1 Introduction

Books on obesity have proliferated in the past three decades, along with the scientific literature, as obesity rates across the world have risen. How is this book different from the others? By looking at how obesity is framed, with different models, world views or rationalities, it is hoped that this book will make some of the issues that structure obesity science and policy more obvious. Since the emergence of obesity as a population-level issue, many models have been developed to explain its causation, emergence and rapid increase (Ulijaszek 2008). These include models that describe thrifty genotypes, obesogenic behaviour, obesogenic environments and nutrition transition, as well as biocultural models that examine interactions of genetics, environment, behaviour and culture (Ulijaszek 2007a). Models for obesity interventions and regulation are also many fold, and include ones that underpin biomedical treatment, epidemiological monitoring, public health approaches (including multilevel models), social marketing and economic regulation, as well as health and nutrition promotion and education. None can hope to be individually correct, given the complexity of the issue (Finegood 2011). Examining the rationalities that underpin different models of obesity (Chapter 2) should help reveal why some interdisciplinary approaches to obesity work better than others.

The view that all models are wrong, but some are useful, attributed to British statistician George E.P. Box (1919–2013), rings true for obesity. All obesity models are conditional, or wrong, in Box's formulation, but are useful for ordering what is currently known about obesity. Models of obesity are not neutral, nor are the facts that emerge from them. Tables 1.1 and 1.2 show two versions of what can be taken as fact about obesity now, based on different world views. The 'ten facts about obesity' given by the World Health Organization (2014) reflect the remit of this particular institution. These facts are largely epidemiological and scientific, and focus largely on prevention. Alternatively, the 'facts about obesity' from the perspective of a writing group that includes very senior obesity researchers almost exclusively in the United States (US) (Casazza et al. 2013) are more treatment-focused, with some emphasis on weight management through individual, familial and pharmaceutical manipulations, as well as on surgical interventions. This reflects the commercial interests and US orientation of much of the authorship of this writing group (Casazza et al. 2013). Such commercial orientation may carry a bias, as is the case with research funded by the pharmaceutical industry more broadly (Lexchin et al. 2003). These two sets of facts about obesity have different framings of what is considered important: predominantly for treatment in the case of Casazza et al. (2013), and

Table 1.1. Ten facts about obesity throughout the world

	Fact	Commentary
1	Overweight and obesity are defined as 'abnormal or excessive fat accumulation that may impair health'	Body mass index (BMI) – weight in kilograms divided by the square of the height in metres (kg/m^2) – is a commonly used index to classify overweight and obesity in adults. The World Health Organization defines overweight as a BMI equal to or more than 25 kg/m^2, and obesity as a BMI equal to or more than 30 kg/m^2
2	More than 1.4 billion adults were overweight in 2008, and more than half a billion were obese	At least 2.8 million people each year die as a result of being overweight or obese. The prevalence of obesity nearly doubled between 1980 and 2008. Once associated with high-income countries, obesity is now also prevalent in low- and middle-income countries
3	Globally, over 40 million preschool children were overweight in 2008	Childhood obesity is one of the most serious public health challenges of the twenty-first century. Overweight children are likely to become obese adults. They are more likely than non-overweight children to develop diabetes and cardiovascular diseases at a younger age, which in turn are associated with a higher chance of premature death and disability
4	Overweight and obesity are linked to more deaths worldwide than underweight	Sixty-five per cent of the world's population live in countries where overweight and obesity kill more people than underweight. This includes all high-income and middle-income countries. Globally, 44 per cent of diabetes, 23 per cent of ischaemic heart disease, and between 7 and 41 per cent of certain cancers are attributable to overweight and obesity
5	For an individual, obesity is usually the result of an imbalance between calories consumed and calories expended	An increased consumption of highly calorific foods, without an equal increase in physical activity, leads to an unhealthy increase in weight. Decreased levels of physical activity will also result in an energy imbalance and lead to weight gain
6	Supportive environments and communities are fundamental in shaping people's choices and preventing obesity	Individual responsibility can only have its full effect where people have access to a healthy lifestyle, and are supported to make healthy choices. The World Health Organization mobilizes the range of stakeholders who have

