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The Causes of Obesity

The prevalence of overweight and obese adults in the United States (US) has steadily increased over the past 50 years. Overweight refers to weighing more than the standard size for one's height and age, whereas obesity refers to having excessive body fat.[1] The Centers for Disease Control and Prevention (CDCP) defines an overweight adult as a person with a body mass index (BMI) between 25 and 29.9. Adults with a BMI over 30 are considered obese.[2] At the national level, it is estimated that between 20 and 30% of the adult US population are obese,[3] and it is expected that in the next five years, 120 million Americans will suffer from obesity.[4] Additionally, during the last quarter century, the percentage of overweight children in the US has doubled.[5] This is not only a problem of the US; the World Health Organization (WHO) has declared obesity a global epidemic due to the increasing rates of obesity worldwide.[6]

Obesity is a problem affecting people of all ages, racial and ethnic backgrounds, and socioeconomic status. The obesity problem may have been distributed unevenly across populations at first but the overall problem is largely due to increased urbanization, change in work structure and technology, increased access to greater amounts of food, especially more calorically dense foods, and more leisure time and sedentary activities.[7] In this report we

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[1] Field, Alison E., Joaquin Barnoya, and Graham A. Colditz. "Epidemiology and Health and Economic Consequences of Obesity," in *Handbook of Obesity Treatment*, edited by Thomas A. Wadden and Albert J. Stunkard, 3-18. New York: The Guilford Press, 2002.

[2] Centers for Disease Control and Prevention." Obesity and Overweight: Defining Overweight and Obesity, 2009." http://www.cdc.gov/obesity/defining.html (accessed May 3, 2010).

[3] Sullivan, Patrick W., Vahram Ghushchyan, and Rami H. Ben-Joseph. "The Effect of Obesity and Cardiometabolic Risk Factors on Expenditures and Productivity in the United States." *Obesity* 16 (2008): 2155–62.

[4] Sullivan, Patrick W., Vahram Ghushchyan, and Rami H. Ben-Joseph. "The Effect of Obesity and Cardiometabolic Risk Factors on Expenditures and Productivity in the United States." *Obesity* 16 (2008): 2155–62.

[5] Covington, Chandice Y., Marisa J. Cybulski, Tawnya L. Davis, Grace E. Duca, Erin B Farrell, Michelle L. Kasgorgus, Carrie L. Kator, and Thor L. Sell. "Kids on the Move: Preventing Obesity Among Urban Children." *The American Journal of Nursing* 101 (2001): 73-82.

[6] Thomas A. Wadden and Albert J. Stunkard. Preface in *Handbook of Obesity Treatment*, edited by Thomas A. Wadden and Albert J. Stunkard, 3-18. New York: The Guilford Press, 2002.

[7] Bovbjerg, Viktor E. "The Epidemiology of Obesity: Causal Roots – Roots of Cause," in *Obesity: Causes, Mechanisms, Prevention and Treatment*, edited by Elliott M. Blass, 19-72. Sunderland: Sinauer Associates, Inc., 2008; Sptizer, R.L., Stunkard, A.J., Yanovski, S., Marcus, M.D., Wadden, T.A., and Wing, R.R. "Binge-eating disorder should be included in DSM-IV: A reply to Fairburn et al.'s "The classification of recurrent overeating: The

examine what the extant literature in various disciplines tells us about what causes obesity and is causing an increase in obesity.

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Health Risks

Obesity is associated with many negative health consequences including early mortality.[8] Being overweight or obese heightens risk factors for cardiovascular disease, certain cancers, diabetes, and death. In addition, being overweight has been found to exacerbate conditions such as

- Hypertension,

'binge-eating disorder' proposal."" *International Journal of Eating Disorders* 13 (1993): 161-169; Price, R. Arlen. "Genetics and Common Obesities: Background, Current Status, Strategies, and Future Prospects," in *Handbook of Obesity Treatment*, edited by Thomas A. Wadden and Albert J. Stunkard, 73-94. New York: The Guilford Press, 2002.

[8] Bovbjerg, Viktor E. "The Epidemiology of Obesity: Causal Roots – Roots of Cause," in *Obesity: Causes, Mechanisms, Prevention and Treatment*, edited by Elliott M. Blass, 19-72. Sunderland: Sinauer Associates, Inc., 2008.

- Osteoarthritis,
- Gallstones,
- Dyslipidemia,
- Musculoskeletal issues, and
- Psychological and Psychosocial issues.[9]

The health consequences of obesity are quite serious and costly. In an effort to curb the associated health risks, understanding more about the factors that contribute to the cause of obesity is necessary. The rest of the report will discuss these factors beginning with a brief introduction of genetics and how this cause may be enhanced by one's environment, then leading into other causes such as diet, exercise, environmental and socioeconomic factors, eating disorders, and societal influences.

Genetics

More than a century's worth of research has shown that there is a significant link between obesity and genetics.[10] If one's parent is obese, the risk of developing obesity significantly increases. Additionally, if obesity is present during early childhood, chances are high that an individual will be obese throughout his or her life. Studies have indicated a person's BMI can be attributed to genetic influences, with a 75% chance that a child with two obese parents will be overweight, and a 25-50% chance with one obese parent.[11]

Another important consideration in the development of childhood obesity is the weight of the mother at the time of giving birth. The weight of the mother predicts the weight of the newborn and additionally the weight of a newborn also may predict the weight of a child. A study in Denmark of 250,000 children indicated that newborns born with a weight of at least 10 pounds were twice as likely to become overweight by the age of 13 than those with birth weights of about seven pounds.[12]

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[9] Field, Alison E., Joaquin Barnoya, and Graham A. Colditz. "Epidemiology and Health and Economic Consequences of Obesity," in *Handbook of Obesity Treatment*, edited by Thomas A. Wadden and Albert J. Stunkard, 3-18. New York: The Guilford Press, 2002.

[10] Price, R. Arlen. "Genetics and Common Obesities: Background, Current Status, Strategies, and Future Prospects," in *Handbook of Obesity Treatment*, edited by Thomas A. Wadden and Albert J. Stunkard, 73-94. New York: The Guilford Press, 2002; Price, R.A., and Lee J.H. "Risk ratios for obesity in families of obese African-American and Caucasian women." *Human Heredity* 51 (2001): 35-40; Price, R.A., Reed D.R., and Guido, N.J. "Resemblance for body mass index in families of obese African American and European American women." *Obesity Research* 8 (2000): 360-366.

[11] U.S. Department of Health and Human Services. "Childhood Obesity." Assistant Secretary for Planning and Evaluation. http://aspe.hhs.gov/health/reports/child_obesity/#_ftn91 (accessed September 22, 2010).

