

# IMPACT OF PHYSICAL ACTIVITY ON OBESITY

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## Introduction

### Determining who is overweight and who is obese

The terms “overweight” and “obesity” are often used as if they are synonymous, but they are not. Both denote excessive body weight, but obesity is a more advanced state than is overweight. The definitions and criteria of obesity depend to a great extent on the method used to determine it. Ideally, one should measure or assess percent body fat by determining skinfold thickness or underwater weight or by using techniques of dual energy X-ray absorptiometry (DEXA). Body fat in excess of 30% is often used as a criterion for obesity.

In the absence of tools to estimate percent body fat, one must resort to the simpler measurements of body weight and height. The most commonly used index of overweight and obesity, based on weight and height, is the Body Mass Index [BMI = weight (kg) divided by height squared ( $m^2$ ). For adults, a BMI of 25-29  $kg/m^2$  denotes overweight, and a BMI of 30  $kg/m^2$  or more denotes obesity. These cut-off points, however, are not valid for children and adolescents. Based on data of more than 97,000 subjects from various countries, the cut-off levels for adolescents are lower than for adults, and they are even lower in children (Cole et al., 2000). For example, the obesity cut off level for a 15-year-old boy is 28  $kg/m^2$ , and for an 8-year-old boy it is 23  $kg/m^2$ . The corresponding cut-off points for overweight are 23 and 18  $kg/m^2$  respectively.

In spite of the popularity of BMI, one must realize that it does not differentiate between a person whose excessive body weight is due to high body fat content and one whose excess bodyweight is attributed to a large fat free mass. This drawback is particularly relevant for athletes, who may vary markedly in their muscle bulk and fat-free mass. For such People, one should attempt a measurement of percent body fat.

The purpose of this article is to concisely describe the recent rapid increase in obesity among children and adolescents, to summarize the investigations that have Studied the potential causes of the epidemic in Obesity, and to briefly discuss approaches to the prevention and treatment this disease. Most of the studies that report an increase in the prevalence of obesity used BMI data to assess obesity.

## RESEARCH REVIEW

### The Juvenile Obesity Epidemic

The last three decades have seen a dramatic surge in the Prevalence of juvenile obesity. (In this article "juvenile" is used collectively for children and adolescents.) For example, as seen in Table 1, the prevalence of juvenile and overweight in the US increased dramatically from 1965 to 1995. The increase was faster in boys than in girls.

**TABLE 1. Increase over 30 years in the prevalence of juvenile obesity, comparing data from the 1965 NHANES I national surveys in the US. Data from Troiano et al. (1965). Obesity was assessed according to BMI percentile**

Gender	Age Group (Years)	% Increase in prevalence
Girls	6-11	106
Girls	12-17	69
Boys	6-11	108
Boys	12-17	146

A nationwide Canadian study showed a major increase in the prevalence of juvenile overweight and obesity between 1981 and 1996 (Tremblay and Willms, 2000). The increase appeared particularly dramatic in the younger age groups. For example, among 7-year-old boys there was a startling six-fold increase in obesity and a three-fold increase in overweight. The rate of increase in juvenile obesity is considerably greater than in Canadian adults (Tremblay et al., 2002). This fast surge of juvenile obesity occurs not only in technologically developed countries (Livingstone, 2001), but also in less developed societies in which under nutrition had previously been prevalent (Seidell, 1999). The World Health Organization has termed this phenomenon a Global Epidemic (World Health Organization, 1997).

## Are obese children and youth insufficiently active?

Several cross-sectional studies were conducted over the years in an attempt to document the activity behaviour of obese young people compared with their non-obese peers (Bar-Or and Baranowski, 1994; Bar-Or et al., 1998). Most (Bruch, 1940; Bullen et al., 1964; Dionne et al., 2000; Pate and Ross, 1987; Waxman and Stunkard, 1980), but not all (Klesges et al., 1990; Stunkard and pestka, 1962; Wilkinson et al., 1977) of these reports suggest that obesity coincides with a relatively sedentary lifestyle.

## The beneficial effects of enhanced physical activity

Although this review focuses on the effects of enhanced physical activity, one must realize that a proper management of juvenile obesity should also include nutritional changes and behaviour modification (of the child and the parents) (Bar-Or et al., 1998; Epstein et al., 1996; Sothorn et al., 2000). There are many documented benefits of enhanced physical activity in juvenile obesity (Epstein and Goldfield, 1999; Gutin and Humphries, 1998)). Tables 2 and 3 summarize the overall results from the literature on the effects of enhanced physical activity on body composition and on variables other than body composition, respectively. The scope of this review does not allow a comprehensive discussion of all these effects. For more details, see recent reviews (Bar-Or et al, 1998; Epstein and Goldfield, 1999; Gutin and Humphries, 1998; Sothorn, 2001).

