

# Introduction

When our then-editor at University of California Press, Stan Holwitz, suggested that we write a book about calories, we said yes right away. Consumption of too few or too many calories is an important—arguably the *most* important—cause of public health nutrition problems in the world today. Problems with calories affect billions of people in rich as well as poor countries. Consuming too few calories leads to malnutrition (undernutrition), which makes people more susceptible to infectious disease. The result is stunted growth, misery, and premature death in children and adults. More than a billion people, most of them in poor countries, go hungry for lack of food.

At the same time, just as many people in the world are consuming more calories than they need and becoming overweight and obese. The numbers of obese people are rising rapidly, even in the poorest countries. Obesity is now so common that the populations of some poor countries contain nearly equal numbers of people who are undernourished and overnourished. Obesity raises risks for any number of chronic diseases, most notably type 2 diabetes.

The health consequences of too many or too few calories threaten to overwhelm the resources of individuals, families, and health care systems. Countries can ill afford the costs of health care for obesity-related chronic or infectious diseases or to have large segments of their populations unable to work or function adequately. Some analysts even suggest that the health burdens of obesity alone may shorten overall life expectancy within the next few years.<sup>1</sup>

Despite widespread concerns about the health and economic consequences of obesity on the one hand and undernutrition on the other, correcting calorie imbalances presents social and economic challenges that few countries are prepared to meet. Calories, therefore, affect societies in ways that are political as well as personal.

Calories, of course, derive from food. But calories are a convenient way to say a great deal about food, nutrition, and health. For this reason, and because calories are so poorly understood, we thought it would be useful to research and write about calories in all of their dimensions—personal, scientific, and political. And because we are both consummate “foodies” who derive enormous pleasure from eating, we liked the idea of using calories as a way to think about these aspects of food.

Let’s be clear from the beginning: this is not a diet book with a breakthrough scheme for losing weight and keeping it off. Instead, we try to provide an appreciation for what you are up against if you want to control your body weight in today’s “toxic,” obesity-promoting—or as we like to call it, “eat more”—food marketing environment.<sup>2</sup> We intend this book to give you the information you need to interpret food labels, diet claims, and your own reactions to this food environment. Knowledge, we argue, is not enough to counter the biological urge to eat or the subtleties of food marketing, but it is a powerful first step in developing weight-management strategies that work for your particular body, lifestyle, and food preferences.

We need to explain that both of us are or were professors in human nutrition departments, Marion Nestle at New York University and Malden Nesheim at Cornell. Our collaboration grew out of a previous project that culminated in a book about the pet food industry.<sup>3</sup> In working on that project, we discovered that we enjoyed researching and writing together and shared similar views of the strengths and limitations of nutrition science and its implications for dietary advice. In this book, the word *we* refers to the two of us and to our joint opinion.

## THE FOOD CONTEXT

In considering this project, we were acutely aware that calories do not exist in isolation. They come from food. And along with calories, foods supply nutrients (vitamins, minerals, amino acids, essential fats), of which forty or more are required for life. To meet your body’s needs for calories and nutrients,

you do best when you vary, balance, and moderate your food intake. Eating a variety of foods balances the nutrients, meaning that you get enough of the ones you need. Foods contain a great many nutrients but in different proportions. If one food is low in a particular nutrient, others will compensate. If you typically vary the foods you eat, you really don't have to worry about nutrients. This leaves moderation as the central nutritional concern. Hence: calories.

One caveat: varying food intake takes care of nutrient needs only when the foods are of good nutritional quality. Processing removes nutrients from foods and often adds calories. Here we must introduce some terms nutritionists use to describe the nutritional quality of foods:

- ✦ *Nutrient density*: The proportion of nutrients in a food relative to its calories. Fruits, vegetables, whole grains, nuts, lean meats, and low-fat dairy products are nutrient-rich for their calories. Because fruits and vegetables often contain a great deal of water, which has no calories, they have an especially high nutrient density.
- ✦ *Calorie density*: The number of calories relative to the weight of a food. Fruits and vegetables provide few calories relative to their weight. Their calorie density is low.
- ✦ *Empty calories*: Calories accompanied by no or few nutrients. Sugar, alcohol, and highly processed “junk” foods are characterized by a low nutrient density as well as a high calorie density. Their calories are “empty.”

“Real,” “whole,” or relatively unprocessed foods tend to be high in nutrients for their calories and low in calories for their weight. Diets based on such foods usually are adequate in essential nutrients and promote health. Nevertheless, the vast majority of health problems that result from inadequate or excessive food intake depend more on calories than on nutrients. We realize that what follows may sound like heresy coming from a couple of nutritionists, but unless diets are severely limited in variety or based largely on empty-calorie foods, nutrient intake is likely to be adequate when calories are adequate. This is especially true in today's era of nutrient fortification and nutritional supplements.