Table 1.1. (*cont.*)

	Fact	Commentary
		vital roles to play in shaping healthy environments and making healthier diet options affordable and easily accessible
7	Children's choices, diet and physical activity habits are influenced by their surrounding environment	Social and economic development as well as policies in the areas of agriculture, transport, urban planning, environment, education, food processing, distribution and marketing influence children's dietary habits and preferences as well as their physical activity patterns. Increasingly, these influences are promoting unhealthy weight gain, leading to a steady rise in the prevalence of childhood obesity
8	Eating a healthy diet can help prevent obesity	People can: maintain a healthy weight; limit total fat intake and shift fat consumption away from saturated fats to unsaturated fats; increase consumption of fruit, vegetables, pulses, whole grains and nuts; and limit their intake of sugar and salt
9	Regular physical activity helps maintain a healthy body	People should engage in adequate levels of physical activity throughout their lives. At least 30 minutes of regular, moderate-intensity physical activity on most days reduces the risk of cardiovascular disease, diabetes, colon cancer and breast cancer. Muscle strengthening and balance training can reduce falls and improve mobility among older adults. More activity may be required for weight control
10	Curbing the global obesity epidemic requires a population-based multisectoral, multidisciplinary and culturally relevant approach	The World Health Organization's *Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases* provides a roadmap to establish and strengthen initiatives for the surveillance, prevention and management of non-communicable diseases, including obesity

From World Health Organization (2014).

predominantly for reporting and prevention in the case of the World Health Organization (2014). They also differ in where responsibility is placed for the rise in obesity rates and for their possible reduction (Chapter 8).

Models of obesity must represent the phenomenon of obesity as accurately as possible. Much obesity science is observational and correlational, as for example in

Table 1.2. Facts about obesity in the US

	Fact	Commentary
1	Although genetic factors play a large role, heritability is not destiny; moderate environmental changes can promote much weight loss	If we can identify key environmental factors and successfully influence them, we can achieve clinically significant reductions in obesity
2	Diets (reduced energy intake) very effectively reduce weight, but trying to go on a diet or recommending that someone go on a diet generally does not work well in the long term	Recognizing this distinction helps our understanding that energy reduction is the ultimate dietary intervention required and that approaches such as eating more vegetables or eating breakfast daily are likely to help only if they are accompanied by an overall reduction in energy intake
3	Regardless of body weight or weight loss, an increased level of exercise increases health	Exercise offers a way to mitigate the health-damaging effects of obesity, even without weight loss
4	Physical activity or exercise in a sufficient dose aids long-term weight maintenance	Physical activity programmes are important, especially for children, but for physical activity to affect weight, there must be a substantial quantity of movement, not mere participation
5	Continuation of conditions that promote weight loss promote maintenance of lower weight	Obesity is best conceptualized as a chronic condition, requiring ongoing management to maintain long-term weight loss
6	For overweight children, programmes that involve the parents and the home setting promote greater weight loss or maintenance	Programmes provided only in schools or other out-of-home structured settings may be convenient or politically expedient, but programmes including interventions that involve parents and are provided at home are likely to yield better outcomes
7	Provision of meals and use of meal replacement products promote greater weight loss	More structure regarding meals is associated with greater weight loss, as compared with seemingly holistic programmes that are based on concepts of balance, variety and moderation
8	Some pharmaceutical agents can help patients achieve clinically meaningful weight loss and maintain the reduction as long as the agents continue to be used	While we learn how to alter the environment and individual behaviours to prevent obesity, we can offer moderately effective treatment for obese people
9	In appropriate patients, bariatric surgery results in long-term weight loss and reductions in the rate of incident diabetes and mortality	For severely obese persons, bariatric surgery can offer life-changing, and in some cases life-saving, treatment

Adapted from Casazza et al. (2013).

the study of the relationships between obesity rates and socioeconomic status (SES) (Sobal and Stunkard 1989; Sobal 1991). Hypothesis testing is integral to some models of obesity, such as those involving macronutrient intake and energy balance (Schutz 1995). Models for obesity regulation are usually predictive and involve hypothesis testing, as for example with the prediction across time of the efficacy of taxation of sugar-sweetened beverages on an obesity-related outcome such as change in sugar consumption. The understanding of the underlying world views, or rationalities, of models of obesity demands two things. The first is an understanding of how obesity is framed as a problem by the makers and/or users of any particular model. This sets the parameters for what is to be understood, and how. The second is an understanding of the values underpinning a model, because any model makes explicit these values in its use. This book contends that it is important to frame, comparatively, the rationalities of different models of obesity if obesity science and policy are to function as interdisciplinary endeavours.