**TABLE 2. Summary of literature reports on effects of enhanced physical activity on body composition.**

Variable	Increase	Decrease	No Change
Body Mass		x	x
Fat-Free Mass	X		X
% Body Fat		X	X
Visceral Fat		X	
Body Height			X

**TABLE 3. Summary of literature reports on effects of enhanced physical activity on variables other than body composition.**

Variable	Increase	Decrease	No Change
Arterial Blood Pressure		X	
Insulin Sensitivity	X		
Plasma Triglycerides		X	X
HDL Cholesterol	X		X
LDL Cholesterol		X	X
Total Cholesterol		X	X
Physical Fitness	X		
Self Esteem	X		

## THE JUVENILE OBESITY EPIDEMIC? WHAT CAN BE DONE ABOUT IT?

The occurrence of obesity in children and youth ("juvenile obesity") has been on the rise in recent decades. This is happening not only in technologically developed countries such as the USA, Canada and Western Europe, but also in regions such as Latin America, South-East Asia, and Africa, where children traditionally have suffered from *under nutrition*. An example for the dramatic increase in occurrence of juvenile obesity.

### LEGEND FOR FIGURE IS.

The dramatic increase in prevalence of juvenile obesity over a 15-year period. Data are based on two large-scale national studies in Canada performed in 1981 (black bars) and in 1996 (grey bars). Data from Tremblay and Willms (2000)

### Why Are Obese Children Insufficiently Active?

- Obese children and youth are usually less active than their non-obese peers. There are several reasons for this pattern: Obese children often feel that their body is "ugly;" one outcome is that they may be unwilling to wear a T-shirt or other "revealing" clothing in public. For example, obese boys often perceive the fat pads in their chest to resemble the female breast. This, in itself, may be a reason for their reluctance to join sports activities.
- One of the most common complaints of obese children and youth is that they are ridiculed and teased by others. This occurs mostly at school, but also in the neighbourhood and even at home. As a result, they tend not to socialize and remain isolated from their peers.
- Obese children often have obese parents who themselves prefer a sedentary lifestyle. Because children's activity behaviour, especially in the first decade of life, is strongly influenced by the lifestyle of their parents, it is likely that obese children of inactive parents will choose not to be active.
- Because of their excessive body weight, obese children are less likely to perform well in activities that include running or jumping. This includes most team games, as well as many track and field events• One outcome is that they tend to excuse themselves from physical education classes.
- A low activity level is likely to induce an excessive increase in body weight, This in itself often causes the child to be even less active and leads to further weight gain, The end result is a vicious cycle of obesity inactivity- obesity.

Knowing the reason why a given child opts to be sedentary is important in determining how best to help that child become more active. Health Professionals and educators should, therefore, include a thorough analysis of the child's habitual activity and the barriers to an active lifestyle that must be overcome by that child.

### **Benefits of Enhanced Physical Activity**

An ideal program for obese children and youth includes nutritional changes, enhanced physical activity, and behaviour modification of both the child and the parents. Research has shown that enhanced physical activity, in itself, can yield several dividends. These include:

- Weight. control
- Reduction of total body fat and the fat around the abdominal organs (which reduces the risk for coronary heart disease)
- Reduction in high blood pressure
- Decrease in the risk of "adult-type" diabetes
- Increased physical fitness and improved self-esteem.

To accomplish some or all of the above benefits, activity programs must be sustained. Once they are stopped, most of the benefits disappear within several weeks.

### **What is Obesity?**

To most people, the term "obesity" means to be very overweight. Health professionals define "overweight" as an excess amount of body weight that includes muscle, bone, fat, and water. "Obesity" specifically refers to an excess amount of body fat. Some people, such as bodybuilders or other athletes with a lot of muscle, can be overweight without being obese.

### **How is Obesity Measured?**

Everyone needs a certain amount of body fat for stored energy, heat insulation, shock absorption, and other functions. As a rule, women have more body fat than men. Most health care providers agree that men with more than 25 percent body fat and women with more than 30 percent body fat are obese.

Measuring the exact amount of a person's body fat is not easy. The most accurate measures are to weigh a person underwater or to use an X-ray test called Dual Energy X-ray Absorptiometry (DEXA). These methods are not practical for the average person, and are done only in research centres with special equipment.

