The ASMBS Textbook of Bariatric Surgery

Volume 1:
Bariatric Surgery

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ISBN 978-1-4939-1205-6 ISBN 978-1-4939-1206-3 (eBook)
DOI 10.1007/978-1-4939-1206-3
Springer New York Heidelberg Dordrecht London

Library of Congress Control Number: 2014945755

Foreword

What an honor to be asked to provide the introduction for the first textbook of metabolic and bariatric surgery to be authored by the ASMBS. We've come a long way since the first bariatric procedures in the 1950s. In the earliest days of the jejunoileal bypass with high mortality in elective procedures, malnutrition, and a poor understanding of the physiology of the procedure, surgeons who worked in this field often experienced justified criticism from their peers. As procedures expanded and surgeons began to do gastroplasty, including horizontal single row stapled, Gomez gastroplasty, and the vertical banded gastroplasty (VBG) and Roux-en-Y gastric bypass (RYGB), our surgical colleagues remained steadfast in their lack of support. In my own experience, I was blocked access to patients referred by pulmonary medicine specialists to treat obesity hypoventilation and sleep apnea, and had difficulty getting gut peptides analyzed in a prominent surgical laboratory after glucose tolerance tests comparing VBG to RYBP. It was Tom O'Dorisio, an internist at Ohio State University, who provided the assays for the first study, which showed a marked rise of GLP-1 (called enteroglucagon at that time) after RYGB versus no change after VBG.

Gradually, after the careful research by surgical leaders such as Ed Mason, MD; Ken Printon, MD; Walter Pories, MD; Bob Brolin, MD; John Halverson, MD; Alex Macgregor, MD; Henry Buchwald, MD; John Linner, MD; Pat O'Leary, MD; George Cowan, MD; Merv Deitel, MD; myself, and others, we were able to establish bariatric surgery as a field of surgery that could help desperately obese patients with multiple obesity-related diseases. This has markedly improved their quality of life and—as we have subsequently learned from Ted Adams et al.'s Utah study and Lars Sjöström et al.'s Swedish Obesity Study (SOS)—has increased their life expectancy. Numerous paired studies were done in the 1980s showing the dramatic improvement in type 2 diabetes mellitus (T2DM), sleep apnea, obesity hypoventilation, venous stasis disease, gastroesophageal reflux disease (GERD), hypertension, degenerative joint disease, pseudotumor cerebri, hepatic steatosis and cirrhosis, from before to after surgically induced weight loss. Clearly, obesity affects every organ in the body—and surgically induced weight loss reverses or improves all of these obesity related comorbidities.

These studies paved the way for the National Institutes of Health (NIH) in 1991 to support bariatric surgery for those whose body mass index (BMI) was $\geq$40 kg/m^2 without co-morbidities and $\geq$35 kg/m^2 with co-morbidities. Without this support, insurance coverage for bariatric surgery would have been discontinued. Dr. John Kral was extremely helpful with this endeavor. The next crisis occurred in 2004 when Centers for Medicare and Medicaid Services (CMS) decided to convene a Medicare Coverage Advisory Committee (MCAC) to determine whether CMS should cover bariatric surgery. The late Dr. Ross Brechner, a retired ophthalmologist, who was a CMS employee, was very helpful by presenting to this Committee a very positive review of the risks and benefits of bariatric surgery (subsequently published in *Surgery for Obesity and Related Diseases*). A number of our colleagues also made strong presentations when this was evaluated. In 2006, CMS published a favorable National Coverage Decision (NCD) supporting bariatric surgery according to the previously NIH-approved criteria. Had this not been approved, it would have been extremely difficult to obtain insurance coverage from private insurers.

Although adjustable gastric banding had been developed by Drs. Kuzmak, Belechiew and O'Brien for a number of years, the next major advance in our field was the application of laparoscopy for complex procedures, such as the RYGB and the BPD w/wo DS. This revolution was begun in 1993 by Dr. Alan Wittgrove and published in 1994. Over the years there has been a progressive increase in the percentage of bariatric procedures performed laparoscopically, reaching more than 90 % currently.

Despite the support from both the NIH and CMS, it still was (and continues to be) a problem obtaining insurance coverage for many suffering individuals. Our colleagues (and society in general) would say that all these patients had to do was eat less—and they should be able to control what they do. However, numerous studies have shown that the efficacy of dietary weight loss programs, with or without pharmaceuticals, were highly ineffective for the vast majority of severely obese patients. Although there are a few people throughout the United States who have been able to effectively lose a lot of weight and maintain that weight loss for many years (and I have met a number of these individuals), they are clearly in the minority—perhaps less than 5 %. Recent long-term data from the Look Ahead trial has shown that even though patients may lose and maintain small amounts of weight loss with a modest improvement of HbA1c, fitness, and decreased waist circumference, the overall cardiovascular mortality is the same. Years of trying to educate our colleagues and the public about the benefits of weight loss through surgery have been frustrated by the underlying prejudice and discrimination against this group of patients and the surgeons and integrated health teams that manage their disease.

The doubts of our colleagues were balanced against early retrospective studies creating an environment in which funding for higher-level data was forthcoming. This included randomized, prospective, controlled (RCT) studies evaluating various bariatric procedures (e.g., VBG versus RYGB) that provided academic credibility. After years of trying to obtain funding from NIH for studies related to bariatric surgery, thanks in large part to the help of Dr. Walter Pories and Dr. Bruce Wolfe, the Longitudinal Study of Bariatric Surgery (LABS) was initiated. Publications from this study in the *New England Journal of Medicine* and *SOARD* provided further scientific support. Studies by Drs. Schauer and Rubino and the international congresses for the treatment of type 2 diabetes mellitus have led our surgical colleagues and diabetologists to accept us as legitimate. We no longer were the "black sheep" of surgery. The ultimate expression of this was when the quality programs of the ASMBS and ACS joined last year to present one unified program of accreditation and quality improvement.

Yet we are still struggling with this issue: Is what we do truly of value? The data demonstrate it clearly is, so why don't all patients have access to surgical therapy for their disease? There never has been obstruction by insurers to operate on patients who smoked and had lung, pancreatic or bladder cancer, or bleb reduction for chronic obstructive pulmonary disease (COPD) or coronary artery bypass for heart disease from the lack of exercise, smoking or improper eating choices. It is highly probable that bariatric surgery has provided many, many more quality adjusted life years (QALY) than all of the cancer or coronary operations combined. In fact, bariatric surgery has been shown to significantly decrease cancer mortality. Do these companies really provide insurance for "their patients" or are they primarily interested in this year's "bottom line," since the benefits of bariatric surgery may take several years to provide a significant return on investment (ROI)?