Framing Obesity as a Problem

Extreme body fatness was known in ancient Greece (Bevegni and Adami 2003), and appears as a pathological category in writings ascribed to Hippocrates, between around 440 and 370 BCE (Gilman 2010). As a category of pathology, the cause of extreme body fatness in the ancient world was viewed in holistic ways. This approach persisted until the eighteenth-century Enlightenment, when changing understandings of disease reframed obesity as a problem of the individual body (Gilman 2010). This understanding has continued in medical practice and now informs most policy responses to obesity. While obesity was also common among the English upper classes in the late eighteenth century (Trowell 1975), it only emerged as a population phenomenon among North American men in the nineteenth century (Kahn and Williamson 1994). Obesity increased in successive surveys in both the US and United Kingdom (UK) across the twentieth century (Garrow 1978), its accelerating rates corresponding largely to the rise of global capitalism and neoliberalism from the 1980s onwards (Finucane et al. 2011; Stevens et al. 2012). This period has been characterized as late modernity (Giddens 1990, 1998), additionally involving increased privatization of services in most nations, and the almost universal expansion of computing and information technology to serve most aspects of life. The global nature of obesity was recognized in the 1990s (Popkin and Doak 1998), while obesity was formally classified as a disease by the World Health Organization *Consultation on Obesity* in 1997 (World Health Organization 2000). Since then, a number of agencies in the US have declared or accepted obesity as disease. These include the National Institutes of Health (in 1998), the Internal Revenue Service (in 2002), the Centers for Medicare and Medicaid Services (in 2006), the Food and Drug Administration (in 2012), the American Association of Clinical Endocrinologists (in 2012), the American Medical Association (in 2013), the US Office of Personnel Management (in 2014) and the US Department of Labor (in 2015) (Mechanick et al. 2012; Kahan and Zvenyach 2016). Obesity also became a matter for economic

concern in the US in the 1990s (Philipson and Posner 1999, 2008), as rates accelerated (Flegal et al. 1998, 2002), and when the direct health costs (Allison et al. 1999), health consequences (Mokdad et al. 2003) and possible demographic changes (Olshansky et al. 2005) associated with it became apparent. Its expense alone has made it a priority for action by several governments (Colditz 1999; Fry and Finley 2005).

Federal government concern about obesity in the US was only expressed in 2001, with *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity* (US Department of Health and Human Services 2001). This noted the health consequences of obesity to be among the greatest faced by the country, in its associations with premature death, disability, additional health-care costs, lost work productivity and social stigma. The *Surgeon General's Vision for a Healthy and Fit Nation 2010* (US Department of Health and Human Services 2010) noted the continued rise of overweight and obesity, reviewing its causes and health consequences, and offering 'opportunities for prevention'. In acknowledging the broad-ranging nature of population obesity, it saw obesity prevention interventions as requiring attention to individual behaviours, biological traits, and aspects of social and physical environments that impact on health outcomes. While also acknowledging the economic burden of rising obesity rates, the idea of prevention through the regulation of corporations whose products and services can contribute to obesity was conspicuously absent.