If you are eating too many calories, your diet is likely to be healthier if the calories come from real foods. But a healthful diet cannot fully protect you

from the effects of overeating. When it comes to calories and body weight, how much you eat matters more than what you eat. Consider, for example, pre-Westernized Japanese and Mediterranean diets. The traditional rice-based diet in Japan was extremely high in carbohydrate and low in fat, while the traditional Mediterranean diet had a much higher proportion of fat (olive oil). People who ate those diets balanced their calories with physical activity. They did not eat more food than they needed, were highly active, and were rarely overweight. Although widely varying in composition, both diets promoted good health.

#### THE CONFUSION CONTEXT

That these points and much else about calories are not obvious constitutes a major rationale for writing this book. In our experience, people are so confused about calories that we have come to think of them as the C-word. Nobody wants to talk about them. They are poorly understood, and understandably so. You cannot see, taste, or smell them. The only way you can tell whether you are getting enough or too many is to observe their effects on your belt size or your weight on a scale. Most people have some vague idea that calories have something to do with putting on weight, but little intuitive grasp of the number in foods or what they do in the body. This, however, does not stop diet gurus, food advertisers, or government agencies from using the word all the time.

To pick our favorite example: In the 2004 film *Super Size Me!* (Marion's screen debut), a camera crew asks people at random on the street to define *calorie*. You watch respondents struggling to say something that makes sense. The film records some of the more amusing attempts, but its director, Morgan Spurlock, tells us that his crew could not find even one person who could come up with a reasonable definition.

Public confusion about calories is widespread, has been studied extensively, and is entirely understandable. Calories are tangible when measured in food or in the body, but such measurements can be done only in laboratories using equipment or techniques that are not available to the average person. The very definition of *calories* is nonintuitive. They are a measure of the energy in food and in the body, but "energy" is conceptually abstract. To get a feel for calories, you have to know how they are measured and what they do, neither of which comes up much in day-to-day life.

Even talking about calories is difficult. For starters, calorie counts are given in no less than *five* different units—calories, Calories, kilocalories, Joules, and kilojoules (along with their abbreviations, cal, Cal, kcal, J, and kJ). Which unit you use depends on whether you are a chemist, a nutritionist, or someone just looking at a food label and whether you live in the United States or someplace else. The bewildering terminology, which we sort out in chapter 1, is the result of history and geography, and not even scientists have an easy time with it.

#### THE MEASUREMENT CONTEXT

Calories in food are measurable, although not conveniently. Scientists also can measure calories used in the body, but even less conveniently. To do so, they must house study subjects in metabolic chambers, attach them to devices that measure oxygen use, or feed them specially labeled isotopes of water—all experimentally difficult and expensive. As we will discuss, other ways of determining calories in food or in the body are *estimates*. Some estimates are better than others, but they are inevitably imprecise.

In the United States, the estimates used to evaluate the number of calories in food were developed more than one hundred years ago by a Department of Agriculture scientist, Wilbur Atwater. Atwater Values—4 calories per gram for protein and carbohydrate, and 9 calories per gram for fat—still remain the basis of calorie counts on food labels. Throughout the last century and well into this one, investigators have attempted to improve the accuracy of these estimates. Despite their imprecision, Atwater Values remain in common use.

We think Atwater Values have survived to the present era because as calorie estimates they are good enough. Precise measurements are essential for research purposes but matter much less to daily eaters. If you cannot make laboratory measurements or enroll in a scientific study, you can only guess the number of calories you eat or use. Estimations work well enough for most purposes, and we will have much to say about how the difference between measurements and estimations applies to current theories of dieting and weight loss.

Because of the inability to make actual measurements of calorie intake and use, body weight is by far the best measure of calorie adequacy. Your body weight is the net result of the balance between the calories you eat and

those you use, store, put out, burn off, or, more formally, “expend”—all terms we will use interchangeably—in metabolism and physical activity. Despite enormous day-to-day variation in calorie intake and output, people generally tend to remain at a relatively constant body weight. How this works is one of the great puzzles of calorie balance and one we address throughout this book.

How many calories should you be eating every day? This question also poses conceptual difficulties. You cannot tell from looking at a food how many calories it contains, because size does not indicate number. An apple, for example, can provide about the same number of calories as a teaspoon of salad oil. Apples are mostly water and have few calories for their weight—a low calorie density. Salad oil, in contrast, is concentrated fat. Only a few components of foods provide calories: proteins, fats, carbohydrates, and alcohol. Of these, fats provide the most. Food components such as vitamins, minerals, antioxidants, cholesterol, and water either do not provide calories or provide so few that their calories can be ignored.

