

# Obvious and hidden calories in food and their impact on weight, obesity and wellness: a review

## Abstract

Nutritionists, health and food professionals need to be skilled in recognizing the various sources of calories in consumed foods and the implications of excessive caloric intake. Such skills are necessary in order to effectively counsel consumers and patients on food choices & weight management, or to advise food manufacturers to make and market products for better health. This paper will address the growing concern on overweight and obesity epidemic and the risks of excessive consumption of calories from various sources in our food supply, especially obvious and hidden calories. The paper will define what is meant by obvious and hidden sources of calories, with real life examples. Using data from published studies, the paper will discuss how caloric consumption impacts weight gain, obesity, health and wellness. Strategies for recognizing and reducing excessive caloric intake especially from hidden calories will be suggested. Such strategies would include lifestyle changes, dietary habits, physical activity, behavior modification, reading food labels, proper food selection & preparation, food substitution, food processing & consumption among others. A joint action by food consumers and regulators, food manufacturers & marketers, nutritionists, food and healthcare professionals will help consumers in managing weight and in fighting the overweight and obesity epidemic in many populations.

**Keywords:** hidden calories, obvious calories, impact, obesity, epidemic, food choices, weight management, health, wellness

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**Abbreviations:** BMI, body mass index; USDA, united states department of agriculture; DGA, dietary guidelines for Americans; HP2020, healthy people 2020 guidelines; NGO, non governmental organizations; USA, united states of America; CDC, center for disease control and prevention; NCHS, national center for health statistics; OECD, organization of economic cooperation and development; WHO, world health organization; NHLBI, national heart, lung & blood institute

## Introduction

The current incidence of obesity and overweight in many US populations has reached epidemic proportions.<sup>1,2</sup> The obesity epidemic is also rising in other countries.<sup>3-5</sup> Obesity and related chronic diseases –the so called obesity co-morbidities–such as heart disease, diabetes, hypertension etc, were formerly regarded as ‘Diseases of Affluence’<sup>6</sup> as these diseases were more prevalent in high income countries. However obesity is also showing an increasing trend even in developing countries.<sup>4,7,8</sup> Nutritionists, health researchers and educators, federal and state government agencies including state public health departments are now on the alert mode. Each agency has raised awareness or taken immediate action to arrest the increasing weight trends and the obesity epidemic in both adults and children, not only in the USA<sup>9-13</sup> but also all over the world<sup>8,14-16</sup> including some developing countries, where obesity, overweight and underweight can coexist in the same country but in different segments of their populations.<sup>7,17-19</sup> Obesity, overweight and underweight are all classified as different forms of unhealthy weight. Unhealthy weight, whether it is too little weight or too much weight, has so many consequences that can affect health and quality of life. Some of the factors that cause high weight gain, overweight and obesity include genetic and environmental factors as well as obesity related conditions. Obvious and hidden calories in food are some of those

environmental factors that contribute to obesity. This paper, inspired following a nutrition practicum at Simmons College in Boston Massachusetts, will review overt and hidden sources of calories in the food supply and their impact on body weight and obesity. In particular, it will discuss strategies not only to maintain healthy weight but also to combat overweight and obesity epidemic in many populations.

## Discussions

### The food calories: sources, storage and body distribution

**Sources of calories:** Calorie is a unit of energy, and food calorie describes the amount of potential energy contained in a particular food. The food consumed by humans can contain caloric (energy-giving) and non-caloric (non-energy giving) nutrients. The macronutrients, such as carbohydrates, fats, protein and alcohol- are caloric nutrients and, when consumed, result in accumulation of calories in the body.<sup>20</sup> Water and the micronutrients (vitamins & minerals) are non-caloric therefore they neither lead to accumulation of calories nor fat in the body. The caloric intake from a food varies and depends on many factors. These factors include: the type of food, the total caloric content of the food, the type of ingredient and cooking method used in preparation and processing of the food, the frequency of consumption or the amount of such food consumed. Food calorie intake can also increase because of the energy content of side dishes or ingredients paired with the main food.