In the UK, obesity was first noted in 1991 as being a health issue of significant magnitude to warrant policy action (Department of Health 1992; Jebb et al. 2013), and was subsequently singled out for specific policy concern with the National Audit Office (2001) report *Tackling Obesity in England* (Chapter 4). Health policy documents of the previous decade only paid oblique acknowledgement to obesity and its dietary risk factors. These included cross-governmental policies published in 1992 and 1999 – *The Health of the Nation* strategy (Department of Health 1992) and *Saving Lives: Our Healthier Nation*, respectively (Her Majesty's Government 1999). The *National Service Framework for Coronary Heart Disease*, released in 2000, also made reference to obesity as a risk factor for chronic disease (Department of Health 2000). The National Audit Office (2001) report was the first to give authoritative estimates of the costs and consequences of obesity for the UK. It also emphasized the need for greater effort to be placed on establishing an evidence-based approach to obesity for greater consistency of management by the health services, and for more extensive joint work on obesity across government, both nationally and locally. Anti-obesity policy in the UK took on a more urgent note when the House of Commons Health Committee (2004) framed obesity as being ungovernable in both economic and health terms. The following year, the Department of Trade and Industry (2005) viewed the rising costs of obesity with alarm, noting that in 1998 the National Audit Office estimated the cost of obesity to the National Health Service to be £480 million, while in 2002 the Health Select Committee placed this cost at more than double the earlier amount, at between £990 and £1125 million. The 2002 Health Select Committee placed the indirect costs of obesity to the economy at £2 billion a year, rising

to £3.6 billion by 2010. The Department of Trade and Industry (2005) report viewed the health and economic costs of obesity to the country as being compelling reasons for addressing obesity seriously. This increasing sense of urgency carried into the UK government Foresight project *Tackling Obesities: Future Choices*, as the annual direct costs of treating obesity and its related morbidities to the National Health Service in England were revised upwards to £4.2 billion per year in 2007 (Butland et al. 2007). Estimates of the indirect costs (arising from the impact of obesity on the wider economy from, for example, loss of productivity) were calculated to be several times higher, rising from £2.6 billion per year in 1998 (National Audit Office 2001) to £15.8 billion per year in 2007 (Butland et al. 2007).

Although obesity has been problematized in many ways, the dominant frameworks are medical, public health and economic, all ultimately based on the energy balance model of obesity. In Chapter 3, the energy balance model and the genetic systems that regulate its physiology are described. Energy balance models, framed in terms of physiological homeostasis, have the deepest history in obesity science. Early energy balance research focused on whole-body physiology, using both human and animal models in studying relationships between macronutrient intake and energy expenditure. While seemingly straightforward, decades of work have revealed the relationships between intake and expenditure to be ever more entangled, with genetic and environmental factors influencing many aspects of the energy balance model. Human genetics may have undergone selection for traits that promote energy intake and storage and that minimize energy expenditure (Rosenbaum and Leibel 1998), thus favouring obesity production in most populations. This view has been contested by alternative framings of obesity genetics (Chapter 3). Regardless of which view of evolutionary genetics of obesity is correct, obesity genotypes and energy balance susceptibilities to obesity can only be expressed in positive energy ecologies, where it is easy for energy intake to exceed energy expenditure. Such ecologies have been vaguely defined as obesogenic environments, and Chapter 3 continues by describing how they are framed in science and policy. Environments and ecologies favouring population obesity have been created, largely unwittingly, with the neoliberal turn in politics since the 1980s, and the concurrent growth of global financialization of markets. From the 1960s onwards, motorized transport has been privileged in many wealthy or high-income countries (HICs), as have the roads and highways that serve it, thus marginalizing physically active transport. Obesogenic environments are served by industrialized and globalized food supplies, both of which shape eating patterns of populations almost everywhere, supplying energy-dense foods at lower prices than more nutrient-dense foods such as fruit and vegetables. Although obesogenic environments have emerged in late modernity, no single modernizing force or outcome can be held responsible for this changing ecology. Rather, it is argued in this book that obesogenic environments are produced by the entanglement of expert systems (Chapter 3), including those of food, transport and urban planning, none of which has sought obesity as an outcome.

