National Academy of Sports Medicine

Obesity Statistics and Body Mass Index

BY

FABIO COMANA MS, MA, NASM-CPT, CES, PES

Obesity Statistics

Over the past 15 years (1995 to 2010), levels of obesity in the United States have increased at an alarming rate. For example, in 1995, no state reported obesity levels above 20%, whereas in 2010, no state reported obesity levels below 20% (1). Coincidently, during that same timeframe (2000 to 2009), the number of Americans meeting the minimal requirements for physical activity set by the Department of Health and Human Services has also increased (1). So why are obesity levels continuing to increase if a growing number individuals are meeting physical activity guidelines? One feasible explanation lies with ACSM's recommendations that individuals need to expend 2,000 kcal per week through activity in order to lose weight in comparison to the government's minimal requirements that only aims to target 1,000 kcal per week to improve health (2). In other words, even though individuals are meeting government guidelines for physical activity (1,000 kcal per week), these guidelines are still too low.

Many do not fully grasp the magnitude of obesity when expressed as a simple percentage statistic. To facilitate a better understanding of the scale of people considered obese, let's examine U.S. population statistics. The current U.S. population stands at approximately 315 million with 75.8 % of the population being over the age of 18 years (238.7 million adults) (3). As 33.8 to 35.7% of adults are considered obese, this implies that there are approximately 80 to 85 million obese adults in America (1). This figure represents four times the entire population of New York City or greater than the total population of California, Texas and New York combined, and does not even include obese children who represent another 13 million people (3). Although obesity represents a major health and financial concern, amassing a cost exceeding $73 billion annually among U.S. full-time employees, one area of growing concern lies with the increasing numbers of individuals who are morbidly obese (4, 5). They exhibit significantly elevated risk for severe health complications and impose a critical burden upon the economy and healthcare system. The Centers for Disease Control and Prevention estimates that 5.7 % of adults are morbidly obese, with BMI scores ≥ 40.0, which represents 13.6 million adults (1). To help put this into perspective and referring to Table 1 presented below, in order for a person to attain a BMI score of 40, a 5'5 individual would need to weigh 240lbs and a 6'0" individual would need to weigh 294 lbs.

On average, men with BMI scores between 30.0 and 34.9 cost $1,143 more per year in medical expenditures, missed workdays and lost productivity at work than normal-weight men, increasing to $2,491 more and $6,087 more for BMI scores between 35.0 and 39.9, and over 40.0 respectively (4). For women, the costs increase from $2,524 per person each year to $4,112 and $6,694 more than a normal-weight woman for BMI scores between 30.0 and 34.9, 35.0 and 39.9 and over 40.0 (4). Presenteeism, defined as the measure of the lost productivity cost on employees who actually show up to work, but are not fully engaged and productive increases proportionally with BMI scores. With female employees, BMI scores between 30 and 34.9, and over 40.0 resulted in 6.3 and 22.7 days of lost time per year whereas in males, these same BMI scores resulted in 2.3 and 21.9 days of lost time per year (4). As the numbers of obese individuals continue to rise, business, the healthcare system, and the national economy will continue to weaken.

The previous section presented a significant amount of statistics to illustrate the magnitude and financial impact of obesity. Using your own words, create some simple talking points to help increase awareness of how important we all should be of this epidemic and the impact it has upon healthcare and the economy.

Concerns using BMI

Whereas obesity is generally regarded as a medical condition where the accumulation of excess body fat may result in adverse health effects (morbidity) and an increased risk for mortality (early death), overweight is generally defined as having more body fat than is optimally healthy. Discussed previously, Body Mass Index, also known as Quetelet's index, has become a primary method used to assess and determine the prevalence of overweight and obesity within a population, but it is important to remember that although it does correlate with body fat, it does not directly measure body fat (2, 6). Researchers have developed several regression equations that estimate percentage body fat from BMI scores, but each tends to overestimate body fat in athletic populations, although they do provide reasonable estimates for the general population (7). Regardless, BMI continues to be regarded by most as an effective means to measure the prevalence of obesity. Major advantages to using BMI lie in its simplicity – requiring only the variables of height and

weight to complete the calculation, thus minimizing potential errors in measurement; and in its validation with mortality and morbidity for the general population (2). However, a major disadvantage of using BMI is that it fails to distinguish between fat tissue and lean body mass. Athletic individuals will generally score in the overweight or even obese categories although they typically demonstrate lower percentages of body fat and greater amounts of lean body mass (muscle) than the general population (8).

Another area of concern with BMI scores lies with older adults who experience greater losses in muscle mass than in stature, potentially leading to underestimations with BMI (9). Conversely, some research on aging populations demonstrate greater decreases in stature that can inaccurately increase BMI by 1.5 kg/m^2 in men and 2.5 kg/m^2 in women, despite minimal changes in body weight (10). Consequently, the use of the BMI classification ranges for overweight and obese should be used cautiously with older adults (over age 65) until more universally agreed-upon recommendations are developed. Furthermore, BMI is considered a weaker predictor of weight-related health problems among some racial and ethnic groups, such as African-American and Hispanic-American women (11).