Newer operations came upon the scene: LAGB, Scopinaro's biliopancreatic diversion (BPD), BPD with duodenal switch (DS), sleeve gastrectomy (SG) as a stand-alone procedure and, more recently, gastric plication. We evolved from simply the ASBS to the ASMBS, the American Society for Metabolic and Bariatric Surgery, as it became more clear how profoundly beneficial bariatric surgery and, in particular, RYGB and BPD with or without DS, or DS alone were for the remission of T2DM. Increasingly these procedures provide a window to understand the physiology of metabolism, hunger and satiety, the pathophysiology of obesity and the mechanisms of action of our procedures. Partnering with our medical and basic sciences colleagues, we are rapidly increasing our understanding of these mechanisms.

The procedures are also shedding light on the physiology and pathophysiology of various diseases. For instance, after gastric bypass beta cell hyperplasia can occur, usually with resolution of T2DM but occasionally with postoperative hypoglycemia, which can be difficult to manage.

Finally, the ASMBS journal, *Surgery for Obesity and Related Diseases*, has become a highly regarded surgical journal. The 2012 Impact Factor, a measurement of journal quality, was 4.1, which placed it 8th of 198 surgical journals. The only major surgical journals that were ranked above *SOARD* were *Annals of Surgery*, the *British Journal of Surgery* and, just barely, the *Journal of the American College of Surgeons*. This is certainly a credit to our field and is dramatic evidence of the regard in which bariatric surgery is held.

The 43 chapters in this textbook provide a comprehensive review of bariatric surgery—from preoperative assessment, anesthetic management, various surgical procedures, and postoperative care. This information should be of great value for surgeons and primary care physicians, internists from numerous specialties in endocrinology, cardiology, pulmonology, hepatology, orthopedics, plastic surgery, psychiatry, nephrology and neurology, as well as anesthesiologists, registered dieticians, bariatric surgical nurses, and patients.

Our field has progressed from a few surgeons pioneering a narrow and controversial path to thousands of surgeons and integrated health teams from around the world providing care for patients afflicted with severe obesity.

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Preface

The American Society for Metabolic and Bariatric Surgery (ASMBS) is comprised of a dynamic group of surgeons, physicians, and integrated health members, all of whom are constantly challenged to improve the care of obese patients. As acknowledged in a landmark 2013 decision by the American Medical Association, clinically severe obesity is a disease process that is associated with multiple life-threatening conditions that may lead to premature death. As repeatedly and consistently demonstrated by literature evidence, bariatric surgery has shown to be the only long-lasting effective treatment for obesity and its related comorbidities.

Due to the development of videoscopic instrumentation, critical care, modern stapling devices, and laparoscopy, the field of bariatric surgery has changed tremendously over that past three decades since ASMBS's founding in 1983. Until 1998, only 10,000 to 12,000 bariatric operations were being performed yearly in the United States, with high rates of morbidity and mortality. This number of operations has increased exponentially over the subsequent years and eventually peaked at more than 140,000 operations in 2004. This growth directly correlates with the development and transition from open to laparoscopic Roux-en-Y gastric bypass. Additionally in 2001, following the US Food and Drug Administration's approval of the laparoscopic adjustable gastric band, the number of bariatric procedures experienced a significant increase. By 2005, the number of laparoscopic Roux-en-Y gastric bypass cases being performed in the US surpassed the number of open Roux-en-Y gastric bypass cases. Most recently, the laparoscopic sleeve gastrectomy has proven to be an additional effective bariatric surgical option, with a risk and benefit profile between that of laparoscopic gastric bypass and laparoscopic adjustable gastric banding.

Along with those utilization changes, technological advancement, surgical technique and quality improvement all required our society to respond to and accommodate the educational needs of our members. This dynamic field of surgery will continue to grow with enhanced understanding of the mechanisms of action of the procedures we can offer and the development of innovative and complementary treatment of obesity. As the needs of the society and its members evolve, the ASMBS is committed to continuing to serve the educational needs of our members and expanding public education. Our annual meeting is the primary venue to disseminate new information and educational materials to clinical professionals. To enhance and augment these educational offerings, we are excited to present this comprehensive ASMBS textbook of bariatric surgery. The development of this book reflects the commitment of the ASMBS leadership's goal of providing the most up-to-date education for our members.

Designed to be the *most* inclusive textbook on the topic of bariatric surgery and integrated health services to date, this textbook comprises two volumes. The first volume is devoted to the science and practices of bariatric surgery and is divided into five parts detailing basic considerations, including bariatric surgery's history and evolution, the pathophysiology of obesity, mechanisms of action, primary operations and management of complications, revision of primary bariatric surgery for failure of weight loss, the role of metabolic surgery, and specific considerations such as the role of endoscopy in bariatric surgery and coding and reimbursement. The second volume focuses on the medical, psychological, and nutritional management of the bariatric patients.

Each chapter in this book was written by a world-renowned expert in their field. A comprehensive text that adheres to the highest standards is a major undertaking, and we, the editors, are grateful and indebted to every author who has devoted time and effort to research the most important evidence-based information and report it in a concise and easy-to-read chapter. We believe that this *ASMBS Textbook of Bariatric Surgery* is the leading source of scientific information for surgeons, physicians, residents, students, and integrated health members today and for years to come.

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Part I

Basic Considerations

Epidemiology and Discrimination in Obesity

1

R. Armour Forse and Devi Mukkai Krishnamurty

Chapter Objectives

At the end of the chapter, the reader should be able to describe:

1. Definition of obesity
2. Epidemiology of obesity
   - Global burden of obesity
   - Obesity in the United States
3. Disparities in obesity by age, race, ethnicity, gender, and socioeconomic status
4. Obesity-related discrimination, especially in spheres of employment and health care
5. Effect of discrimination on obese individuals

Introduction

Obesity is an extremely significant and increasing public health challenge in both economically developed and developing regions of the world. In 2008, more than 1.4 billion adults, worldwide, were overweight and of these more than 200 million men and nearly 300 million women were obese, a number that has doubled since the 1980s [1]. The current estimates are that 33 % of the world's population of 7.08 billion—a staggering 2.36 billion people—are overweight or obese [1]. There are an estimated 2.5 people added to the global population each second and one of them will be obese or overweight. It is estimated that 35.7 % of the adult population in the United States is obese [2].

Obesity is associated with markedly reduced life expectancy, thus becoming a leading cause of preventable deaths in the United States. It has been shown to be associated with hypertension, hyperlipidemia, coronary artery disease abnormal glucose tolerance or diabetes, sleep apnea, nonalcoholic fatty liver disease, and certain cancers including esophageal, pancreatic, renal cell, postmenopausal breast, endometrial, cervical, and prostate cancers. Even more alarming is that at least 2.8 million people across the world are dying each year directly as a result of being overweight or obese [1].

Health-care costs associated with obesity are high. In 1998 the estimated annual cost of obesity was 78.5 billion and this doubled over the next 10 years to almost 147 billion in 2008 with the medical costs for people who are obese being $1,429 higher annually than those of normal weight in the same year [3]. Social, psychological, and economic consequences are also well recognized. A large amount of research is directed toward the understanding of obesity and many public health efforts have been directed toward controlling its exponential growth.