From a strictly medical perspective, Bray (2004) has argued that obesity is a chronic relapsing neurological disease, which requires lifelong treatment or

management. Similarly, Casazza et al. (2013) argue that it should be conceptualized as a chronic condition requiring ongoing management. Alternatively, a public health framing of obesity views it as a chronic disease risk factor, alongside high blood pressure, tobacco use, high blood glucose and physical inactivity (World Health Organization 2009a). The World Health Organization (2009a) has placed obesity among the leading global risks of mortality, considering it to be responsible for 5 per cent of all deaths globally. Public health approaches to obesity emphasize prevention as being the only feasible way to resolve population obesity (Visscher and Seidell 2001; Lobstein et al. 2004), usually through state policy (Nestle and Jacobsen 2000; Kumanyika et al. 2002). The costs of obesity to the economy are usually the most politically compelling, however (Rashad and Grossman 2004; Mazzocchi et al. 2009; Cawley 2010; Grossman and Mocan 2011). Obesity has clear economic costs, and both economic and public health framings of obesity are related to each other with their roles in state regulation.

Medical and economic framings of obesity reflect the dominant institutions of late modern society. There are other framings of body fatness that make obesity, as a category, problematic (McCullough and Hardin 2013). Critics of the medicalization of body fatness reject the term 'obesity', many favouring the term 'critical fat studies' as a way of distancing themselves from the pathologization of oversized bodies. While some critical fat studies scholars do not deny the materiality of the body (Guthman 2013), there is a clear difference between those who see obesity as a physical reality, and those who see it as being socially constructed (Warin et al. 2015). The American Medical Association's resolution to recognize obesity as a disease in 2013 (Table 1.3) acknowledges both the material reality of obesity and obesity as a disease state with multiple pathophysiological aspects. This has led to recommendations for intervention that largely emphasize treatment. Questioning the notion of obesity as a disease, de Vries (2007) has asserted that if some bodily conditions either confer evolutionary or biological advantage or are common to a species, they should not be regarded diseases; only if bodily conditions are rare and fall out of the range of morphological normality should they be considered diseases. With respect to obesity, bodily fatness is typical of the human species, is usually within the range of normality and cannot be considered to be a disease by these criteria, except at the extremes. However, when societal aspects of obesity are considered, de Vries (2007) argues that it can be framed as disease because it represents bodily deviation from norms and social desirability. Beyond treating obesity as a disease, some of the medical preoccupation with obesity seeks to correct unwanted or immoral behaviour (Crossley 2004; Gard and Wright 2005). Moral judgement has been argued to be implicit in some medical approaches to obesity (Aphramor 2005; Gard and Wright 2005; Monaghan 2005; Evans 2006; Colls 2007; Evans and Colls 2009; Gard 2011a). With respect to childhood obesity, de Vries (2007) sees its medicalization as confronting children and their parents with a societal expectation that they will recover from this stigmatized condition. Failure to 'recover' in this sense is morally judged by society as weakness on the part of the child and potentially as child abuse on the part of their parents, as they deny their obese child a normal life (de Vries 2007).

Table 1.3. American Medical Association resolution to recognize obesity as a disease

AMERICAN MEDICAL ASSOCIATION HOUSE OF DELEGATES Resolution: 420 (A-13)

Introduced by: American Association of Clinical Endocrinologists; American College of Cardiology; The Endocrine Society; American Society for Reproductive Medicine; The Society for Cardiovascular Angiography and Interventions; American Urological Association; American College of Surgeons

Subject: Recognition of Obesity as a Disease

Referred to: Reference Committee D (Douglas W. Martin, MD, Chair)

Whereas, Our American Medical Association's Council 1 on Science and Public Health Report 4, A-05, has identified the following common criteria in defining a disease: 1) an impairment of the normal functioning of some aspect of the body; 2) characteristic signs or symptoms; and 3) harm or morbidity; and

Whereas, Congruent with these criteria there is now an overabundance of clinical evidence to identify obesity as a multi-metabolic and hormonal disease state including impaired functioning of appetite dysregulation, abnormal energy balance, endocrine dysfunction including elevated leptin levels and insulin resistance, infertility, dysregulated adipokine signaling, abnormal endothelial function and blood pressure elevation, nonalcoholic fatty liver disease, dyslipidemia, and systemic and adipose tissue inflammation; and

Whereas, Obesity has characteristic signs and symptoms including the increase in body fat and symptoms pertaining to the accumulation of body fat, such as joint pain, immobility, sleep apnea, and low self-esteem; and

Whereas, The physical increase in fat mass associated with obesity is directly related to comorbidities including type 2 diabetes, cardiovascular disease, some cancers, osteoporosis, polycystic ovary syndrome; and