[12] Field, Alison E., Joaquin Barnoya, and Graham A. Colditz. "Epidemiology and Health and Economic Consequences of Obesity," in *Handbook of Obesity Treatment*, edited by Thomas A. Wadden and Albert J. Stunkard, 3-18. New York: The Guilford Press, 2002.

Diet

A growing issue related to obesity is an individual's diet. For the past 50 years, there has been an increasing amount of effort put into the health and wellbeing of an individual with little focus on teaching good nutritional practices.[13] Areas that need to be looked into more thoroughly are fats, portion sizes, and sugars.

Because studying humans in a controlled environment for a long-term experiment is impossible, some researchers have chosen to study rodents to model the human metabolism and learn more about how a high fat diet may lead to weight gain, although what exactly constitutes a high fat diet hasn't been clearly defined. One study that used rats to model the human metabolism determined that diets with a fat content of more than "40% energy based on animal fats and fats from the unsaturated fat family w-6 and w-9 fatty acid – containing plant oils will lead to obesity, whereas diets with larger amounts of marine w-3 another unsaturated fat will not."[14] "High-fat diet promotes excessive energy intake by passive overconsumption; fat-induced appetite control signals are too weak or too delayed to prevent excessive energy intake from a fatty meal."[15] This problem is related to the issue of how much food one eats during a sitting.

The amount of food that one eats at a sitting varies depending upon certain factors. These factors are included below:[16]

- Food deprivation
- Sleep
- Prior experiences
- Estrogen levels
- Accessibility
- Perceived calories
- Celebratory event

Typical US portion sizes have dramatically risen[17] and currently exceed USDA and FDA standards by substantial margins. Cookies, for example, are now 700% larger than USDA standards. In

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[13] Richards, Sara. "The Building Blocks of a Healthy Diet." *Practice Nurse* 38.3 (2009): 12-17.

[14] Buettner, Roland, Jurgen Scholmerich, and L. Cornelius Bollheimer. "High-fat Diets: Modeling the Metabolic Disorders of Human Obesity in Rodents." *Obesity* 15 (2007): 798- 808.

[15] Jequier, E. "Pathways to Obesity." *International Journal of Obesity* 26 (2002): S12-S17.

[16] Smith, Gerard P. "Critical Introduction to Obesity," in *Obesity Prevention and Public Health*, edited by D. Crawford and R. W. Jeffery, 1-15, Oxford: Oxford University Press, 2005; Pliner, P. R. and P. Rozin. "The Psychology of the Meal," in *Dimensions of the Meal: the Science, Culture and Art of Eating*, edited by H. L. Meisselman, 19-46. Gaithersburg, MD: Aspen Publishers, Inc., 2000; Stroeble, N. and J. M. de Castro. "Influence of Physiological and Subjective Arousal on Food Intake in Humans." *Nutrition* 22 (2006): 996-1004; Walsh, B. T., H.R. Kissileff, S.M. Cassidy, and S. Dantzic. "Eating Behavior of Women with Bulimia." *Archives of General Psychiatry* 46 (1989): 54-58.

[17] Young, Lisa R. and Nestle, Marion. "The Contribution of Expanding Portion Sizes to the US Obesity Epidemic." *American Journal of Public Health* 92 (2002): 246-249 http://ajph.aphapublications.org/cgi/content/abstract/92/2/246 (accessed 23 June 2010).

restaurants, "patrons eat nearly 350 more calories than they did 15 years ago."[18] Larger portions have a positive correlation with intake amounts in children aged four to six.[19] This increase in food portions is present in restaurants, fast food chains, and cookbooks. This trend appears to have started in the 1970s, substantially increased in the 1980s, and has continued to increase to the present day[20] and has coincided with an increase in body weights.[21]

In addition to the increase in food portion sizes, consumption of obesity-promoting fats and sugar-sweetened beverages is also linked to obesity.

The consumption of sugar-sweetened beverages has doubled in the US since 1977 and has increased internationally as well.[22] According to the USDA, per capita consumption of soft drinks increased nearly 500% over the past 50 years.[23] As sugar-sweetened beverage consumption increased, it replaced other beverages, particularly milk and fruit juice, in the diet of children and adolescents leading to an increase in caloric consumption.[24] According to one study approximately 67% of sugar-sweetened beverages consumed are soda.[25] Soda consumption has been demonstrated to be one of the leading causes of the rapid growth of obesity in the US.[26]Not only does soda contribute to caloric intake but it and other foods rich in sugar have been shown to reduce appetite control.[27] Like the increase in food portion sizes, the increase in soda consumption has also paralleled the rise of obesity.[28]

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[18] Patrick, H. and Nicklas, T. A. "A Review of Family and Social Determinants of Children's Eating Patterns and Diet Quality." *Journal of the American College of Nutrition* 24 (2005): 83-92, p. 85.

[19] Patrick, H. and Nicklas, T. A. "A Review of Family and Social Determinants of Children's Eating Patterns and Diet Quality." *Journal of the American College of Nutrition* 24 (2005): 83-92.

[20] Young, Lisa R. and Marion Nestle. "The Contribution of Expanding Portion Sizes to the US Obesity Epidemic." *American Journal of Public Health* 92 (2002): 246-249 http://ajph.aphapublications.org/cgi/content/abstract/92/2/246 (accessed 23 June 2010).

[21] Young, Lisa R. and Nestle, Marion. "The Contribution of Expanding Portion Sizes to the US Obesity Epidemic." *American Journal of Public Health* 92 (2002): 246-249 http://ajph.aphapublications.org/cgi/content/abstract/92/2/246 (accessed 23 June 2010).

[22] Brownell et al. "The Public Health and Economic Benefits of Taxing Sugar Sweetened Beverages." *The New England Journal of Medicine* 361 (2009): 1599-1605 http://content.nejm.org/cgi/content/full/361/16/1599#R37 (accessed July 30, 2010).

[23] Jason M. Fletcher, David Frisvold, and Nathan Teft. "Can Soft Drink Taxes Reduce Population Weight?" *Contemporary Economic Policy* ISSN 1074-3529 (2009): 1-13. http://publichealth.yale.edu/faculty/labs/fletcher/fft.pdf (accessed July 8, 2010).

[24] Lisa Harnack, Jamie Stang, and Mary Story. "Soft Drink Consumption among US Children and Adolescents." *Journal of the American Diabetes Association* 99.4 (1999): 436-441.

[25] Lisa Powell, Jamie Chriqui, and Frank J. Chaloupka, "Associations between State-level Soda Taxes and Adolescent Body Mass Index." *Journal of Adolescent Health* 45 (2009): S57-S63 http://www.kchealthykids.org/_FileLibrary/FileImage/200909%20Assoc%20Between%20Soda%20Tx%20and%20Body%20Mass%20PIIS1054139X09001062.pdf (accessed 8 June 2010).