High caloric foods are those foods that contain large amounts of caloric macronutrients or combinations of these nutrients in liquid, solid, or semi solid forms. Caloric nutrients supply the body with energy needed for its daily metabolic, physical and mental activities. If the body has met its need for the calories needed for its daily activities, the rest or excess calories is stored as fat in adipose tissues.

It should be noted that all food calories, whether they originate from proteins, carbohydrates, fats or alcohol are convertible to fat. Gradual accumulation of fat in the body leads to gradual weight gain and with time, if the fat calorie is not burnt through metabolism or lost through regular physical activity or exercise, the increase in accumulated fat contributes to weight gain and overweight. Excessive accumulation of body fat that impairs health results in obesity and metabolic problems.<sup>21</sup> Obesity and weight status are estimated by body mass index or BMI. To determine BMI, body mass in kilograms is divided by height in meter squared. If efforts are not made to lose some weight by the obese person, the obesity becomes progressive and chronic, and this has adverse consequences for health and quality of life.<sup>21,22</sup> It should also be noted that not all obesity result from excessive intake of calories as several non diet related causes of obesity exist.

**Fat storage:** Fat is stored in different regions of the body, either in the upper body (areas around the stomach and abdomen) or lower body (areas around the hip, thigh and legs) or both.<sup>23,24</sup> Excess body fat stored mainly in the upper body results in upper body obesity, also known as apple-shape obesity or abdominal obesity.<sup>25</sup> Other names used to describe upper body obesity include central obesity, truncal obesity or android obesity. In the layman's language, apple shape obesity is sometimes called 'pot belly' or 'beer belly', i.e. the body structure commonly seen as protruding belly in people who consume excess amount of beer or other alcoholic drinks in addition to excess food consumption.

Excess body fat that is stored mainly in the lower body (hips, thighs, legs) results in lower body obesity or pear shape obesity.<sup>23</sup> Pear shape obesity is also known by various other names such as rear end obesity, gluteal obesity or gynoid obesity. In the street language, pear shape obesity is sometimes called 'hip fat' or 'sitter's fat' because this body structure is commonly seen in people who have sedentary jobs that require sitting in one place for a long time each day as observed in some long distance truck drivers, bus and train drivers. Pear shape obesity is also observed in sedentary office workers and computer users, in video game players and in people who sit on the couch or chair all day watching television with little time devoted to physical activity. Other people who display pear shape obesity are those immobilized in one place because of accidents or people who are wheel-chair bound.

Both apple shape obesity and pear shape obesity are dangerous to health; people living with such obesity should make efforts to lose weight as both types of obesity can predispose sufferers to high risks of some metabolic diseases. However, apple shape obesity which is accompanied by increased waist circumference appears to present greater risk to various metabolic diseases than pear shape obesity.<sup>25,26</sup> People with apple shape obesity are more vulnerable to several diseases including hypertension, type 2 diabetes, cardiovascular disease, fatty liver and some types of cancer (of the colon, stomach and breast). Anecdotal reports also indicate that fat in people living with pear shape obesity is more difficult to lose than fat in people with apple shape obesity.

**Pattern of body fat distribution: visceral, subcutaneous and intra-muscular fat:** In upper body obesity, varied proportions of fat stores are distributed in several locations in the body, namely visceral, subcutaneous and intramuscular tissues and organs in the body. Most of upper body obesity arises from visceral fat. Visceral fat sometimes called 'intra-abdominal fat' or 'organ fat' is stored in the stomach, abdominal cavity and organs within the abdomen.<sup>23</sup> In general, adult females tend to have more body fat stores than adult males. Adult

males and females store their body fat in different body locations. Adult males store most of their body fat as abdominal or visceral fat and less as lower body fat. Adult females on the other hand store most of their body fat in the lower body-(hip, thigh, legs) and less of their fat as abdominal fat. However as women get to menopause, the amount of their abdominal fat storage increases due to hormonal changes as well as genetics, ageing and other factors.<sup>25,27</sup> Visceral or abdominal fat accumulation increases the risk for cardiovascular disease.<sup>21,25</sup> Subcutaneous fat is body fat stored just underneath the skin while intramuscular fat is the body fat stored in between the skeletal muscles. Environmental factors and genetics influence body fat distribution but genetics appears to have a greater role in fat distribution while diet and exercise have more effect on total body fat content.<sup>28</sup>