Whereas, Weight loss from lifestyle, medical therapies, and bariatric surgery can dramatically reduce early mortality, progression of type 2 diabetes, cardiovascular disease risk, stroke risk, incidence of cancer in women, and constitute effective treatment options for type 2 diabetes and hypertension; and

Whereas, Recent studies have shown that even after weight loss in obese patients there are hormonal and metabolic abnormalities not reversible by lifestyle interventions that will likely require multiple different risk stratified interventions for patients; and

Whereas, Obesity rates have doubled among adults in the last twenty years and tripled among children in a single generation and a recent report by the Robert Wood Johnson Foundation states evidence suggests that by 2040 roughly half the adult population may be obese; and

Whereas, The World Health Organization, Food and Drug Administration (FDA), National Institutes of Health (NIH), the American Association of Clinical Endocrinologists, and Internal Revenue Service recognize obesity as a disease; and

Whereas, Obesity is recognized as a complex disease by CIGNA, one of the nation's largest health insurance companies; and

Whereas, Progress in the development of lifestyle modification therapy, pharmacotherapy, and bariatric surgery options has now enabled a more robust medical model for the management of obesity as a chronic disease utilizing data-driven evidenced-based algorithms that optimize the benefit/risk ratio and patient outcomes; and

Whereas, The suggestion that obesity is not a disease but rather a consequence of a chosen lifestyle exemplified by overeating and/or inactivity is equivalent to suggesting that lung cancer is not a disease because it was brought about by individual choice to smoke cigarettes; and

Whereas, The Council on Science and Public Health has prepared a report that provides a thorough examination of the major factors that impact this issue, the Council's report would receive much more

Table 1.3. (*cont.*)

of the recognition and dissemination it deserves by identifying the enormous humanitarian and economic impact of obesity as requiring the medical care, research and education attention of other major global medical diseases; therefore be it

RESOLVED, That our American Medical Association recognize obesity as a disease state with multiple pathophysiological aspects requiring a range of interventions to advance obesity treatment and prevention.

Received: 05/16/13

From American Medical Association (2013).

Medicine is not the only domain in which obesity is morally judged. Such judgement exists as stigma and discrimination in a wide range of other institutional contexts, and is especially strong in employment, in the workplace and in media representations (Chapter 5) (Puhl and Brownell 2003). Stigma also accompanies the weighing and quantification of fat bodies (Chapter 4) that is a precondition to the framing of obesity as a medical, economic and public health problem. The standardized metric of obesity since the year 2000 is the body mass index (BMI). This measure was adopted by the World Health Organization (2000) for use by governments and international agencies primarily because of its positive association with mortality and morbidity, and with the future morbidity of children. The BMI cut-off for classifying obesity among adults has been set at 30 kg/m^2, while that for overweight has been set at between 25 and 30 kg/m^2 (World Health Organization 2000). The internationally accepted classificatory cut-offs for childhood obesity and overweight are age-specific measures of BMI that pass through 25 and 30 kg/m^2, respectively, at the age of 18 years (Cole et al. 2000). Both classifications are used consistently when discussing or describing overweight and obesity of adults and children in this book. Such epidemiologically determined obesity rates are used to make a case for, and monitor, public health and economic interventions against obesity. There are other measures of obesity (Chapter 4), but BMI is the most widely used in epidemiological mapping and econometric modelling of obesity. While the BMI cut-offs for obesity in adults (World Health Organization 2000) have strong relationships with mortality at the population level (Berrington de Gonzalez et al. 2010; Flegal et al. 2007), they cannot be used to predict mortality either among different adult age groups (Winter et al. 2014), or among some regional populations of the world (Wen et al. 2009). Furthermore, epidemiological studies relating body fatness (by the proxy of BMI) and mortality have methodological biases, including reverse causation and confounding by related factors such as smoking (Hu 2008).

Economics and Obesity

Econometric models start with the assumption that individuals practise rationality in choice, action, preference and belief (Chapter 2). Economic rationality is central to contemporary mainstream economics (Foley 1998). It requires consistency of action