[26] Fletcher et al. "Can Soft Drink Taxes Reduce Population Weight?"

[27] Fletcher et al. "Can Soft Drink Taxes Reduce Population Weight?"; World Health Organization. "Diet, Nutrition, and the Prevention of Chronic Diseases." *Geneva WHO-TR* 916 (2003): 1-149.

[28] Fletcher et al. "Can Soft Drink Taxes Reduce Population Weight?"

Unlike sugar-sweetened foods, sugar-sweetened beverages do not seem to provide adequate satiety. Satiety, a feeling of being full, leads a person to stop eating after ingesting sufficient food. Lack of satiety prevents individuals from compensating for the calories ingested from SSBs during later meals.[29] This dynamic leads to a higher total caloric intake overall, by an average of 172 calories in children and 175 calories in adults each day among those who drink SSBs.[30] Over time, this can lead to significant weight gain. According to a study conducted during 1995 to 1997 on schoolchildren, the risk of obesity increased one to six times with each additional daily serving of sugar-sweetened beverage.[31]

It is also believed that the routine consumption of sugar-sweetened beverages may lead consumers to develop a preference for sweeter, less satiating foods over healthier options. There is a considerable amount of evidence that supports the claim that sugar sweetened beverages can cause obesity.

According to Kelly D. Brownell et al., there *is* a causal link between the consumption of sugar-sweetened beverages and the risk for obesity, diabetes, and heart disease because there is a positive association between SSBs and weight gain.[32] Brownell declares that behavioral and biological mechanisms are responsible for the connection between the consumption of sugar-sweetened beverages and these health problems. For example, adverse physiological and metabolic effects of sugar include the elevation of triglyceride levels and blood pressure and the lowering of high-density lipoprotein cholesterol levels ("good" cholesterol), which could increase the risk of coronary heart disease.[33] He also points to weight gain as a consequence of "poor satiating properties of sugar in liquid form," in which many people do not adjust their calorie intake in accordance with the amount of calories in SSBs.[34] Additionally there are psychological effects that Brownell and his colleagues explored. For instance, many people consume sugar-sweetened beverages in absence of hunger in order to satisfy thirst or for social reasons, while children who habitually consume these beverages come to find them more appealing than water and less sweet foods, thus causing them to have a poor diet.[35]

Benjamin Caballero MD, PhD states, "Of the seven types of beverages examined, sugar-sweetened beverages were the only beverages significantly associated with weight change."[36] Caballero and his colleagues from the Johns Hopkins School of Medicine and other distinguished medical research institutions found that of sugar-sweetened beverages, diet

[29] David S. Ludwig, Karen E. Peterson, and Steven L. Gortmaker. **"**Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis." *The Lancet* 357.9255 (2001): 505-508.
[30] Brownell et al. "The Public Health and Economic Benefits of Taxing Sugar-Sweetened Beverages."
[31] Ludwig, Peterson, and Gortmaker. **"**Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis."
[32] Brownell et al. "The Public Health and Economic Benefits of Taxing Sugar Sweetened Beverages."
[33] Brownell et al. "The Public Health and Economic Benefits of Taxing Sugar Sweetened Beverages."
[34] Brownell et al. "The Public Health and Economic Benefits of Taxing Sugar Sweetened Beverages."
[35] Brownell et al. "The Public Health and Economic Benefits of Taxing Sugar-Sweetened Beverages."
[36] Chen et al. "Reduction in consumption of sugar-sweetened beverages is associated with weight loss: the PREMIER trial." *American Journal of Clinical Nutrition* 89 (2009): 1299-1306.

drinks, milk, 100% juice, coffee and tea with sugar, coffee and tea without sugar, and alcoholic beverages, the leading source of liquid calories came from SSBs at 37%.[37] Researchers also found that consumption from liquid calories in beverages "increased in parallel to the obesity epidemic." [38]

It has been found that substituting water for SSBs is an effective way to reduce calorie intake among children and adults, thus reducing the risk of obesity and related health issues, as well as dental problems, like cavities, that are related with sugar intake.[39] Through these analyses, there appears to be some consensus among experts that point to SSBs as one of the many causes of obesity.

Exercise

Another major contributing factor of obesity is lack of exercise. Caloric balance is one of the most important factors that relates to obesity. According to the CDCP being overweight and obese results from an energy imbalance caused by eating too many calories and not getting enough exercise.[40] Caloric balance and body weight are generally maintained by balancing calories consumed against calories used by normal bodily functions and exercise.[41] Thus, by consuming as many calories as expended and vice-versa, a person's weight will remain stable. Obesity results if the food intake exceeds physical activity and an abnormally large amount of energy is stored within the body.[42]

In terms of obesity treatment, too much emphasis may have rested on diet and not enough on one's activity level. With the growing popularity of sedentary activities such as watching television and playing online, obesity has risen.[43] Increased use of electronically powered devices like escalators and elevators also decreases physical activity levels.[44] While the US tends to focus its attention on the use of low-calorie and low-fat diets for weight management, this

[37] Chen et al. "Reduction in consumption of sugar-sweetened beverages is associated with weight loss: the PREMIER trial."
[38] Chen et al. "Reduction in consumption of sugar-sweetened beverages is associated with weight loss: the PREMIER trial."
[39] Columbia University's Mailman School of Public Health. "Substituting Water for Sugar-sweetened Beverages Can Reduce Excess Calorie Consumption." *ScienceDaily* http://www.sciencedaily.com/releases/2009/04/090406192350.htm (accessed July 28, 2010).
[40] Centers for Disease Control and Prevention. "Obesity and Overweight for Professionals: Causes, 2009." Centers for Disease Control and Prevention. http://www.cdc.gov/obesity/causes/index.html (accessed June 28, 2010).
[41] Centers for Disease Control and Prevention. "Obesity and Overweight for Professionals: Causes, 2009." Centers for Disease Control and Prevention. http://www.cdc.gov/obesity/causes/index.html (accessed June 28, 2010).
[42] Smith, Gerard P. "Critical Introduction to Obesity," in *Obesity: Causes, Mechanisms, Prevention and Treatment*, edited by Elliott M. Blass, 1-17. Sunderland: Sinauer Associates, Inc., 2008.
[43] Blair, Steven N. and Leermakers, Elizabeth A. "Exercise and Weight Management," in *Handbook of Obesity Treatment*, edited by Thomas A. Wadden and Albert J. Stunkard, 283-300. New York: The Guilford Press, 2002.
[44] Blair et al. "Exercise and Weight Management."

approach may be discredited by the rapid increase in the prevalence of overweight and obesity. Greater focus of attention on physical activity would be beneficial.[45]