### Some published causes of overweight and obesity

Basically excess weight results from energy imbalance caused when there is surplus energy intake (i.e. Eating more calories than is actually needed), or decreased energy expenditure (not burning enough of consumed calories through regular physical activity, exercise & metabolism) or a combination of surplus energy intake and decreased energy expenditure. This situation where energy intake is more than energy output leads to positive energy balance and energy storage. Excess energy storage manifests as fat accumulation, weight gain, overweight and obesity. It should also be noted that obesity may sometimes be caused by factors not associated with diet and activity.

Several factors<sup>29</sup> published in literature contribute to or cause the obesity epidemic, and as more research in weight management continues, new contributing factors continue to be found. These include factors related to

- (i) Diet,
- (ii) Inactivity,
- (iii) Lifestyle and eating behavior,
- (iv) Environment
- (v) Health conditions & medications
- (vi) Socio-cultural, psychological and other factors.<sup>29</sup>

Among the socio-cultural and environmental factors (Table 1) that cause obesity are hidden and obvious calories. This paper will discuss obvious and hidden calories as causes of obesity. A subsequent paper will treat various obesity causing factors in more detail.

### Questions about the causes of obesity epidemic

- a. The upward trend in excess body weight despite concerted efforts at weight management raises many questions, as listed in Table 2. One such question about obesity causes includes contribution of hidden calories. Although a search in the literature revealed that several factors & food sources including obvious caloric sources, contribute to causing the obesity epidemic, not much has been written on hidden or latent calories (Table 3) in the food supply as contributing to the obesity problem.<sup>33-35</sup> Awareness of the hidden calories, understanding where the calories come from and knowing how to control their caloric intake can be some useful, cost effective tools available to the consumer in controlling unnecessary weight gain. This knowledge and skill will empower each consumer and hence lead to control of overweight and obesity problem in many populations.

**Table 1** Some Psycho-social, cultural and environmental factors implicated in Obesity and overweight published in literature

Some psycho-social, cultural and environmental factors causing obesity	References
Hidden calories	30
	31
	32
	33
	34
Food marketing and advertising	35
	36
	37
	38
Culture	39
	40
	41
Family & Parental influences	42
	43
	38
Migration & acculturation	44
	45
	46
	47
	48
<b>Psychological factors</b>	49
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**Table 2** Obesity epidemic raises many questions

Why are obesity and overweight trends increasing or persisting in various populations despite measures at controlling them?
Why does weight regain occur after losing weight for some time?
Why are people unable to maintain healthy weight even after following guidelines like the Healthy People programs, My Plate food guide and the Dietary Guidelines for Americans?
Why are people investing money and time participating in various dieting and weight management programs (such as Biggest Loser program and various dieting programs like Weight Watchers, Atkins Diet, Paleo Diet & Zone Diet etc) without adequate return on their investments in terms of weight loss?
What is causing the weight gain in most people even after making efforts to control weight by modifying some factors like physical activity, diet and lifestyle?
Is it possible that people are consuming foods high in hidden calories that they are not aware of?
Do consumers lack knowledge of caloric content of foods they consume?
Is it possible that consumers do not know about low calorie alternatives that can be used to substitute high caloric foods?
Are consumers undercounting, downplaying or underestimating the caloric contents of certain foods they eat, leading to over consumption of food calories?

