribute to this energy imbalance that leads to weight gain and the development of obesity. Overconsumption of food
energy may potentially be facilitated by the composition of the diet, by serving sizes, by where, when or how we eat, as a response to external cues or driven by the appeal of price, marketing or nutrition guidance. Understanding these issues is important in formulating appropriate dietary strategies to assist with weight loss or the prevention of weight gain in the community.

Whilst there has been much written about the aetiology of obesity in recent years, most books that examine the problem of obesity provide only limited coverage of dietary aspects, because they need to address the wide-ranging aspects of the issue. Therefore, in planning this book it was decided that there would be great merit in examining in more detail the broad range of dietary issues that may receive only cursory attention in more general texts. Authors were requested to prepare short chapters which focused on a single aspect of the relationship between diet and the prevention and management of obesity.

This is not a textbook or encyclopaedia, but rather an edited collection of short, relevant (and sometimes personal) review chapters by experts on the most important developments and topics in obesity management. These chapters are arranged in five sections that deal with different aspects of the relationship between diet and obesity:

- Part One deals with general issues and background to the problem of obesity, its development and strategies for its management.
- Part Two examines the role of different dietary components in obesity management and weight control.
- Part Three explores the role of eating patterns and other behavioural factors in obesity management.
- Part Four addresses structured dietary interventions in the treatment of obesity.
- Part Five tackles the difficult issues around government and industry interventions in the prevention of obesity.

The focus of each chapter means that authors cannot explore all the interrelated aspects of their topic. To ensure each chapter is complete, there may be some overlap between chapters. In addition, given the scale and complexity of the subject, there are many potential issues which are not addressed in depth. However, we hope that the breadth and scope of the contents help ensure that most of the important topics relating to dietary aspects of obesity are covered. It is likely that as research evidence builds in this area over time, that some of the insights and conclusions presented within these chapters may be challenged and replaced. However, the concepts and principles are likely to stand the test of time.

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Introduction: an overview of the key drivers of obesity and their influence on diet

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1 Introduction

Obesity results from a prolonged period of energy imbalance where the energy intake from food and drink exceeds energy expenditure for metabolic processes and physical activity. Excess energy is stored as fat within the body and is associated with a wide range of health, social and psychological problems.

Energy balance within the body is usually well regulated by a range of physiological responses which monitor food intake, metabolism and storage and send signals to influence appetite and to a lesser extent energy expenditure. Physiological energy regulation mechanisms operate within each person to keep weight and body fat stores stable in the long term (Schutz 1995). However, powerful societal and environmental forces influence energy intake and expenditure through effects on dietary and physical activity patterns, and may overwhelm the physiological control of body weight. The susceptibility of individuals to these forces is influenced by genetic and other biological factors such as gender, age and hormonal activities, over which they have little or no control.

The breadth of these ‘drivers of weight gain’ is addressed in this chapter but discussed in more detail in later chapters.

1.1 Key influences on energy balance and weight gain

A number of analyses have attempted to define the key determinants of obesity and there remains a degree of controversy over which factors have made the greatest contribution to the recent rise in the rates of obesity throughout the world. Comprehensive assessment of the situation has been undertaken by the World Health Organization in the *Expert Report on Diet, Nutrition and the Prevention of Chronic Disease* (WHO 2003) and the World Cancer Research Fund report *Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective* (WCRF 2007).

These reports examined the current literature and identified a range of key factors which either increase or decrease the risk of weight gain and the development of obesity. The results of both assessments are summarised in Table I.1.
Table 1  Summary of the strengths of evidence on behaviours that might promote or protect against weight gain and obesity – agreement from WHO 2003 and WCRF 2007 reports

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Decreases risk</th>
<th>Increases risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated convincing or likely in both reports.</td>
<td>Regular physical activity.</td>
<td>Sedentary lifestyles.</td>
</tr>
<tr>
<td></td>
<td>High intake of low energy-dense foods.*</td>
<td>High intake of energy-dense foods.*</td>
</tr>
<tr>
<td>Rated probable or possible in both reports.</td>
<td>High dietary fibre intake.</td>
<td>Sugar-sweetened soft drinks and juices.</td>
</tr>
<tr>
<td></td>
<td>Promoting linear growth.</td>
<td>High proportion of food prepared outside of homes.</td>
</tr>
<tr>
<td></td>
<td>Breastfeeding.</td>
<td>High exposure to television (marketing).</td>
</tr>
<tr>
<td>Rated possible in one report only.</td>
<td>Low glycaemic index foods.</td>
<td>Adverse social and economic conditions in developed countries (especially for women).</td>
</tr>
<tr>
<td></td>
<td>Increased eating frequency.</td>
<td>Large portion sizes.</td>
</tr>
<tr>
<td>Rated insufficient.</td>
<td></td>
<td>Rigid restraint/periodic disinhibition eating patterns.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alcohol.</td>
</tr>
</tbody>
</table>

* Energy-dense foods are high in fat/sugar, and energy-dilute foods are high in fibre and water such as vegetables, fruits, legumes and whole grain cereals.


### 1.2 The complex web of influences on the aetiology of obesity

Although the WHO and WCRF reviews touched upon the array of behavioural and environmental influences in the aetiology of obesity at an individual and population level, they did not capture the interplay of these factors and how they operate at a societal level. One of the first attempts to represent the nature of the prevailing, multi-layered environmental factors that influence energy balance in the modern world was the International Obesity Task Force ‘causal web’ (Kumanyika et al., 2002). The causal web illustrated that although food intake and energy expenditure ultimately influence energy balance, there are an array of forces operating at different layers of society that impact directly or indirectly upon these behaviours. The implications of this representation are apparent. Addressing obesity prevention will require action at many levels and must include a focus on many of the distal factors that influence our food and activity environment.

Although the causal web suggests that the genesis of and thus, the solution to obesity is complicated, its linear format does not clearly illustrate the complexity of the interactions between the various layers. The Foresight Programme of the UK Government Office for Science expanded on the causal web approach by using a systems approach to produce a complex conceptual model with 108 variables known