Physical activity has been a practice used in school systems to get into the habit of exercising. Recess is a regular event occurring in elementary schools that allows children to discover enjoyable physical activities and increase their motivation to engage in more movement, thereby forming habitual physical activity patterns that potentially reduce obesity.[46] Adequate use of recess time will lead to more physically active children meeting the goals of the Surgeon General's advisement of 30 to 60 minutes of physical activity on most if not all days of the week. For instance, if a child gets the recommended amount of physical activity, research findings suggest that physical activity can positively influence mood states, mental health, anxiety reduction, and brain function.[47]

According to a survey done by the 2000 National College Health Assessment, 57% of male and 61% of female college students reported that they had completed no physical activity on at least three of the previous seven days.[48]

Neighborhood Walkability

The prevalence of sidewalks and other pedestrian-friendly infrastructure in neighborhoods encourages physical activity in residents. In neighborhoods with high walkability, residents were more likely to walk to do errands than those who lived in low walkability neighborhoods. This extra exercise helps to account for a 25% decrease in the percentage of overweight residents in areas of high walkablity versus areas of low walkablity.[49] Therefore, the arrangement of one's neighborhood and ease of walkability is significant because it may promote increased physical activity and less prevalence of obesity.

In addition to the arrangement of the neighborhood, another important factor that may contribute to obesity is where one's neighborhood is located, whether it is urban, suburban, or rural. One study indicated that more rural adults were physically inactive than urban ones, independent of ethnicity. This was especially true for those who lived in the Midwest and

[45] Blair et al. "Exercise and Weight Management."; World Health Organization, Technical Report Series. "Diet, Nutrition, and the Prevention of Chronic Diseases." *Geneva WHO-TR* 916 (2003): 1-149.
[46] Stellino, EdD, Megan B., Christina D. Sinclair, PhDb, Julie A. Partridge, PhDc, and Kristi M. King, PhDd. "Differences in Children's Recess Physical Activity: Recess Activity Intervention." *Journal of School Health* 80 (2010): 436-44.
[47] Norling, J. C., et al. "The Benefit of Recreational Physical Activity to Restore Attentional Fatigue: The Effects of Running Intensity Level on Attention Scores." *Journal of Leisure Research* 42 (2010): 135-52.
[48] Buckworth, Janet, and Claudio Nigg. "Physical Activity, Exercise, and Sedentary Behavior in College Students." *Journal of American College Health* 53 (2010): 28-34.
[49] Saelens, B.E., J.F. Sallis, J.B. Black, and D. Chen. "Neighborhood-Based Differences in Physical Activity: An Environment Scale Evaluation." *American Journal of Public Health* 93 (2003): 1552-1558.

South. In the Northeast, however, rural adults were less likely than their urban counterparts to be physically inactive by over 10%.[50]

One study looked into the potential reasons why area of residence is a factor for obesity. It found that there is no difference between the total cholesterol, blood pressure, smoking, and physical activity levels of rural and urban children. However, there was a significant increase in the BMI and sum of skin folds of rural children, resulting in a 54.7% increased risk of obesity in rural children over urban ones.[51] Suburban residents were more likely to meet physical activity recommendations than their urban or rural counterparts.[52]

Additional studies of the effect one's neighborhood has on obesity have indicated that obesity has been linked with living close to highways, living on streets without sidewalks, having no perceivable paths within walking distance, having poor access to recreational facilities, having no shopping areas within walking distance, and not having constant access to a vehicle.[53]

Additional Factors

There are several additional factors that may contribute to obesity and include various forms of pollution, sleep, medicine, and depression. All are discussed in the following section.

Pollution

Endocrine disruptors, which manipulate the hormones that control body weight, are thought to be a potential cause of obesity.[54] These disruptors have numerous common sources such as pharmaceuticals, plastics, food, and toys.[55] Additionally, chemical pollutants such as

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[50] Patterson, P.D., C.G. Moore, J.C. Probst, and J.A. Shinogle. "Obesity and Physical Inactivity in Rural America." *The Journal or Rural Health* 20 (2006): 151-159 http://www.ncbi.nlm.nih.gov/pubmed/15085629 (accessed August 23, 2010).

[51] Dietz, William H. Jr., and Steven L. Gortmaker. "Factors within the physical environment associated with childhood obesity." *The American Journal of Clinical Nutrition*. 39 (1984): 619-624.

[52] Parks, S.E., Housemann, R.A., and Brownson, R.C. "Differential correlates of physical activity in urban and rural adults of various socioeconomic backgrounds in the United States." *Journal of Epidemiology and Community Health* 57 (2003): 29-35 www.jech.bmj.com/content/57/1/29.full (accessed September 24, 2010).

[53] Giles-Corti, B., Macintyre, S., Clarkson, JP, Pikora, T., and Donovan, RJ. "Environmental and Lifestyle Factors Associated with Overweight and Obesity in Perth, Australia." *American Journal of Health Promotion* 18 (2003): 93-102. http://eprints.gla.ac.uk/2628 (accessed June 20, 2010).

[54] Keith, S. W. et al., "Putative Contributors to the Secular Increase in Obesity: Exploring The Roads Less Traveled." *International Journal of Obesity* 30 (2006): 1585-1594. http://www.nature.com/ijo/journal/v30/n11/full/0803326a.html (accessed July 3, 2010).

[55] National Institute of Environmental Health Sciences. "Endocrine Disruptors, 2010." National Institute of Environmental Health Sciences http://www.niehs.nih.gov/health/topics/agents/endocrine/index.cfm (accessed July 1, 2010).

benzo[a]pyrene have been shown to induce obesity.[56] Carcinogens that focus on adipose (fat) tissue, such as organochlorine pesticides and polychlorinated biphenyls (PCBs) may also have an effect on weight.[57]

Sleep

Research indicates a link between obesity and lack of sleep. The National Health and Nutrition Examination Survey I (NHANES) of more than 9,000 participants in 1982-1984 determined that those getting less than seven hours of sleep at night were more likely to become obese.[58] Less sleep typically means greater exposure to light thereby throwing off one's natural internal mechanisms like their metabolism. Additionally, it's possible that when one is awake longer they may ingest more food. Numerous studies have indicated a clear relationship between lack of sleep and obesity. It has also been shown that lack of sleep may make it more difficult to lose fat. A preliminary study conducted in 2009 compared two groups of people on a nutritionally balanced, calorie-reduced diet with one group getting at least seven hours of sleep and the other getting approximately five hours of sleep. Those on the sleep restricted plan lost only 26% of fat but those following the normal sleep plan lost 56% of fat indicating that sleep plays a considerable role in fat reduction.[59]

Studies have made it clear that lack of sleep is linked to obesity in a variety of ways including metabolic disturbances and fat reduction.[60] Another relationship, present but causally unclear, is the link between depression and obesity, discussed below.