Definition of Obesity

The World Health Organization (WHO) defines obesity as a condition of excessive fat accumulation in the body to the extent that health and well-being are adversely affected [1]. If the amount of body fat exceeds normal physiological values, a person is obese. Although this definition appears simple on the surface, it has major limitations. The physiologically normal amount of body fat depends on age and, on sex with high variation among individuals. Newborns have 10–15 % body fat (BF), and during the first year of life, this increases to about 25 %. After that, BF% slowly decreases again to 15 % of body weight at the age of 10 years, when differences between the sexes become more apparent. During sexual maturation, girls experience an increase in their body fat again, up to about 25 %, whereas boys keep about the same BF%. During adulthood, BF% increases slowly with age in both males and females. It is not known whether this age-related increase during adult

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N.T. Nguyen et al. (eds.), *The ASMBS Textbook of Bariatric Surgery: Volume 1: Bariatric Surgery*,
DOI 10.1007/978-1-4939-1206-3_1,

Table 1.1 Categories of BMI and disease risk relative to normal weight and waist circumference

			Relative disease risk by waist circumference (type 2 diabetes, hypertension, cardiovascular disease)	
			Men ≤ 102 cm (≤40 in)	Men >102 cm (>40 in)
	BMI kg/m^2	Obesity class	Women ≤ 88 cm (≤35 in)	Women >88 cm (>35 in)
Underweight	<18.5	–	–	–
Normal[a]	18.5–24.9	–	–	–
Overweight	25.0–29.9	–	Increased	High
Obesity	30.0–34.9	I	High	Very high
Obesity	35.0–39.9	II	Very high	Very high
Extreme obesity	≥40	III	Extremely high	Extremely high

Modified from [5, 6]

[a]Increased waist circumference can also be a marker for increased risk even in persons of normal weight

life is a normal physiological effect or whether it is caused by overeating and/or a sedentary lifestyle.

Body fat can be measured by different techniques including densitometry, hydrometry, dual energy X-ray absorptiometry (DXA), chemical multi-compartment models, computed tomography (CT), or magnetic resonance imaging (MRI). These methods are not suited for use under clinical conditions and in population-based studies. There are a number of other methods available for large-scale use that can predict body fat (BF)%; these include skinfold thickness measurements, bioelectrical impedance, the use of body mass index (BMI) and waist circumference, and the more recently described body adiposity index (BAI) [4]:

$$\mathrm{BAI} = \left(\text{hip circumference} / \text{height}^{1.5}\right) - 18.$$

These methods rely on statistical relationships between easily measurable parameters and a method of reference, normally densitometry, deuterium oxide dilution, or DXA. As the range of BF% varies largely and is dependent on age and sex, clearly defined cutoff points for obesity, expressed as BF%, cannot easily be established. There is no doubt that these clinical measures are limited in terms of accuracy, but they are very portable and applicable and give meaningful trends when used over time.

Of the aforementioned parameters, the one that is most widely applied is BMI, which is determined by weight divided by height in meters^2. Generally, healthy BMI range is from 18.5 to 24.9 kg/m^2. Overweight is defined as a BMI from 25 to 29.9 kg/m^2, and obesity is defined as a BMI of 30 kg/m^2 or greater. Obesity can further be subdivided based on subclasses of BMI, as shown in Table 1.1 [5, 6]. Extreme obesity is defined as a BMI greater than 40 kg/m^2. Waist circumference can also be used in combination with a BMI value to evaluate health risk for individuals. The waist/hip ratio relates to the distribution of body fat. Patients with a waist/hip ratio of less than one tend to have more of a peripheral fat distribution ratio often referred to as being a "pear" distribution. This fat distribution has low health risk. Patients with a waist/hip ratio of greater than one are referred to as having an "apple" or central fat distribution and these patients are considered to have a high health risk. In children (2–19 years of age), overweight is defined as a BMI-for-age greater than or equal to the 85th percentile and less than the 95th percentile on the Centers for Disease Control and Prevention (CDC) growth charts [7]. Obesity is defined as a BMI-for-age greater than or equal to the 95th percentile on the CDC growth charts.

It is well accepted that BMI is an estimate rather than an accurate measurement. It fails to account for fitness and there is a wide variation of body adiposity in the same BMI range. In general, adiposity has been shown to vary among men and women (with women having more adiposity for the same BMI group) and across different age groups (adiposity increases with age). It has also been noted that in the same BMI range, Asians and African-Americans have more prevalence of diseases such as hypertension and diabetes. Using BMI as the only qualifying requirement for bariatric surgery runs the risk of discriminating against these groups, and care may be denied to patients who may benefit from if delivery of care is based upon this imperfect and somewhat arbitrary measure of obesity.

Epidemiology of Obesity

Global Burden of Obesity

Overweight and obesity are significant and increasing public health challenges in both economically developed and developing regions of the world, with 33.0 % of the world's adult population (1.4 billion people) overweight or obese [1]. In 2008, more than 1.4 billion adults, and more than 40 million children under the age of five were overweight in 2010. It is estimated that if recent trends continue, by 2030 up to 57.8 % of the world's adult population (3.3 billion people) could be either overweight or obese [8]. The prevalence of overweight and obesity is higher in economically

developed countries compared with economically developing countries [8]. Close to 35 million overweight children are living in developing countries and 8 million in developed countries [1]. Although overweight and obesity is more common in economically developed countries, the much larger population of developing countries results in a considerably larger absolute number of individuals affected. The prevalence of overweight and obesity is also on the rise in developing countries, particularly in urban settings. This is in part due to promotion of unhealthy "fast foods" in these countries in the last two decades. Many developing nations are now facing a "double burden" of disease as is seen in much of Asia, Latin America, the Middle East, and Africa. While they continue to deal with the problems of infectious disease and undernutrition, they are experiencing a rapid upsurge in noncommunicable disease risk factors such as obesity and overweight. It is not uncommon to find undernutrition and obesity existing side by side in the same community and the same household. It is estimated that up to 20 % of Chinese urban children are obese with increase in childhood obesity rates at 8 % per year [9]. Children in developing countries are more vulnerable to inadequate prenatal, infant, and young child nutrition. At the same time, they are exposed to high-fat, high-sugar, high-salt, energy-dense, micronutrient-poor foods, which tend to be lower in cost. Additionally, urbanization and mechanization, higher rates of television viewing, and increasing pressure among children in developing countries to perform scholastically have led to a sharp decline in physical activity. Interaction of these factors with changing dietary patterns results in sharp increases in childhood obesity and metabolic syndrome. This complex interaction of genetic factors such as variation in DNA sequence or expression and epigenetic factors including in utero environment, behavior, lifestyle, ethnic variability in body composition, and values/perceptions has led to an increase the prevalence of obesity and chronic diseases associated with it such as diabetes and cardiovascular disease.