**Table 3** Sources of Hidden Calories in the food supply

Coffee enriched with cream, syrup , honey, sugar, nuts and caloric ingredients	Breads, gluten free foods, Sugary breakfast cereals
Cappuccino, mocha, latte or chocolate coffee	Baked potato
Salads with excess accessories like creamy dressings, full fat mayonnaise, croutons, bacon pieces, nuts, breads crumbs	Pancake syrup
Sodas (soft drinks) and alcoholic beverages ,diet drinks, drink mixes consumed along with foods	Red wine,
Energy drinks	White wine
Oversized whole grain or multigrain bagels Whole grain muffins eaten at breakfast or as snacks, sugar coated cereals	Whole milk regarded as natural
Small size packaged convenience foods high in fat and carbohydrates such as creamy pastries, buttered popcorn	Orange juice, dried fruits
Fried foods such as French fries, fried fish and chips, crispy foods	Eggnog, omelet mixed with ham, bacon, cheese or butter
Fast food restaurant foods high in cheese and pastry, ketchup	Peanut butter, Peanuts, nuts, trail mix, butter, sweetened applesauce, candy
Snacks sweetened with syrup, honey or sugar; energy bars, Beverages sweetened with honey & syrup	Dark chocolate eaten in excess, honey, chocolate candy.

Table Continued...

Restaurant foods loaded with fat, sugar and carbohydrates to increase taste, texture, mouth feel and to increase appetite	Salad dressings, salad dressed with mayonnaise
Ethnic foods described as natural or traditional but filled with high caloric ingredients unknown to consumer e.g., tortillas, burritos wrapped with caloric ingredients, Indian foods, Thai foods, African foods such as fufu, pounded yam, bean porridge.	Soups, sushi,
Imported foods sold without food labels and whose nutrient content is unlisted.	Meat pie, filled with cheese, bacon and fried onions
Juices, soft drinks and sweetened beverages	Chocolate cake, applesauce
Desserts, yogurts, smoothies and sauces; yogurt with fruit or honey or chocolate on the bottom;	Red meat, tuna salad.
Alcoholic drink mixes,	Fish oil
Fat free foods loaded with sugar, salt and carbohydrates such as granola bars, cereals,	Small side dishes whose calories add up when excessively consumed.
Veggie burgers made with fried vegetables, onions, mayonnaise, and cheese.	Tofu

### Environmental causes of obesity

Few reports have implicated hidden calories as contributing to the rising obesity and overweight trends,<sup>30-33</sup> though more has been written about overt calorie sources. Many factors (social, political, economic, lifestyle, etc) that resulted in the increasing weight trends around the world are indirect and hidden from the consumer according to some published reports.<sup>34,37</sup> A closer look into the causes of increased body weight, especially hidden calories will clarify the trends and give a better understanding of the situation, and will highlight the need for a concerted action to fight the obesity epidemic.

**Obvious sources of calories:** Obvious or overt caloric food source is any food, food ingredient or food product that can be obviously identified or generally recognized as a source of caloric nutrient. Such foods can be identified through the following characteristics:

- (i) Common knowledge (e.g. white rice, white pasta, white potato, white flour, cake, pie, pastry, ice cream) or
- (ii) Food composition– The foods may contain the macronutrients –fats, proteins, carbohydrates-e.g. fatty meat, high fructose corn syrup, protein enriched yogurt, and protein fortified milk or buttered bread.
- (iii) Food name, appearance, texture or description: These can give an idea of the caloric macronutrient in the food. For example:–starchy rice, white bread, white flour, whole grain, fried foods, fried potato, roasted beef, fried chicken, crispy cookie, fried plantain, glazed cake, buttery cookie, crunchy meat, hydrogenated fats, roasted chicken etc.
- (iv) The food label claims (e.g. High calorie, low calorie, reduced calorie, low sugar, reduced fat, low-fat, high protein, high fat, reduced sugar etc).
- (v) The taste or flavor of the food: The food’s taste or flavor can

give an idea of its caloric content.