Depression

Studies show that obese people have a 55% chance of becoming depressed over time and depressed people have a 58% chance of becoming obese over time.[61] Depression may lead to obesity and obesity may lead to depression. The cause and effect relationship of depression

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[56] Irigaray, P, J.A. Newby, S. Lacomme, and D. Belpomme. "Overweight/obesity and cancer genesis: More than a biological link." *Biomedicine & Parmacotherapy* 61 (2007): 665-678. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VKN-4R1MGWV-1&_user=10&_coverDate=12%2F31%2F2007&_rdoc=1&_fmt=high&_orig=search&_sort=d&_docanchor=&view=c&_searchStrId=1382059612&_rerunOrigin=scholar.google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=de2c37c39d64596800986c13f57e476c (accessed June 24, 2010).

[57] Irigaray, Newby, Lacomme, and Belpomme. "Overweight/obesity and cancer genesis: More than a biological link."

[58] Hitti, Miranda. "Sleep More to Fight Obesity." WebMD Health News. http://www.webmd.com/diet/news/20041116/sleep-more-to-fight-obesity (accessed August 25, 2010).

[59] Spivey, Angela. "Lose Sleep, Gain Weight. Another Piece of the Obesity Puzzle." *Environmental Health Perspectives* 118 (2010): A28-A33.

[60] Spivey, Angela. "Lose Sleep, Gain Weight. Another Piece of the Obesity Puzzle." *Environmental Health Perspectives* 118 (2010): A28-A33.

[61] Preidt, Robert. "Obesity and Depression: A Vicious Circle? - Depression Symptoms, Causes, and Treatments Including Clinical and Manic Depression on MedicineNet.com." MedicineNet.com. http://www.medicinenet.com/script/main/art.asp?articlekey=113882 (accessed June 29, 2010).

and obesity is poorly understood but the two *are* linked.[62] Sarah Mustillo, Ph.D. notes that the link could have to do with social or neuroendocrine-related factors. She argues:

> At the center of the obesity-depression link is biology in which the route of communication between the hypothalamus, the part of the brain that governs parts of the nervous system, and the pituitary and adrenal glands, which secrete a variety of hormones, work together to maintain chemical equilibrium when the body is under stress. This hormonal pathway, called the HPA axis, is responsible for releasing cortisol, known as the "stress hormone," which plays a critical role in metabolizing energy. However, cortisol encourages the body to deposit fat around the abdomen, a pattern that is especially hazardous to one's health. Therefore, stress not only contributes toward the chances of depression but weight gain as well.[63]

Dr. Evan Atlantis from the University of Adelaide's School of Medicine states that "obesity may constitute a chronic stressful state, which in turn can cause significant physiological dysfunction. Such dysfunction would then predispose individuals to depressed mood and associated symptoms."[64] He further notes that "obese people, especially those who perceive themselves as being overweight, often experience weight-related stigma and discrimination, and consequently present with symptoms of low self-esteem, low self-worth, and guilt. Obesity is associated with socioeconomic disadvantage and low levels of physical activity, both of which are strong predictors of depression."[65] The following section will present some of the socioeconomic factors associated with obesity.

Medication

Although there are numerous drugs prescribed to treat obesity, many medicines cause weight gain as an unintended side effect. Certain anti-depressants, anti-convulsants, diabetes medications, hormones, and most corticosteroids can contribute to the potential for obesity.[66] Many prescription drug side effects contribute to a sedentary or unhealthy lifestyle that consequently causes weight-gain. Corticosteroids, for instance, can make one feel hungry which may cause weight gain, while anti-depressants can cause a person to crave high-energy or sugary foods.[67]

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[62] Bovbjerg, Viktor E. "The Epidemiology of Obesity: Causal Roots – Roots of Cause," in *Obesity: Causes, Mechanisms, Prevention and Treatment*, edited by Elliott M. Blass, 19-72. Sunderland: Sinauer Associates, Inc., 2008; Dixon, J.B., M.E. Dixon, and P.E. O'Brien. "Depression in Association with Severe Obesity: Changes with Weight Loss." *Archives of Internal Medicine* 163 (2003): 2058-2065.

[63] Lawson, Willow. "The Obesity-Depression Link." *Psychology Today* 2003 http://www.psychologytoday.com/articles/200305/the-obesity-depression-link (accessed June 24, 2010).

[64] Atlantis, Evan. "Strong Link Between Obesity and Depression."

[65] Atlantis, Evan. "Strong Link Between Obesity and Depression." The University of Adelaide. http://www.adelaide.edu.au/news/news35941.html (accessed July 6, 2010).

[66] Medicinenet.com. "Obesity (Weight Loss) Complete Medical Information on This All Too Common Disease on MedicineNet.com." Medicinenet.com. http://www.medicinenet.com/obesity_weight_loss/article.htm#tocd (accessed June 24, 2010).

[67] Consumer Reports. "Obesity - Medications and Obesity." Consumer Reports. http://www.consumerreports.org/health/conditions-and-treatments/obesity/what-is-it/medications-and-obesity.htm (accessed June 24, 2010).

Socioeconomic Factors

People with a lower income tend to consume a high-fat, energy dense diet because it is more affordable than a healthier diet comprised of lean meats, fresh fruits, and vegetables.[68] Studies have shown that diets based on energy-dense foods are less satisfying, nutrient deficient,[69] and may lead to passive overeating. If there is a correlation between rising obesity rates and a growing price gap between healthy and unhealthy foods, it has been suggested that current obesity-prevention strategies will need revision. There is some evidence of the price disparity. Between 1985 and 2000, for example, the price of soft drinks increased by 20%, whereas the price of fresh fruits and vegetables increased by 120% in the same period of time. Current policies, such as encouraging those in poverty to consume more expensive foods, even if they are healthier, may be viewed as elitist and a tax on fats or sugars would be regressive. Instead, it has been suggested that the "broader problem may lie with growing disparities in incomes and wealth, declining value of the minimum wage, food imports, tariffs, and trade."[70]

Data shows that low-income consumers are more sensitive to price elasticity than high-income consumers for fresh fruits and vegetables. This means that a price change of those foods has a larger impact on the purchasing decisions of lower-income consumers than with higher incomes.[71]

Diet cost appears to be the principle variable between obesity and the food environment.

> If higher food costs represent both a real and perceived barrier to dietary change, especially for low-income families, then the ability to adopt healthier diets may have less to do with psychosocial factors, self-efficacy, or readiness to change than with household economic resources and the food environment.[72]

Societal food divisions often create areas of low-quality food facilities known as "food deserts" and are linked to areas of low income with poor access to healthy food.[73] "The price and

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[68] Drewnowski, Adam and SE Specter. "Poverty and obesity: the role of energy density and energy costs." *American Journal of Clinical Nutrition* 79 (2004): 6-16 http://www.ajcn.org/cgi/content/abstract/79/1/6 (accessed June 29, 2010).