Prevalence of Overweight and Obesity in the United States

The strongest data on obesity prevalence rates over time in the United States come from the results of the National Health and Nutrition Examination Surveys (NHANES). The NHANES program of the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, includes a series of cross-sectional nationally representative health examination surveys beginning in 1960 [10–14]. In each survey, a nationally representative sample of the US civilian non-institutionalized population was selected using a complex, stratified, multistage probability cluster sampling design. In the 2009–2010 survey, household interview and a physical examination were conducted for each survey participant including height and weight measured as part of a comprehensive set of body measurements by trained health technicians, using standardized measuring procedures and equipment excluding pregnant women and persons missing a valid height or weight measurement [2]. Age was based on age at the interview and grouped into 20–39 years of age, 40–59 years of age, and 60 years and older. Race and ethnicity were self-reported and for purposes of this report were classified as non-Hispanic white, non-Hispanic black, Mexican-American, other Hispanic, and other. Data for 2009–2010 were analyzed overall, including all race/ethnicity groups, and separately for non-Hispanic white, non-Hispanic black, all Hispanic participants (including both Mexican-American and other Hispanic participants), and Mexican-American participants.

Results from the 2009–2010 National Health and Nutrition Examination Survey (NHANES), using measured heights and weights, indicate that an estimated 33.0 % of US adults aged 20 and over are overweight, 35.7 % are obese, and 6.3 % are extremely obese [2]. In 2009–2010, the age-adjusted mean BMI was 28.7 (95 % CI, 28.3–29.1) for men and also 28.7 (95 % CI, 28.4–29.0) for women [2]. The age-adjusted prevalence of obesity was 35.5 % among adult men and 35.8 among adult women [2]. One of the national health objectives for the Healthy People 2020 initiative is to reduce the prevalence of obesity among adults by 10 % to 30.5 % [15]. Figure 1.1 shows the trends in overweight and obesity among adults from 1960 to 2010 [13]. Data for adults suggests a steady prevalence of obesity from the 1960s through the 1980s, with a steady increase in obesity between the late 1980s and today in the United States, with the estimated age-adjusted prevalence moving upward from a previous level of 23.0 % in 1988–1994 to approximately 36.0 % in 2009–2010 [13]. It is interesting to note in this figure that the rate of overweight has been more or less stable, but there have been significant increases in the rates of obesity, with obesity rates having very recently overtaken the rate of prevalence of overweight in the adult population.

Among children, results from the 2009–2010 NHANES, using measured heights and weights, indicate that an estimated 16.9 % of children and adolescents aged 2–19 years are obese (Fig. 1.2) [14]. Just as with adults, the prevalence of overweight has increased over time. In the same time period, the rates of childhood obesity in children and adolescents aged 2–19 increased from approximately 6.5 % to about 17 % [14]. Recent projections based on NHANES predict that if the current trends continue, more than half (51.1 %) of US adults are likely to be obese and 86.3 % are likely to be overweight or obese by 2030 [16]. In children, at the current rate, the prevalence of overweight is likely to nearly double by 2030 [16].

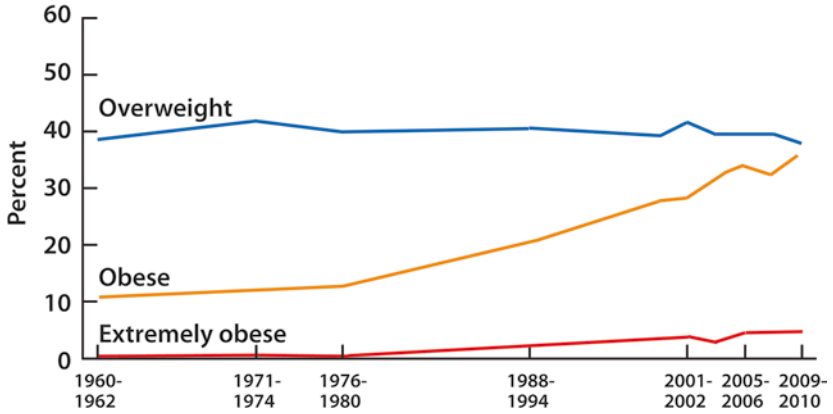

Fig. 1.1 Increasing trends in overweight, obesity, and extreme obesity among US men ages 20–74 years, spanning the years 1960–1962 through 2009–2010. *Notes*: Age adjusted by the direct method to the 2000 U.S. Census population using age groups 20–39, 40–59, and 60–74. Overweight is a body mass index (BMI) of 25 kg/m^2 or greater but less than 30 kg/m^2. Obesity is a BMI greater than or equal to 30 kg/m^2. Extreme obesity is a BMI greater than or equal to 40 kg/m^2 (*Sources*: CDC/NCHS, National Health Examination Survey I 1960–1962; National Health and Nutrition Examination Survey (NHANES) I 1971–1974; NHANES II 1976–1980; NHANES III 1988–1994; NHANES 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, and 2009–2010. Modified from Fryar et al. [13])

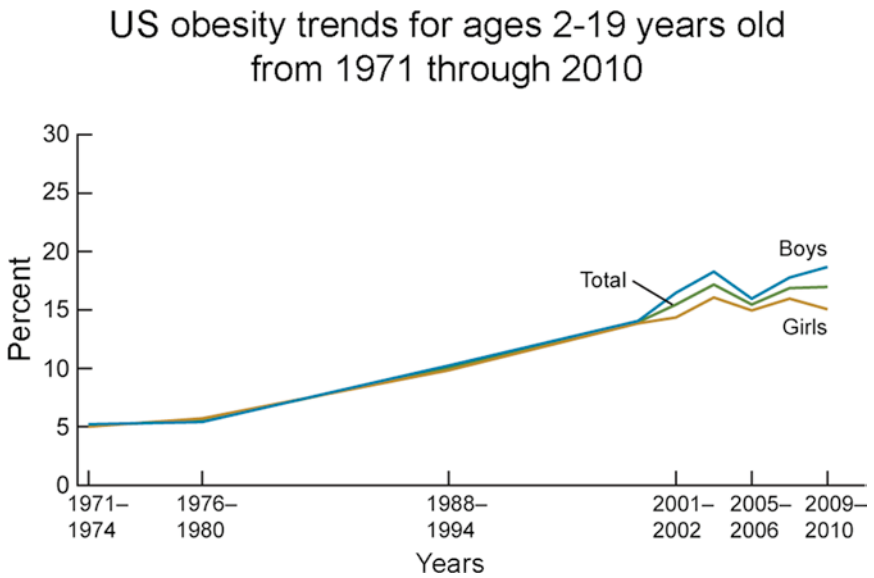

Fig. 1.2 Obesity trends among US children and adolescents ages 2–19 years. Comparison by gender between the years 1971–1974 and 2009–2010. *Note*: Obesity is body mass index greater than or equal to the 95th percentile of the sex- and age-specific 2000 CDC growth charts (*Sources*: CDC/NCHS, National Health and Nutrition Examination Surveys (NHANES) I-III; and NHANES, 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, and 2009–2010. Modified from Fryar et al. [14])

Data suggests that those who are obese may be gaining weight at a more rapid pace than those who are not. Data from the Behavioral Risk Factor Surveillance System (a random-digit telephone survey of the household population of the United States) shows that it is not just that more Americans are becoming obese, but that it is the most severe obesity that is increasing the most in relative terms. From 2000 through 2005, the prevalence of obesity (self-reported) increased by 24 %, the prevalence of a self-reported BMI greater than 40 increased by 50 %, and the prevalence of a BMI greater than 50 increased by 75 % [17]. The greatest relative increase has been in the proportion of individuals with a BMI greater than 50 kg/m^2. The most recent NHANES data also confirm this trend: the percentage of the population with a BMI greater than 40 has increased from 0.9 % in the 1960s to approximately 6 % at the current time [14].