For example, sweet or sugary food, honey-sweetened beverage, nutty bread; syrup, grainy, soggy, fatty, salty, starchy foods can show that they are high in carbohydrates, fats or other macronutrients.

Obvious sources of calories can be avoided easily by persons on prescribed diets for certain conditions since such diets are known and recognized as starchy, sugary, fatty or salty. Examples of such diets include low sugar diet, diabetic diet, low calorie diet, sugar-free diet, reduced calorie food, low fat or fat-free diet, meatless or low protein diet, No Added sugar or No Added salt diets. Such diets are prescribed for various disease conditions such as diabetes, obesity, hypertension, kidney or heart disease conditions and many others. Examples of obvious caloric foods include baked foods, pastry foods, bread and pasta, white rice, whole grain pasta, macaroni, spaghetti, potatoes, noodles, cake, nuts, starchy, fried, oily foods and snacks.

**Hidden food calories & how they are identified:** Hidden calories are calories present in some foods or food products & ingredients that are not obvious to the consumer as being caloric or deliberately ignored as caloric, but such foods contribute calories in each day’s total caloric intake. The calories are described as ‘hidden’ because the consumer is not aware of them, or ignores them, or can neither observe nor recognize them.

### Hidden calories have the following characteristics:

- (i) Most people who consume hidden calories from food are not aware of the caloric content of the consumed foods.
- (ii) The foods are not easily identifiable or generally recognizable as high in calorie or a high source of calorie in the consumer’s diet plan either by their name, appearance, taste or through common knowledge. For example, some foods may be high in carbohydrate but their taste may be bland and does not reveal their sugar content.
- (iii) Consumers don’t take caloric content of such food into account when eating the food or estimating total daily calories consumed.
- (iv) Hidden caloric foods are not perceived as highly caloric, but are still part of regular diet.
- (v) Hidden calories tend to deceive dieters into erroneously believing that they are eating properly or ‘eating healthy’ foods while in actual fact they are over-consuming the calories.
- (vi) Hidden calories in food tend to add up quickly and they induce weight gain because of constant consumption or mindless eating e.g. several packets of corn chips, potato chips and nachos can be eaten before the end of a football game like the Super Bowl or the World Cup for soccer.
- (vii) Hidden calorie foods are usually off the dieter’s radar screen when counting or controlling calories either because the consumer doesn’t see them as a threat to their health or consumer sometimes stopped worrying about calories due to other reasons. These other reasons may include current psycho-social or health issues that are of higher priority to the consumer.
- (viii) The consumer minimizes the caloric effect of the food or the caloric content is overlooked because the foods are paired with known healthy foods and ingredients promoted in the media as ‘super food’ ‘healthy’ and ‘natural’.

- (ix) Some consumers erroneously believe that the healthy food in a menu will neutralize the unhealthy food or complement the unhealthy food. Consequently the unhealthy hidden calorie food is consumed in large amounts.
- (x) Sometimes hidden calorie foods which come in small packages are deemed as ‘too small to hurt anybody’. So they are consumed excessively.
- (xi) Hidden calorie foods can mostly be identified only under the guidance of a trained nutritionist, dietitian, and food professional or concerned consumer.
- (xii) Hidden calorie foods are sometimes described by dieters with pejorative names such as “sneaky diet destroyers” or “covert”, “latent”, “unperceived” or “stealth” food calories after discovering that they are the cause of their weight gain.