[69] James et al. "Socioeconomic determinants of health: The contribution of nutrition to inequalities in health." *British Medical Journal* 314 (1997): 308-309 http://www.bmj.com/cgi/content/abstract/314/7093/1545 (accessed June 28, 2010).

[70] Drewnowski, Adam and Darmon, Nicole. "The economics of obesity: dietary energy density and energy cost." *American Journal of Clinical Nutrition* 82 (2005): 265-273 http://www.ajcn.org/cgi/content/abstract/82/1/265S (accessed July 1, 2010).

[71] Jones, Eugene. "The Economics of Eating Fresh Fruits and Vegetables: Recognizing Discernible Patterns for Obesity Differences among Lower- and Higher-Income Consumers," paper presented at the Southern Agricultural Economics Association Annual Meetings, Orlando, Florida, February 5-8. 2006.

[72] Drewnowski, Adam. "Obesity and the food environment: Dietary energy density and diet costs." *American Journal of Preventative Medicine* 27 (2004): 154-162 http://www.ajpm-online.net/article/S0749-3797%2804%2900150-3/abstract (accessed July 2, 2010).

[73] Lang, Tim and Caraher, Martin. "Access to Healthy Foods: Part II. Food Poverty and Shopping Deserts: What are the Implications for Health Promotion Policy and Practice?" *Health Education Journal* 57 (1998): 202-211 http://hej.sagepub.com/cgi/content/abstract/57/3/202 (accessed June 29, 2010).

availability of food may be an important mediating factor in the relationship between neighborhood, environment, diet quality, and obesity."[74]

Baum et al. argue that weight and obesity are inversely related to social and economic advantage and that poor health during childhood is associated with lower educational attachment, lower status, and more health problems in adulthood, "suggesting that health is an important mechanism through which economic status is transmitted[75] Baum et al. showed that 4.6% of those in the lowest socioeconomic status (SES) group are obese at age 18 and 31.3% at age 40, while growth for the high SES group is from 1.9 to 19.6%. Baum et al. explained that "beneficial effects of advantaged childhood circumstances primarily propagate through education and, to a lesser extent, race/ethnicity."[76]

In the South, rural women are the most likely to be obese, have poor health, and be in poverty. Urban women had the next highest obesity rate. Suburban women on the other hand were the healthiest and had the lowest poverty rates. According to this study, poor health significantly correlated with obesity, marital status (unmarried), education (less educated), and rural residency.[77]

Access to areas that offer healthier food options is an important factor that contributes to the obesity problem and often affects those who live in low-income, minority, and rural neighborhoods. Improved access to supermarkets rather than convenience stores may help reduce obesity levels by improving one's diet. Low-income neighborhoods are often dominated by fast-food restaurants that offer poor food choices, thereby contributing to the obesity epidemic.[78]

This report has already mentioned two factors, walkability and rural characteristics, related to neighborhoods that are important with regard to obesity. An additional factor but related on a socioeconomic level has to do with the presence of athletic facilities within low-income neighborhoods. Athletic facilities such as gyms are less likely to be found in lower-income neighborhoods or in neighborhoods with more minorities, the two demographics most

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[74] Cummins, Steven and Macintyre, Sally. "Food Environments and Obesity—Neighborhood or Nation?" *International Journal of Edpidemiology* 35 (2006): 100-104 http://ije.oxfordjournals.org/cgi/reprint/35/1/100 (accessed July 6, 2010).

[75] Baum II, Charles L., and Christopher J. Ruhm. "Age, Socioeconomic Status and Obesity Growth." *Journal of Health Economics* 28 (2009): 635-49.

[76] Baum II, Charles L., and Christopher J. Ruhm. "Age, Socioeconomic Status and Obesity Growth." *Journal of Health Economics* 28 (2009): 635-49.

[77] Ramsey, Priscilla W. and Lee L. Glenn. "Obesity and Health Status in Rural, Urban, and Suburban Women." *Southern Medical Journal* 95 (2002): 666-671 http://journals.lww.com/smajournalonline/Abstract/2002/95070/Obesity_and_Health_Status_in_Rural,_Urban,_and.2.aspx (accessed June 23, 2010).

[78] Larson, Nicole I., Story, Mary T., and Nelson, Melissa C. "Neighborhood Environments: Disparities in Access to Healthy Foods in the U.S." *American Journal of Preventative Medicine* 36 (2009): 74-81 http://www.ajpm-online.net/article/S0749-3797%2808%2900838-6/abstract (accessed July 4, 2010).

susceptible to obesity.[79] Additionally, commercial physical activity-related facilities are less likely to be found in lower-income neighborhoods and in neighborhoods with a greater minority population.[80] The availability of fitness-related facilities is directly related to income level, meaning that financially disadvantaged households have less of an opportunity to go to such facilities. Rural areas are also less likely to house such businesses than urban ones.[81]

This section has demonstrated that there are many socioeconomic factors that contribute to the presence of obesity. Another important topic, especially when considering how to address the obesity problem, is the association between dieting, eating disorders, and obesity. This is discussed in the following section.

Eating Disorders

There is a linkage between dieting, eating disorders, and obesity.[82] While dieting is often conceived as a solution to the rising obesity epidemic, a number of studies suggest that dieting is not effective in preventing weight gain, and in some cases, dieting may actually be associated with an increased risk of obesity among children and adolescents.[83] Dieting may promote weight loss but restrictive eating may provoke disordered eating which may then lead to obesity.[84] There are two types of eating disorders known to contribute to obesity: binge eating disorder (BED) and night eating syndrome (NES). BED is the most common eating disorder, affecting three percent of adults in the US, and is most common among severely obese people.[85] Those with BED tend to engage in frequent dieting behaviors[86] and it has been

[79] Powell, Lisa M., Sandy Slater, Frank J. Chaloupka, and Deborah Harper. "Availability of Physical Activity—Related Facilities and Neighborhood Demographic and Socioeconomic Characteristics: National Study." *American Journal of Public Health* 96 (2006): 1676-1680 http://ajph.aphapublications.org/cgi/content/abstract/96/9/1676 (accessed June 30, 2010).

[80] Powell, Slater, Chaloupka, and Harper. "Availability of Physical Activity—Related Facilities and Neighborhood Demographic and Socioeconomic Characteristics: National Study."

[81] Powell, Slater, Chaloupka, and Harper. "Availability of Physical Activity-Related Facilities and Neighborhood Demographic and Socioeconomic Characteristics: A National Study."

[82] Haines et al. "Prevention of Obesity and Eating Disorders: A Consideration of 9 Shared Risk Factors."