Obesity and Age

Obesity rates are high in most age groups. Obesity rates, in general, increase with age until approximately 75 years of age,

when rates decline. The decline in obesity rates in the elderly could be attributed to a decrease in lean body mass and a tendency to gain fat in the older patient, which plateaus as the older patient establishes a new weight set point. In addition there is increasing mortality from obesity-related conditions with age; a significantly higher all-cause mortality has been noted in obese individuals compared to normal weight subjects, with one study predicting that mortality was likely to occur 9.44 years earlier for those who were obese (BMI, ≥30) [18].

Racial, Ethnic, and Income Disparities

Increasing BMI and increasing obesity prevalence are affecting the entire adult population with no group being immune [19, 20]. Increasing rates of obesity are seen across men and women all ethnic groups, of all ages, and of all educational and socioeconomic levels. Still racial, ethnic, and socioeconomic disparities are seen in the prevalence of obesity and some subgroups in the population are affected to a greater extent than others.

Obesity and Race

There are significant racial and ethnic disparities in obesity prevalence among US adults. Among men (Fig. 1.3), age-adjusted obesity prevalence was 35.5 % (95 % CI, 31.9–39.2 %) overall, and within race/ethnicity groups, prevalence ranged from 36.2 % among non-Hispanic white men to 38.8 % (95 % CI, 33.9–43.9 %) among non-Hispanic black men with prevalence in all Hispanics of 35.3 % and specifically in Mexican-Americans of 35.6 % [13]. For women (Fig. 1.4), the age-adjusted prevalence was 35.8 %, and the range was from 32.2 % among non-Hispanic white women to 58.5 % among non-Hispanic black women, with prevalence in all Hispanics of 40.7 % and specifically in Mexican-Americans of 44.3 % [13]. Between 1988–1994 and 2007–2008, the prevalence of obesity among men increased, from 20.3 to 31.9 % among non-Hispanic white men, from 21.1 to 37.3 % among non-Hispanic black men, and from 23.9 to 35.9 % among Mexican-American men [13]. In 2007–2008 and 1988–1994, there were no significant differences between racial and ethnic groups in the prevalence of obesity among men [13]. Among women in 2007–2008, non-Hispanic black women (49.6 %) were significantly more likely to be obese than non-Hispanic white women (33.0 %) [13]. Similarly, Mexican-American women (45.1 %) were more likely to be obese than non-Hispanic white women (33.0 %) [13]. Similar disparities existed in 1988–1994 (22.9 % of non-Hispanic white women, 38.3 % of non-Hispanic black women, and 35.3 % of Mexican-American women were obese) [13]. For men, the overall prevalence of obesity showed a significant linear trend over the 12-year period from 1999 through 2010 [13]. For women, within race/ethnicity groups, the data suggested slight increases that were statistically significant for non-Hispanic black and Mexican-American women but not significant for women overall [13]. For both men and women, estimates for 2009–2010 did not differ significantly from estimates for 2003–2008 [13]. It is not clear if such differences are solely from the socioeconomic status and differences in environmental and social risk factors among racial

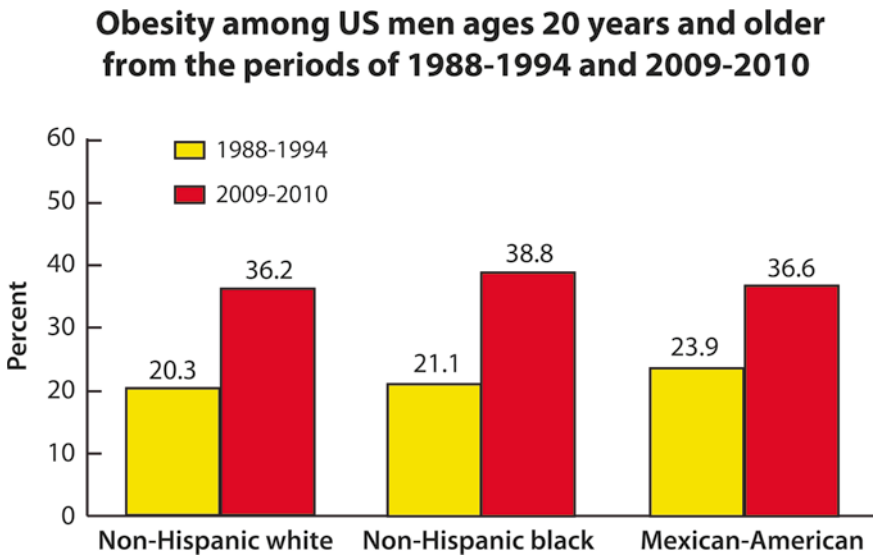

Fig. 1.3 Comparison showing the increase in prevalence of obesity among men ages 20 years and older, by race and ethnicity for the periods of 1988–1994 and 2009–2010 in the United States. *Notes*: Age adjusted by the direct method to the 2000 U.S. Census population using age groups 20–39, 40–59, and 60 and over. Obesity is a body mass index greater than or equal to 30 kg/m^2 (*Source*: CDC/NCHS, National Health and Nutrition Examination Survey (NHANES) III 1988–1994 and NHANES 2009–2010. Modified from Fryar et al. [13])

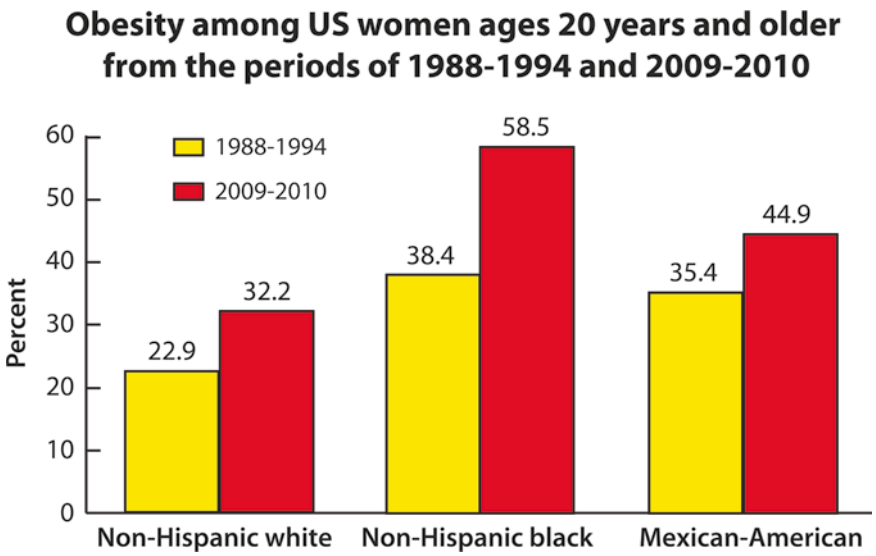

Fig. 1.4 Prevalence of obesity among US women ages 20 years and older, by race and ethnicity for the periods of 1988–1994 and 2009–2010. *Notes*: Age adjusted by the direct method to the 2000 U.S. Census population using age groups 20–39, 40–59, and 60 and over. Pregnant females were excluded. Obesity is a body mass index greater than or equal to 30 kg/m^2. (*Sources*: CDC/NCHS, National Health and Nutrition Examination Survey (NHANES) III 1988–1994 and NHANES 2009–2010. Modified from Fryar et al. [13])

groups or from differences in genetic, epigenetic, and metabolic factors, which may suggest a hereditary nature of disease and similar obesity patterns in families [11, 12].