It is next to impossible to guess the number of calories in meals in restaurants or at salad bars or dinner parties—unless you weigh the foods and know how they were prepared. How important imprecise estimates might be to weight maintenance is a question we also consider. Imprecision complicates not only personal dietary decisions but also government decisions about food policy. And imprecise estimates make public education about obesity an especially challenging task, particularly in light of today’s “eat more” food environment.

## THE ENVIRONMENT CONTEXT

Advice to maintain or to lose weight invariably includes two elements: eat less (translation: take in fewer calories) and move more (expend more calories). We like to add a third admonition: eat better (meaning eat this instead of that). Following this advice usually means replacing high-calorie foods with those lower in calories, or restricting one or another food component that achieves the same goal. But if you do not know how many calories you need or how many are in the food you eat, the meaning of “eat less” is uncertain. Indeed, when researchers ask people how many calories they habitually eat, most responders *underestimate* the number by an astonishingly large percentage—30 percent or more. People confronted with large food portions under-

estimate calories by even larger percentages. And most people overestimate their levels of physical activity, also by large percentages.

Overweight and obesity are serious public health concerns, not least because they are preventable. Much of this book is about the relationship of calories to body weight. If this relationship were simple, it would not take a book to deal with it. But as we continually emphasize, food and calories are more than physiological; they also have social, political, and economic dimensions.

In the United States, for example, rates of obesity began to rise sharply in the early 1980s. At that time, people must have begun to eat more, move less, or do both. How that happened involved changes in agricultural and economic policies that promoted greater food production. As we explain in chapter 21, more food meant that the number of calories available in the U.S. food supply rose from 3,200 per capita per day in 1980 to 3,900 twenty years later. With so much food available, food companies had to find new ways to sell products in a competitive marketplace. Food prices dropped, and people suddenly could afford to eat more food outside the home more often, in more places and in larger portions—all of which encouraged greater calorie intake. Eating more is good for business. Eating less is not.<sup>4</sup>

In seeking ways to maintain sales, food companies insistently promoted their products through the use of health and nutrient-content claims on package labels. Packages began to sport claims that their contents were free of fat, cholesterol, trans fat, salt, or sugar; contained vitamins or antioxidants; or were organic or could help prevent heart disease or immune disorders. Because people tend to interpret the meaning of such claims as “low calorie,” health claims are calorie distracters.<sup>5</sup>

Calorie distracters lull people into forgetting how much they are eating. They convey the impression that what you eat matters more to body weight than how much you eat. Conveying this impression is the basis of the flourishing diet industry. Diet experts say that if you follow their particular newly discovered dietary principle, often based on complicated metabolic reasoning, you will lose weight without having to give a thought to calories or how much you eat. Remarkably, the particulars of breakthrough diet plans vary and contradict one another. Some emphasize avoiding fat, while others say you should avoid carbohydrate. Still others focus on fiber or a particular food group. To the extent that these plans help you take in fewer calories, they will

result in weight loss—at least as long as you stick to the plan, a challenge in itself.

We need to reemphasize that calories occur within the context of food, diet, culture, and lifestyle. The effects of calories must be understood within this broader context. Much evidence demonstrates the health benefits of consuming diets based on foods of high nutrient and low calorie density. Such diets are well established to meet nutrient needs as well as to reduce risks for heart disease, cancers, and other chronic diseases. They also make it much easier to balance calories and prevent weight gain.

#### ABOUT THIS BOOK

What we attempt to do here is to give you information you can use to interpret current concerns about calories as they relate to the full spectrum of calorie intake—from too little to too much—and the consequences of such concerns for food and nutrition policy. Much of the current debate about calories centers on just a few questions:

- ♦ Why do some people and not others get fat, even though they eat similar diets?
- ♦ How much do you have to overeat or undereat to gain or lose weight?
- ♦ Why is it so much easier to gain weight than to lose it?
- ♦ Which is more important to body weight and health, calorie intake or the composition of the diet?
- ♦ Who is more responsible for childhood obesity: parents or society?
- ♦ What is the role of government in ensuring that people have enough to eat?
- ♦ What is the role of government in regulating the food environment and promoting appropriate calorie intake and expenditure?

Our approach to dealing with these questions begins with the science—how it developed, how it is used, and where it now stands. Because science necessarily occurs within the context of society, these questions also have evident social and political implications. We address these implications throughout this book.

Our purpose here is to give you a greater appreciation of calories and, as a result, of the pleasures and health-giving qualities of food. We hope that by



understanding calories you will worry about them less, eat more healthfully without having to think about it, and enjoy your food even more. We also hope to inspire you to appreciate the political dimensions of calories and to press for policies that will make it easier for you and everyone else to have enough to eat, to eat better, and to be more active.