There are simpler methods to estimate body fat. One is to measure the thickness of the layer of fat just under the skin in several parts of the body. Another involves sending a harmless amount of electricity through a person's body. Both methods are used at health clubs and commercial weight loss programs. Results from these methods, however, with severe obesity can be inaccurate if done by an inexperienced person or on someone

Because measuring a person's body fat is difficult, health care providers often rely on other means to diagnose obesity. Weight-for-height tables, which have been used for decades, usually have a range of acceptable weights for a person of a given height. One problem with these tables is that there are many

•versions, all with different weight ranges. Another problem is that they do not distinguish between excess fat and muscle. A very muscular person may appear obese, according to the tables, when he or she is not.

In recent years, Body Mass Index (BMI) has become the medical standard used to measure overweight and obesity.

## Body Mass Index

BMI uses a mathematical formula based on a person's height and weight. BMI equals weight in kilograms divided by height in meters squared ( $BMI = \text{kg}/M^2$ ). The BMI table that follows has already calculated this information.

Find your weight on the bottom of the graph. Go straight up from that point until you come to the line that matches your height. Then look to find your weight group.

## Causes of Obesity

In scientific terms, obesity occurs when a person consumes more calories than he or she burns. What causes this imbalance between calories in and calories out may differ from one person to another. Genetic, environmental, psychological, and other factors may all play a part.

## Genetic Factors

Obesity tends to run in families, suggesting a genetic cause. Yet families also share diet and lifestyle habits that may contribute to obesity. Separating these from genetic factors is often difficult. Even so, science shows that heredity is linked to obesity. In one study, adults who were adopted as children were found to have weights closer to their biological parents than to their adoptive parents. In this case, the person's genetic makeup had more influence on the development of obesity than the environment in the adoptive family home.

## Environmental Factors

Genes do not destine people to a lifetime of obesity, however. Environment also strongly influenced obesity. This includes lifestyle behaviours such as what a person eats and his or her level of physical activity. Americans tend to eat high-fat foods, and put taste and convenience ahead of nutrition. Also, most Americans do not get enough Physical activity. Although you cannot change your genetic makeup, you can change your eating habits and levels of activity. can physical change your activity.

Try these techniques that have helped some people lose weight and keep it off:

- Learn how to choose more nutritious meals that are lower in fat.
- Learn to recognize and control environmental cues (like inviting smells) that make you want to eat when you're not hungry.
- Become more physically active.
- Keep records of your food intake and physical activity.

## Psychological Factors

psychological factors may also influence eating habits. Many people eat in response to negative emotions such as boredom, sadness, or anger.

Most overweight people have no more psychological problems than people of average weight. Still, up to 10 percent of people who are mildly obese and try to lose weight on their own or through commercial weight loss programs have binge eating disorder. This disorder is even more common in people who are severely obese.

During a binge eating episode, people eat large amounts of food and feel that they cannot control how much they are eating. Those with the most severe binge eating problems are also likely to have symptoms of depression and low self-esteem. These people may have more difficulty losing weight and keeping it off than people without binge eating problems.

If you are upset by binge eating behaviour and think you might have binge eating disorder, seek help from a health professional such as a psychiatrist, psychologist, or clinical social worker.

## Other Causes of Obesity

Some illnesses can lead to obesity or a tendency to gain weight. These include hypothyroidism, Cushing's syndrome, depression, and certain neurological problems that can lead to overeating. Also, drugs such as steroids and some antidepressants may cause weight gain. A doctor can tell whether there are underlying medical conditions that are causing weight gain or making weight loss difficult.

## Guidance for Treatment of Adult Obesity October, 1996

Dear Colleague:

Obesity is a disease afflicting millions of Americans and causing a great deal of pain and suffering. In our society, stereotyping of overweight and obese individuals is quite common.

Despite evidence to the contrary, many people view obesity as a lack of willpower on the part of the individual. As a result, obese persons are frequently the object of prejudice and discrimination. They may be viewed as lazy and unlikeable by their leaner counterparts and very often by themselves as well,

As a physician, you are in a unique position to help reduce this distress. Some guiding principles you can use to foster a positive and Supportive therapeutic relationship with your overweight and obese patients include:

- Examine your own feelings about obesity and the obese. You may unknowingly harbour some feelings that may colour your interactions with your patients.
- View each patient as a unique, competent individual worthy of your time and respect. Not all overweight individuals are the same. How their obesity has affected their lives and the factors that have contributed to their weight gain will differ from patient to patient.
- Encourage your patients to discuss their feelings about their weight, weight reduction or weight maintenance efforts. Listen to them when They share their concerns and empathize with their frustrations.
- Encourage your patient to work in partnership with you to make decisions about treatment strategy and options. This will help the patient be more involved in the treatment process.
- Make every effort to recognize and comment on positive changes in health status, weight loss, and eating and exercise efforts.