Obesity and Income Level

Among men, prevalence is generally similar at all income levels, with a tendency to be slightly higher at higher income levels especially among non-Hispanic black and Mexican-American men [11]. Among women, obesity prevalence increases as income decreases, with higher income women less likely to be obese compared to lower income women [11].

Obesity and Level of Education

Regarding education level, among men, there is no significant trend between education level and obesity prevalence. Among women, obesity prevalence increases as education decreases. Women with college degrees tend to be less obese than lesser educated [11].

Epidemiology of Childhood Obesity

Several studies have demonstrated that overweight children who experience weight-based teasing are more likely to engage in binge eating and unhealthy weight control behaviors with increased incidence of eating disorder symptoms and bulimia. Weight-based victimization among overweight youths has been linked to lower levels of physical activity, negative attitudes about sports, and lower participation in physical activity among overweight students.

The increase in prevalence of childhood obesity is seen at all race, ethnicities, and income levels [12]. Overall, Mexican-American males and African-American females are more likely to have a higher BMI. According to the most recent NCHS data, in general, prevalence of childhood obesity decreases as income level and the education of the head of household increases, but these relationships were not consistent across race and ethnicity groups [12]. This is significant because childhood obesity often tracks to adulthood and, in the short run, childhood obesity can lead to psychosocial problems and cardiovascular risk factors such as high blood pressure, high cholesterol, and abnormal glucose tolerance or diabetes.

Trends in Obesity

Close examination of trends in obesity shows that this epidemic arose from gradual yearly weight gain in the population produced from a slight consistent degree of positive energy balance (i.e., energy intake exceeding energy expenditure). Using longitudinal and cross-sectional data sets, they found that the average adult in the United States has gained an average of 1–2 lb/year for the past two to three decades [21]. Assuming that an excess of 3,500 kcal produces 1 lb of weight gain and assuming that excess energy was stored with an efficiency of 50 %, that weight gain in 90 % of the adult population is attributable to a positive energy balance of approximately 100 kcal/day. Thus, it seems that the obesity epidemic arose gradually over a long period because of a slight but consistent degree of positive energy balance.

Our bodies are designed to work best in an environment in which food was inconsistent and high levels of physical activity were required to secure food and shelter and for transportation. In previous environments, this biology was

adequate to allow most people to maintain a healthy weight without conscious effort. Body weight regulation was achieved for most with simple physiological control. The situation is different in today's environment. Securing food and shelter and moving around in our environment do not require the high levels of physical activity needed in the past. Technology has made it possible to be productive while being largely sedentary.

Advancements in workplace technology and reduction of manual labor have resulted in decreased energy expenditure. Factors such as urban design, land use, public transportation availability, density and location of food stores and restaurants, and neighborhood barriers such as safety and walkability contribute to unhealthy lifestyles. Significant changes have taken place in the food environment with increased accessibility of inexpensive foods. Prices of calorie-dense foods and beverages have decreased considerably in contrast to increasing prices of fresh fruits, vegetables, fish, and dairy items, contributing to increased consumption of unhealthy foods in increasing portion sizes. Significant marketing and advertising of unhealthy, energy-dense foods by the food industry contribute to excessive food consumption. Under such conditions, weight gain can only be prevented with conscious efforts to eat less or to be physically active.

Obesity rates are increasing among people in all income and educational levels, but absolute rates are lower in those with higher incomes and higher education levels. The finding that minority and low-income individuals are disproportionately affected by obesity is not surprising. The most inexpensive foods are those containing high levels of fat and sugar. The biological preference for these foods combined with easy availability contributes to overeating. Further, minority and low-income individuals may engage in less physical activity than other sectors of the population. One reason for this disparity may be because problems with neighborhood safety in low-income areas may prevent adults and children from engaging in outdoor physical activities. People who have more financial resources combat these circumstances more easily and, consequently, are more physically active and less obese than those with fewer resources.

Discrimination in Obesity

Obesity Discrimination

Overweight and obese individuals are vulnerable to negative societal attitudes, stigma, and prejudice. Reported experiences of weight/height discrimination included a variety of settings in major lifetime events and interpersonal relationships. Weight bias has been documented in multiple settings including places of employment, health-care facilities, educational institutions, mass media, and close interpersonal relationships with friends and family members [22–25]. Obese individuals, especially the severely obese, often confront bias in these various settings. They are frequently the target of ridicule even in their early years in school. Some estimates even suggest that 25 % of severely obese women were sexually abused. The obese have difficulty finding jobs [24] and, when they find employment, they all too often have high levels of absenteeism, poor performance at work, and high health-care costs. Similarly, within their families, the levels of conflict regarding relationships, parenting, and sexuality are high. Data from the two waves of the National Survey of Midlife Development in the United States (MIDUS) have shown increasing incidence of weight-based discrimination from 7 % in 1995–1996 to 12 % in 2004–2006 [22]. Data for this was drawn from a nationally representative multistage probability sample of community-based English-speaking adults in the coterminous United States.

Weight-based discrimination is the third leading cause of prejudice, next only to age and race. In contrast to more widely recognized social stigmas such as gender or race that have legal sanctions in place to protect individuals from discrimination, there are no laws to prohibit weight discrimination, with the exception of a few states. It is unknown how weight discrimination compares in strength or prevalence to discrimination based on these attributes. Because weight stigma remains a socially acceptable form of bias, negative attitudes and stereotypes toward obese persons have been frequently reported by employers, coworkers, teachers, physicians, nurses, medical students, dietitians, psychologists, peers, friends, family members, and even among children aged as young as 3 years [22].