Alternative Methods to Measure BMI

Traditionally, BMI is calculated using the metric system; weight (Kg) divided by the square of height (meters). A simpler standard formula devised to help Americans is to multiply body weight (lbs.) by 703 and then divide the product by height (inches) two times. For example, for a person standing 5'10" (1.78m) and weighing 196 lbs. (89.1 Kg), their BMI score would be:

- Metric Formula: BMI = Weight (kg) ÷ $Height^2$ (m^2)
  - 89.1 ÷ $(1.78m)^2$ = 28.1

- Standard Formula: BMI = Weight (lbs.) x 703 ÷ Height (inches) ÷ Height (inches)
  - 196 x 703 = 137,788 ÷ 70" = 1,968.4 ÷ 70" = 28.1

Another option is to use the BMI chart provided (Table 1) that provides BMI estimates (12). In using this table, the appropriate row corresponding to the individual's height is

selected then followed horizontally until a weight that best matches the individual's weight is located. Moving vertically up that column, the individual's BMI score is determined from the top row that represents BMI scores. Using the previous example, locate the row that corresponds to 5'10" (70") then move along that row until a weight that best matches 196 lbs. is located (195 lbs. in this case). Follow that column vertically to the top row to read a BMI score of 28.

Table 1: BMI Calculation Table

BMI (kg/m^2)	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**35**	**40**
Height (in.)	**Weight (lb.)**													
58	91	96	100	105	110	115	119	124	129	134	138	143	167	191
59	94	99	104	109	114	119	124	128	133	138	143	148	173	198
60	97	102	107	112	118	123	128	133	138	143	148	153	179	204
61	100	106	111	116	122	127	132	137	143	148	153	158	185	211
62	104	109	115	120	126	131	136	142	147	153	158	164	191	218
63	107	113	118	124	130	135	141	146	152	158	163	169	197	225
64	110	116	122	128	134	140	145	151	157	163	169	174	204	232
65	114	120	126	132	138	144	150	156	162	168	174	180	210	240
66	118	124	130	136	142	148	155	161	167	173	179	186	216	247
67	121	127	134	140	146	153	159	166	172	178	185	191	223	255
68	125	131	138	144	151	158	164	171	177	184	190	197	230	262
69	128	135	142	149	155	162	169	176	182	189	196	203	236	270
70	132	139	146	153	160	167	174	181	188	195	202	207	243	278
71	136	143	150	157	165	172	179	186	193	200	208	215	250	286
72	140	147	154	162	169	177	184	191	199	206	213	221	258	294
73	144	151	159	166	174	182	189	197	204	212	219	227	265	302
74	148	155	163	171	179	186	194	202	210	218	225	233	272	311
75	152	160	168	176	184	192	200	208	216	224	232	240	279	319
76	156	164	172	180	189	197	205	213	221	230	238	246	287	328

Do the Math

Measurement	Conversion	Example
Weight (Kg)	2.2 lb. = 1 Kg.	165 lb. ÷ 2.2 = 75 Kg
Height (m)	1 inch = 2.54 cm 100 cm = 1 m	5'5" = 65" x 2.54 = 165 cm 165 = 1.65 m

Calculate Mary's BMI score using the metric, standard and BMI table if she currently weights 160 lbs. and stands 5'7" (67").

Answer:

- Metric Formula: BMI = Weight (kg) ÷ Height^2 (m^2)
  - Step 1. Convert weight from pounds (lbs.) to kilograms (Kg)
    - 160 ÷ 2.2 = 72.7
  - Step 2. Convert height from inches to meters
    - 67" x 2.54 = 170 cm or 1.70 m
  - Step 3. Plug numbers into equation
    - 72.7 Kg ÷ (1.70m)^2 = 25.1
- Standard Formula: BMI = Weight (lbs.) x 703 ÷ Height (inches) ÷ Height (inches)
  - 160 (lbs.) x 703 = 112,480 ÷ 67" = 1,678.8 ÷ 67" = 25.1
- BMI Table = 25.0

References:

1. Centers for Diseases Control and Prevention, 2010. *Obesity Data and Statistics.* http://www.cdc.gov/obesity/data/index.html; retrieved 11/20/12.
2. American College of Sport Medicine (2010). *ACSM's Guidelines for Exercise Testing and Prescription* (8th Ed.). Philadelphia, PA: Wolters Kluwer.
3. U.S. PopClock Projection. http://www.census.gov/population/www/popclockus.html. Retrieved 11/20/12.
4. Finkelstein, E.A., DiBonaventura, M., Burgess, S.M,. & Hale, B.C. (2010). The costs of obesity in the workplace. *Journal of Occupational and Environmental Medicine*, 52(10):971-976.
5. Robert Wood Johnson Foundation, (2011). *F as in Fat – 2011 - How Obesity Threatens America.*
6. Bentzur, K.M., Kravitz, L., & Lockner, D.W. (2008). Evaluation of the Bod POD for estimating percent body fat in collegiate track and field female athletes: a comparison of four methods. *Journal of Strength and Conditioning Research*, 22:1985-1991.
7. Esco, M.R., Williford, H.N., & Russell, A.R. (2011). Cross-validation of BMI-based equations for predicting percent body fat in female collegiate athletes. *Journal of Exercise Physiology*, 14(3): 43-52.
8. Ode, J.J., Pivarnik, J.M., Reeves, M.J., & Knous, J.L. (2007). Body mass index as a predictor of percent fat in college athletes and non-athletes. *Medicine and Science in Sports and Exercise*, 39: 403-409.
9. Ness-Abramof, R. & Apovian, C. M. (2008). Waist circumference measurement in clinical practice. *Nutrition in Clinical Practice*, 23(4), 397-404.
10. Srikanthan, P., Seeman, T.E., & Karlamangla, A.S. (2009). Waist-hip-ratio as a predictor of all-cause mortality in high-functioning older adults. *Annals of Epidemiology*, 19, 724-731.
11. National Institute of Diabetes and Digestive and Kidney Diseases, (2008). Weight and waist measurement: Tools for adults: http://win.niddk.nih.gov/publications/tools.htm#circumf. Retrieved November 21, 2012.
12. Bray, G.A., & Gray, D.S. (1988). Obesity, Part I, Pathogenesis. *Western Journal of Medicine,* 149: 429-41.