[83] Haines, Jess and Dianne Neumark-Sztainer. "Prevention of Obesity and Eating Disorders: A Consideration of 9 Shared Risk Factors." *Health Education Research* 21 (2006): 770-782. http://her.oxfordjournals.org/cgi/content/full/21/6/770 (accessed June 23, 2010).

[84] Carrier, K. M., Steinhardt, M.A., and Bowman S. "Rethinking traditional weight management programs: A 3-year follow-up evaluation of a new approach." *The Journal of Psychology* 129 (1994): 517-535; Dixon, J.B., M.E. Dixon, and P.E. O'Brien. "Depression in Association with Severe Obesity: Changes with Weight Loss." *Archives of Internal Medicine* 163 (2003): 2058-2065; Dixon, J.B., M.E. Dixon, and P.E. O'Brien. "Depression in Association with Severe Obesity: Changes with Weight Loss." *Archives of Internal Medicine* 163 (2003): 2058-2065; Ernsberger, P. and Koletsky, R.J. "Biomedical rationale for a wellness approach to obesity: An alternative to a focus on weight loss." *Journal of Social Issues* 55 (1999): 221-260; McFarlane, T., Polivy, J., and McCabe, R. E. "Help, Not Harm: Pyschological Foundation for a Nondieting Approach Toward Health." *Journal of Social Issues* 55 (1999): 261-276.

[85] Stunkard, Albert and Allison, Kelly Costello."Two forms of disordered eating in obesity: binge eating and night eating." *International Jounal of Obesity* 27 (2002): 1-12 http://www.nature.com/ijo/journal/v27/n1/full/0802186a.html (accessed July 14, 2010).

suggested that dieting is a precursor for binge eating disorder.[87] Adolescent girls that diet have three times the chance of becoming obese than those that do not diet. This is because of the cyclical pattern of restrictive eating followed by overeating or binge eating.[88]

Night eating syndrome is more common in obese people than non-obese people. It affects about 33% of morbidly obese persons (those who are 100 pounds or more overweight) and its prevalence increases with weight.[89] Studies indicate that those with NES often suffer from a type of depression that increases as the day progresses.[90] Therefore, there is additional evidence that supports a link between depression and obesity.[91]

Food Advertising

According to a recent study published in the *American Journal of Public Health*, childhood obesity is directly related to children's exposure to television commercials that advertise unhealthy foods.[92] Researchers gathered data from primary care providers of over 3,000 children ranging from infants to 12 year olds regarding their television viewing habits and the format of TV entertainment, such as DVDs, cable television, etc., over the course of five years.[93] They found that commercial viewing (e.g. viewing non-educational programs containing commercials) was positively associated with higher BMI, while non-commercial viewing (like DVDs or educational television programming) had no significant association with obesity.[94] The

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[86] Spitzer, R.L., Devlin, M., Walsh, B.T., Hasin, D., Wing, R., Marcus, M., Stunkard, A. J., Wadden, T., Yanovski, S., Agras, S., Mitchell, J., and Nonas, C. "Binge eating disorder: A multisite field trial of the diagnostic criteria." *International Journal of Eating Disorders* 11 (1992): 191-203; Sptizer, R.L., Stunkard, A.J., Yanovski, S., Marcus, M.D., Wadden, T.A., and Wing, R.R. "Binge-eating disorder should be included in DSM-IV: A reply to Fairburn et al.'s "The classification of recurrent overeating: The 'binge-eating disorder' proposal." *International Journal of Eating Disorders* 13 (1993): 161-169.

[87] Herman, C.P. and Polivy, J. "Restrained eating." In *Obesity*, edited by A.J. Stunkard, 208-225. Philadelphia: WB Saunders, 1980; McFarlane, T., Polivy, J., and McCabe, R. E. "Help, Not Harm: Pyschological Foundation for a Nondieting Approach Toward Health." *Journal of Social Issues* 55 (1999): 261-276; McFarlane, T., Polivy, J., and McCabe, R. E. "Help, Not Harm: Pyschological Foundation for a Nondieting Approach Toward Health." *Journal of Social Issues* 55 (1999): 261-276; Herman, C.P. and Polivy, J. "From dietary restraint to binge eating: Attaching causes to effects." *Appetite* 14 (1990): 123-125.

[88] Haines et al. "Prevention of Obesity and Eating Disorders: A Consideration of 9 Shared Risk Factors."

[89] Eating Disorders Online. "Night Eating." http://www.eatingdisordersonline.com/explain/nighteating.php (accessed August 14, 2010); World Health Organization. "Diet, Nutrition, and the Prevention of Chronic Diseases." *Geneva: WHO TRT* 916 (2003).

[90] Stunkard, Albert, and Allison, Costello Kelly. "Two forms of disordered eating in obesity: binge eating and night eating."

[91] Stunkard, Albert, and Allison, Costello Kelly. "Two forms of disordered eating in obesity: binge eating and night eating."

[92] Anderson, Sarah. "Childhood Obesity: It's Not the Amount of TV, It's the Number of Commercials." February 8, 2010. http://newsroom.ucla.edu/portal/ucla/it-s-not-how-much-tv-kids-watch-153255.aspx (accessed July 14, 2010).

[93] Anderson, Sarah. "Childhood Obesity: It's Not the Amount of TV, It's the Number of Commercials."

[94] Anderson, Sarah. "Childhood Obesity: It's Not the Amount of TV, It's the Number of Commercials."

study suggests that turning kids away from commercial television could help in reducing childhood obesity.[95]

Kids aged 8 to 18 spend approximately four hours per day watching television and an additional two hours on the computer. Not only does watching TV and working on the computer affect a child's physical and mental development[96] but it is a major form of sedentary behavior.[97] CDCP confirms the association between television watching and overweight and states that television viewing increases children's food consumption through snacking and eating meals. [98] Television viewing lowers their metabolic rate because of a decreased ability to burn fat while watching TV.[99]

On average, children in the US watch about 10,000 food advertisements each year and almost all of them are marketing sugar cereals, fast foods, candy, or soft drinks.[100] For children's television programming, half of the advertisements were for food with 60% being for cereal or confectionary/snacks. Those food advertisements were also more likely to use engaging medium such as animation and humor.[101] Experts agree that excessive media use is positively associated with weight gain and exposure to television advertisements contribute to children making unhealthy food choices.

According to researchers affiliated with the National Bureau of Economic Research, a ban on fast-food restaurant advertising on children and adolescents would lead to an 18% decrease in the number of overweight children aged 3 to 11 and a 14% decrease in the number of overweight children age 12 to 18.[102] By simply eliminating the tax deductibility of these adverts, a five to seven percent decline would occur. This second plan would have the added benefit of lower costs to those who only occasionally consume fast food because they would be able to get information on those restaurants via the adverts.[103]

Another study on advertising during children's programming showed that 71% of those commercials were about food and that 80% of those ads were for foods with low nutritional

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[95] Anderson, Sarah. "Childhood Obesity: It's Not the Amount of TV, It's the Number of Commercials."