Employment Discrimination

Obesity discrimination is widespread in employment. Employment discrimination may be related to the increasing focus on employee weight and its contribution to employers' overall costs, both from increased health-care costs and from decreased productivity from absenteeism, which is perceived among coworkers as laziness and lack of dedication and may lead to heightened discrimination. In 2004, obesity and morbid obesity were associated with an estimated cost of $4.3 billion dollars in the United States with the estimated annual cost of absenteeism being $1,026 for male worker with BMI >40 and $1,262 for female worker with the same BMI [24]. In addition employing morbidly obese individuals is associated with additional cost to employers; for example, a bariatric chair able to hold 500 lb is estimated to cost $1,295 and a bariatric toilet rated at 700 lb is estimated at $1,049. Employers have started implementing wellness programs and incentives to control health-care cost. Evidence suggests that medical costs fall by about $3.27 for every dollar spent

on wellness programs and that absenteeism costs fall by about $2.73 for every dollar spent [26]. Wellness programs have their own disadvantages; especially those that impose financial risk on unhealthy employees are likely to be regressive because the prevalence of unhealthy conditions typically targeted by wellness programs is highest among people with low socioeconomic status.

Data from various surveys consistently document lower labor market participation of overweight and obese individuals. While employers and coworkers may use the data mentioned previously to justify bias against obese workers, this mentality may adversely impact the psychological well-being of the individual, which in turn can result in lost days at work and decreased productivity. Roehling et al. found that overweight respondents were 12 times more likely, obese respondents were 37 times more likely, and severely obese respondents were 100 times more likely than normal weight respondents to report employment discrimination [24]. In addition, women were 16 times more likely to report weight-related employment discrimination than men [24]. A meta-analysis of 32 experimental studies that investigated weight discrimination in employment settings was recently conducted [23]. Typically, such experimental studies ask participants to evaluate a fictional applicant's qualifications for a job, where his or her weight has been manipulated (through written vignettes, videos, photographs or computer morphing). Outcome variables examined in these studies included hiring recommendations, qualification/suitability ratings, disciplinary decisions, salary assignments, placement decisions, and coworker ratings. Across studies, it was demonstrated that overweight job applicants and employees were evaluated more negatively and had more negative employment outcomes compared to non-overweight applicants and employees [23]. After adjusting for sociodemographic and health-related variables, an increase in BMI is shown to be associated with a lower percentage of total working years, a lower rate of employment, and a lower probability of regaining employment.

Health-Care Discrimination

Health-care costs associated with obesity are high and the estimated annual cost of obesity of 147 billion dollars in 2008 with the medical costs for people who are obese being $1,429 higher annually than those of normal weight in the same year [27]. Studies demonstrate negative stereotypes and attitudes toward obese patients by a range of health-care providers and fitness professionals [25]. There is also research indicating that providers spend less time in appointments and provide less health education with obese patients compared with thinner patients. In response, obese individuals frequently report experiences of weight bias in health care. Obese patients also indicate that they feel disrespected by providers, perceive that they will not be taken seriously because of their weight, report that their weight is blamed for all of their medical problems, and are reluctant to address their weight concerns with providers.

A number of studies demonstrate that obese persons are less likely to undergo age-appropriate preventive cancer screenings. Lower rates of preventive health care exist even after control for factors such as less education, lower income, lack of health insurance, and greater illness burden. In a survey of obese women about their perceived barriers to routine gynecological cancer screenings, weight was reported to be a major barrier to seeking health care with perception of disrespectful treatment and negative attitudes from providers, embarrassment about being weighed, and receiving unsolicited advice to lose weight, and it was also reported that gowns, examination tables, and other medical equipment were too small to be functional for their body size [28].

Effect of Discrimination on Obese Individuals

Perceived weight stigma and discrimination have a vast impact on the quality of life of overweight individuals [22]. A number of studies have consistently demonstrated that experiencing weight stigma increases the likelihood of engaging in unhealthy eating behaviors and lower levels of physical activity, both of which exacerbate obesity and weight gain. For instance, as a result of discrimination in the sphere of health-care, overweight patients might be reluctant to seek medical care, be more likely to cancel or delay medical appointments, or put off important preventative health-care services [25].

Obesity Discrimination and Psychological and Physical Health

Emerging research suggests that weight stigma invokes psychological stress, which contributes to poor physical health outcomes for obese individuals and is a risk factor for depression, low self-esteem, and body dissatisfaction [23]. Adults who experience weight-based stigmatization engage in more frequent binge eating, are at increased risk for maladaptive eating patterns, and are more likely to have a diagnosis of binge eating disorder.

Obesity has been associated with impaired quality of life. A 1997 study measured the impact of obesity on functional health status and subjective well-being. Health-related quality of life, as measured by the Medical Outcomes Study Short Form-36 Health Survey, of more than 300 obese persons seeking treatment for obesity at a university-based

weight management center was compared with that of the general population and with that of other patients with chronic medical conditions [29]. Obese participants (mean BMI of 38.1) reported significantly lower scores (more impairment) on all eight quality-of-life domains, especially bodily pain and vitality. The morbidly obese (mean BMI of 48.7) reported significantly worse physical, social, and role functioning; worse perceived general health; and greater bodily pain than did the mildly obese (mean BMI of 29.2) or moderately to severely obese (mean BMI of 34.5) [29]. The obese participants also reported significantly greater disability attributable to bodily pain than did participants with other chronic medical conditions.

Obesity Discrimination and Public Health

It has been shown that the more a disease is perceived as under volitional control, the more it is stigmatizing—with obesity generally being perceived as highly under control. Numerous studies have documented harmful weight-based stereotypes that overweight and obese individuals are lazy, weak-willed, unsuccessful, unintelligent, lack self-discipline, have poor willpower, and are noncompliant with weight loss treatment. Society regularly regards obese persons not as innocent victims, but as architects of their own ill health, personally responsible for their weight problems because of laziness and overeating. Because of these common perceptions, weight stigmatization is regarded as justifiable (and perhaps necessary) because obese individuals are personally responsible for their weight, and that stigma might even serve as a useful tool to motivate obese persons to adopt healthier lifestyle behaviors, with weight stigma being suggested by some as a method for obesity control.

Although assumptions about personal responsibility in obesity and justification of weight stigma are prevalent in our national mindset, considerable scientific evidence has emerged to challenge them. Many significant contributors to obesity are beyond the control of individuals. In addition to the important role of genetic and biological factors regulating body weight, multiple social and economic influences have significantly altered the environment to promote and reinforce obesity. It has been shown that most behavioral and dietary interventions produce a modest 10 % weight loss with a high rate of weight regain. This is associated with improvements in obesity-related health consequences such as diabetes, hypertension, and cardiovascular disease but is unlikely to alter appearance or translate into a non-obese BMI and is unlikely to be significant to reduce obesity-related stigma and discrimination.

Obesity stigma creates significant barriers in efforts to address the epidemic. Current public health approach to tackling this epidemic focuses on providing education to the affected individuals rather than providing a comprehensive plan to tackle this epidemic. This approach is based on the assumption that Americans lack sufficient knowledge of the personal behaviors leading to weight gain. This is apparent on comparing the federal institution's policies regarding obesity when compared to other disease states, for example, NIH's projected spending for HIV/AIDS in 2012 is $3.075 billion. When compared to this, obesity, which affects more individuals and poses numerous health risks, is allocated $830 million. Federal and state legislative initiatives related to obesity have failed to address societal and environmental contributors for obesity. There is also a significant lack of attention to stigma associated with obesity and its consequences for individuals in public health efforts against this epidemic. Stigmatization of obese individuals poses serious risks to their psychological and physical health, generates health disparities, and interferes with implementation of effective obesity prevention efforts. To optimize obesity prevention and intervention efforts, these assumptions must be addressed within the sphere of public health, with recognition of the harmful impact of weight stigma on quality of life and the need to eliminate stigma from current and future public health approaches to the obesity epidemic.