Striving to forge a supportive therapeutic relationship with each of your overweight patients throughout the treatment process will help them feel they have been treated with dignity and respect. This is absolutely essential to the successful treatment of obesity and maintenance of weight loss.

Sincerely,

C. Everett Koop, M.D.  
Chairman and Founder  
Shape Up America

## Weight Loss Tips

Weight loss success will require a high degree of motivation and the ability to change your lifestyle. Also see dietary guidelines.

- Set Rules
- Utilize both diet and exercise
  - o Diet to' lose weight
  - o Exercise to keep weight off
  - o Shift stress relief from eating to exercise
- Learn what and how to eat
  - o Do not eat just what is convenient
  - o Eat a variety of fruits and vegetables (7 different colours)
  - o Don't lose control
- Eat small meals and snacks throughout the day
- Don't have processed snack foods available
- Eat before being around processed snack foods (eg: party, shopping, etc.)

## GENERAL TRENDS

In many developing countries, obesity co-exists with under-nutrition a Body Mass Index (BMI) less than 18.5.

- In economically advanced regions of developing countries, prevalence rates of obesity may be as high as in industrialized countries.
- Globally, women generally have higher rates of obesity than men do, although men may have higher rates of overweight.
- Prevalence of obesity in children and adolescents is on the rise in both developed and developing regions

## HEALTH CONSEQUENCES

Cancers

Cardiovascular Disease (CVD)

Diabetes (Type 2)

Heat Disorders

Stroke

Hypertension

## OTHER COMPLICATIONS

- Obesity has been established as a risk factor for Carpal Tunnel Syndrome (CTS)
- Patients with Chronic Venous Insufficiency (CVI), an inadequate blood flow through the veins , are usually older males who have obesity.
- People with obesity frequently complain of daytime. Sleepiness and fatigue, two probable causes of mass transportation accidents.
- Obesity increases the risk of Deep Vein Thrombosis (DVT), a condition that disrupts the normal process of blood clotting.
- Obesity may be a direct or indirect factor in the initiation or progression of renal disease.
- Obesity is an established predictor of gallbladder disease.
- Obesity contributes to the cause of gout — the deposit of uric acid crystals in joints and tissue.
- Obesity has been found to decrease the body's resistance to harmful organisms.( Impaired Immune Response )
- Obesity is associated with impairment in respiratory function.
- Obesity is associated with the increased incidence of wound infection.
- Obesity increases the risk for several reproductive disorders, negatively affecting normal menstrual function and fertility.
- Excess weight is reported to be an independent risk factor for the envelopment of alcohol related liver diseases including cirrhosis and acute hepatitis.
- Obesity may play a part in aggravating a simple low back problem, and contribute to a long-lasting or recurring condition.
- Women with severe obesity have a menstrual disturbance rate three times higher than that of women with normal weight.
- Bodily pain is a prevalent problem among persons with obesity.
- Obesity is a risk factor for complications after a surgery.
- Obesity is associated with the development of Osteoarthritis (OA) Of the hand, hip, back and especially the knee.
- Obesity has been found related to Rheumatoid Arthritis (RA) in both men and women

## WHAT SHOULD BE DONE

Carrying excess body weight can increase your risk of developing or worsening an existing medical condition like diabetes, heart disease, certain cancers, and osteoarthritis.

Weight loss of about 10 percent of body weight is proven to benefit health by reducing many obesity-related risk factors.

Prevention includes maintenance of healthy weight, maintenance of weight loss and prevention of weight gain. Identifying risk factors that can lead to obesity or cause related health problems, and learning strategies toward achieving a healthy weight are the keys to successful prevention.

Healthy weight, overweight and obese individuals can all benefit from using obesity prevention strategies.

If you are at a healthy weight, you can prevent weight gain by continuing your healthy habits and adopting new healthy habits.

If you are overweight or obese, preventing further weight gain is the first part of treatment, and you can do so by making healthy changes.



Keep the Energy balance

Engage in regular endurance type physical activity.

## Energy Balance

Neutral energy balance is when the calories you take in is equal to the calories expended-Weight is maintained.

Positive energy balance is when the calories you take in is greater than the calories expended -Weight is gained and fat stores are increased. (One pound of fat contains approximately 3500 Calories).

Negative energy balance is when the calories you take in is less than the calories expended- Fat stores are used for energy to make up the caloric deficiency – Weight is lost and fat stores are reduced Metabolic adjustments due to diet and exercise.

If calories are increased – Thermo-genesis – Body heat is produced – Metabolism increases – Muscle mass may increase.

If calories are restricted -Thyroid hormones decrease -Metabolism decreases Muscle mass may decrease.

Anaerobic exercise can increase metabolism for hours after exercise is finished (3-14 Hours: dependent upon intensity).