[96] Kids Health. "How TV Affects Your Child." http://kidshealth.org/parent/positive/family/tv_affects_child.htm (accessed July 13, 2010).

[97] Anderson, Sarah. "Childhood Obesity: It's Not the Amount of TV, It's the Number of Commercials."

[98] "Overweight and Obesity: Contributing Factors." October 20, 2009. http://www.cdc.gov/obesity/childhood/causes.html (accessed 14 July, 2010).

[99] "Overweight and Obesity: Contributing Factors." October 20, 2009. http://www.cdc.gov/obesity/childhood/causes.html (accessed 14 July, 2010).

[100] Haines et al. "Prevention of Obesity and Eating Disorders: A Consideration of 9 Shared Risk Factors."

[101] Lewis, MK. and Hill, AJ. "Food Advertising on British Children's Television: A Content Analysis and Experimental Study with Nine-Year Olds." *International Journal of Obesity* 22 (1998): 206-214. http://cat.inist.fr/?aModele=afficheN&cpsidt=2176812 (accessed June 28, 2010).

[102] Chou, Shin-Yi, Inas Rashad, and M. Grossman. "Fast-Food Restaurant Advertising on Television and Its Influence on Childhood Obesity." *The Journal of Law and Economics* 51 (2008): 599- 618.

[103] Chou, Sin-Yi, Rashad, Inas, and Grossman, Michael. "Fast-Food Restaurant Advertising on Television and Its Influence on Childhood Obesity." *Journal of Law and Economics* 51 (2008): 599-618. http://www.journals.uchicago.edu/doi/abs/10.1086/590132 (accessed 21 June 2010).

value. This is quite crucial as there is a positive association between advertised foods and children requesting and consuming those foods.[104]

Family Influences

The different ways families are structured (i.e., a family with one or two parents, married or divorced parents, or more than one child, etc.) has no significant effect on adult obesity. However, by odds of 7-1, parental neglect leads to a higher risk. Additionally, neglected children were more likely to have adult obesity than averagely groomed ones. Being an only child, having overprotective parents, or being hygienic had no effect.[105]

Children who eat with other family members tend to eat healthier foods and more foods from the basic food groups. Additionally, children who ate with family members consumed fewer soft drinks and were less likely to skip breakfast. Children who live with families that watch TV while eating are less likely to eat fruit or vegetables and more likely to eat pizza, snacks, or sodas. Additionally, the manner in which parents teach their children to eat has a bearing on diet.[106]

Office-Work Influences

Work that takes place in an office-based setting (aka knowledge based work) has been shown to be heavily dependent on glucose to fuel the neurons. Fatty acids cannot be converted into glucose, meaning that more food must be eaten to replenish the used glucose; but, while the glucose is being used up, the fatty acids are being stored. Research suggests that knowledge-based work may lead to this greater caloric intake. This hypothesis is supported by the finding that even doing easy tasks such as reading, stimulates people to eat significantly more food.[107]

Summary

This document has mentioned many potential factors that contribute to the obesity problem in the US. Some of these factors may work independently of one another but others may build upon one another, creating a very complex, multi-faceted problem.

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[104] Patrick, Heather and Nicklas, Theresa A. "A Review of Family and Social Determinants of Children's Eating Patterns and Diet Quality." *Journal of the American College of Nutrition* 24 (2005): 83-92.

[105] Lissau, I., and Sørensen, T.I.A. "Parental neglect during childhood and increased risk of obesity in young adulthood." *The Lancet* 343 (1994): 324-327 http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6T1B-49KCB2M-2J1&_user=10&_coverDate=02%2F05%2F1994&_rdoc=1&_fmt=high&_orig=search&_sort=d&_docanchor=&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=5614889fa10c1f8fb2dbb5c2f5ce9025 (accessed July 3, 2010).

[106] Patrick and Nicklas. "A Review of Family and Social Determinants of Children's Eating Patterns and Diet Quality."

[107] Tremblay, Angelo and Chaput, Jean-Philippe. "About Unsuspected Potential Determinants of Obesity." *Applied Physiology, Nutrition, and Metabolism* 33 (2008): 791-796.

Beyond a basic imbalanced energy equation there are numerous factors that may play a part in complicating the obesity issue. The many factors that contribute to the obesity problem are highlighted below:

- A child whose parent is obese is more likely to become obese.
- A person that develops obesity as a child increases his or her chances of developing obesity as an adult.
- Research shows that a mother's weight at the time of giving birth predicts a newborn's weight. Additionally, the weight of a newborn predicts one's likelihood of being overweight or obese as an adult.
- Children that eat meals with family members are less likely to develop obesity.
- Dieting can lead to eating disorders and obesity. Some eating disorders can lead to obesity.
- Researchers have also discovered evidence which suggests that the consumption of sugar sweetened beverages may cause obesity. The rise in consumption of SSBs is parallel with the rise of the rate of obesity in the US. Furthermore, many people drink these beverages because they are more appealing than water and satiate the appetite in the absence of food, thus causing them to consume an excessive amount of calories and to have a poor diet. Data indicate that implementation of legislation discouraging the consumption of SSBs may help to reduce the rates of overweight and obesity.
- Sleep is clearly linked to obesity and affects one's ability to lose fat.
- Depression is linked to obesity though the causal relationship is poorly understood.
- The side effects of prescription medication cause some people to gain weight and may contribute to obesity.
- Television viewing contributes to the obesity problem with the flood of food advertisements, typically of unhealthy foods and often directed at children, and the increased sedentary activity.
- One's socioeconomic class does affect the likelihood of developing obesity. Less costly foods are generally comprised of those foods considered to be less healthy. Additionally, one's socioeconomic class would affect their residential location thereby affecting their accessibility to markets that provide more health options (grocery versus convenience stores). Additionally, characteristics the neighborhoods in which people live that are related to levels of obesity—the level of walkability, access to parks, or gym—tend to relate to one's socioeconomic class. More affluent neighborhoods tend to have trails and sidewalks available to the residents as well as a recreational facility and close access to a supermarket.

Completed at the request of the Vermont Attorney General's Office by Kate Fournier, Alexander McManus, and Patrick Doyle under the supervision of Professor Gierzynski on November 16, 2010.

Disclaimer: This report has been prepared by undergraduate students at the University of Vermont under the supervision of Professor Anthony Gierzynski. The material contained in the report does not reflect the official policy of the University of Vermont.