Experimental research has shown that providing individuals with information emphasizing personal responsibility for obesity increases negative stereotypes toward obese persons, whereas information highlighting the complex etiology of obesity (such as biological and genetic contributors) improves attitudes and reduces stereotypes [23].

Conclusion

There is a clear need for increased public awareness and education about the complex etiology of obesity and the significant obstacles present in efforts to achieve sustainable weight loss. The prevailing societal and media messages that reinforce blame on obese persons need to be replaced with messages that obesity is a chronic disease with a complex etiology and a lifelong condition for most obese persons. Supporting individuals with adaptive ways to cope with weight stigma can facilitate weight loss outcomes.

Question Section

Questions

1. Overweight is defined as a BMI (kg/m^2) of _____.
   A. 20–24.9
   B. 30–34.9
   C. >35
   D. 25–29.9

2. Which of the following is true?
   A. Medical costs for obese individuals are the same as individuals with normal weight.
   B. Patients with "apple" distribution are considered to have a lower health risk than "pear" distribution.
   C. Women have more adiposity for the same BMI group.
   D. Adiposity decreases with age.
3. Which of the following factors does not affect development of obesity in adulthood?
   A. Variation in DNA sequence or expression
   B. In utero environment
   C. Ethnic variability in body composition
   D. None of the above
4. Discrimination related to obesity has been documented in which of the following spheres?
   A. Employment
   B. Health-care facilities
   C. Educational institutions
   D. Close interpersonal relationships
   E. All of the above

References

1. World Health Organization. http://www.who.int/mediacentre/factsheets/fs311/en/. Accessed 28 May 2013.
2. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity in the United States, 2009–2010. NCHS Data Brief. 2012;82:1–8.
3. Finkelstein EA, Trogdon JG, Cohen JW, Dietz W. Annual medical spending attributable to obesity: payer-and service-specific estimates. Health Aff (Millwood). 2009;28(5):w822–31.
4. Bergman RN, Stefanovski D, Buchanan TA, Sumner AE, Reynolds JC, Sebring NG, et al. A better index of body adiposity. Obesity (Silver Spring). 2011;19(5):1083–9.
5. [No authors listed] Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: executive summary. Expert panel on the identification, evaluation, and treatment of overweight in adults. Am J Clin Nutr. 1998;68:899–917.
6. http://whqlibdoc.who.int/hq/1998/WHO_NUT_NCD_98.1_(p1-158).pdf. Accessed 28 May 2013.
7. http://www.cdc.gov/growthcharts/clinical_charts.htm. Accessed 28 May 2013.
8. Kelly T, Yang W, Chen CS, Reynolds K, He J. Global burden of obesity in 2005 and projections to 2030. Int J Obes (Lond). 2008;32(9):1431–7.
9. Wang Y, Monteiro C, Popkin BM. Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China and Russia. Am J Clin Nutr. 2002;75:971–7.
10. Ogden CL, Carroll MD. Prevalence of overweight, obesity, and extreme obesity among adults: United States, trends 1960–1962 through 2007–2008. National Center for Health Statistics. http://www.cdc.gov/nchs/data/hestat/obesity_adult_07_08/obesity_adult_07_08.pdf. Accessed 21 May 2013.
11. Ogden CL, Lamb MM, Carroll MD, Flegal KM. Obesity and socioeconomic status in adults: United States, 2005–2008. NCHS Data Brief. 2010;50:1–8.
12. Ogden CL, Lamb MM, Carroll MD, Flegal KM. Obesity and socioeconomic status in children and adolescents: United States, 2005–2008. NCHS Data Brief. 2010;51:1–8.
13. Fryar C, Carroll MD, Ogden CL. Prevalence of overweight, obesity, and extreme obesity among adults: United States, trends 1960–1962 through 2009–2010. NCHS. http://www.cdc.gov/nchs/data/hestat/obesity_adult_09_10/obesity_adult_09_10.htm. Accessed 28 May 2013.
14. Fryar C, Carroll MD, Ogden CL. Prevalence of obesity among children and adolescents: United States, trends 1963–1965 through 2009–2010. NCHS. http://www.cdc.gov/nchs/data/hestat/obesity_child_09_10/obesity_child_09_10.htm. Accessed 28 May 2013.
15. US Department of Health and Human Services. http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=29. Accessed 28 May 2013.
16. Wang Y, Beydoun MA, Liang L, Caballero B, Kumanyika SK. Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. Obesity (Silver Spring). 2008;16(10):2323–30.
17. Sturm R. Increases in morbid obesity in the USA: 2000–2005. Public Health. 2007;121(7):492–6.
18. Greenberg JA. Obesity and early mortality in the United States. Obesity (Silver Spring). 2013;21(2):405–12.
19. Catenacci VA VA, Hill JO, Wyatt HR. The obesity epidemic. Clin Chest Med. 2009;30(3):415–44, vii.
20. Mitchell NS, Catenacci VA, Wyatt HR, Hill JO. Obesity: overview of an epidemic. Psychiatr Clin North Am. 2011;34(4):717–32.
21. Hill JO, Wyatt HR, Reed GW, Peters JC. Obesity and the environment: where do we go from here? Science. 2003;299:853–5.
22. Andreyeva T, Puhl RM, Brownell KD. Changes in perceived weight discrimination among Americans, 1995–1996 through 2004–2006. Obesity (Silver Spring). 2008;16(5):1129–34.
23. Puhl RM, Heuer CA. Obesity stigma: important consideration for public health. Am J Public Health. 2010;100(6):1019–28.
24. Roehling MV, Roehling PV, Pichler S. The relationship between body weight and perceived weight-related employment discrimination: the role of sex and race. J Vocational Behav. 2007;71(2):300–18.
25. Budd GM, Mariotti M, Graff D, Falkenstein K. Health care professionals' attitudes about obesity: an integrative review. Appl Nurs Res. 2011;24(3):127–37.
26. Baicker K, Cutler D, Song Z. Workplace wellness programs can generate savings. Health Aff (Millwood). 2010;29(2):304–11.
27. Finkelstein E, Trogdon J, Cohen J, Dietz W. Annual medical spending attributable to obesity: payer- and service-specific estimates. Health Aff. 2009;28(5):w822–31.
28. Amy NK, Aalborg A, Lyons P, Keranen L. Barriers to routine gynecological cancer screening for White and African-American obese women. Int J Obes (Lond). 2006;30(1):147–55.
29. Barofsky I, Fontaine KR, Cheskin LJ. Pain in the obese: impact on health-related quality-of-life. Ann Behav Med. 1997;19(4):408–10.