**Sources of hidden calories in foods:** Hidden calories are ubiquitous in the food supply and it needs a trained eye or knowledge of an expert such as nutritionist, dietitian, food scientist, chef, culinary scientist or trained consumer to recognize or identify them. There are so many sources of hidden calories present in the food supply and they can be found in many food categories:

- (a) **Pre-packaged & processed foods & snacks:** Hidden calories are present in various processed and packaged foods such as (i) fast foods; (ii) Restaurant foods; (iii) take-out foods from food joints and eateries; (iv) Street foods from vending trucks; (v) Pizza and pastries from pizzerias and coffee shops; (vi) deli foods; (vii) grab-and-go foods, ready to eat or convenience foods, (viii) sugar-free or low sugar snacks (ix) fat free or low fat snacks.
- (b) **Prepared meals:** Prepared foods such as cakes and other celebratory foods especially those enriched with caloric ingredients for special occasions are also high in hidden calories.
- (c) **Side dishes:** Some high caloric side dishes are sometimes paired with low caloric entrees when they are served and people consume both types of foods without any hesitations and do not seem to worry about the ‘hidden’ caloric content of the side dishes.
- (d) **Reduced salt version of some foods:** Some low sodium foods & many salty foods especially snacks are also high in hidden calories.
- (e) **Reduced or low fat/low sugar Foods:** These reduced versions of fatty or sugary foods can deceive the consumer: Low fat and fat-free foods tend to be high in carbohydrates while low sugar or sugar-free foods tend to be high in fat and each of these reduced versions are highly caloric and can induce weight gain.
- (f) **Caloric Additives:** Food ingredient additives used in processing and preparing foods e.g. flour, baking sugar, spices, cooking wine, cooking oils, honey, tomato sauces & pastes, marinating sauce as well as caloric synthetic additives contribute ‘hidden’ calories to total daily intake. Additives are adjuncts to the main foods and tend to be downplayed by consumers.
- (g) **Bottled or flavored drinks and beverages:** The beverages such as energy drinks, bottled and flavored water, sugar or honey sweetened beverages, diet beverages, creamy coffees (e.g. lattes and cappuccinos), flavored teas, soft drinks, low sugar drinks, juice and juice drinks have hidden calories that contribute to caloric intake.

- (h) **High caloric foods paired with super foods:** Many high caloric foods are down-played or ignored because they are paired with foods portrayed in the media as natural, super foods, healthy foods and diet foods. This pairing makes the caloric foods hidden sources of calories as super foods tend to mask the presence of caloric foods. In addition, some super foods can also give hidden calories that consumers overlook and over eat. These super foods include quinoa, sorghum, whole milk, goat milk, condensed milk, seafood, poultry/beef, bread, whole grain bagels, whole grain and regular cereals, vegetables, grains, potatoes, olive oil, avocado, red wine, sweetened yogurt, cheese, dried fruits, vegetables, dark chocolates, chocolate candies, beverages and fruit juices.
- (i) **Small sized packaged foods eaten in large amounts:** Some foods are present in the daily diet and are deemed harmless because of their small size packaging; hence their calorie contents are discounted and therefore ‘hidden’. For example, a little piece of chocolate candy or a piece of cake, small piece of chocolate bar, a handful of nuts, are all deemed as small sized food or snack. However when such foods are eaten in excess, or without portion control, or eaten more frequently, they increase total daily calorie intake and can be unhealthy.
- (j) **Intentionally minimized or downplayed caloric foods:** Some foods whose portion sizes or calorie contributions are intentionally downplayed or minimized or portrayed as insignificant can contribute to hidden calories. This minimizing action is taken either because the consumer does not want to take responsibility for excess calories or the consumer does not want to feel guilty if the main entree is a healthy food while side dish is highly caloric. Some consumers erroneously believe that a healthy ingredient in the food could mask, complement or counterbalance the caloric content of the side dish.
- (k) **Healthy snacks consumed in excess amounts:** Snacks like nuts, trail mix, energy bars, yogurt, cheese slices, are healthy and seem inconsequential in small quantities but when eaten in excessive portions, or eaten more frequently, the calories in these healthy snacks pile up and now become hidden calories since the consumer sees such food as still healthy instead of as caloric. The calorie intake builds up quickly especially if such healthy but caloric snacks are consumed in addition to consuming ones daily regular meals.
- (l) **Healthy oils consumed in excess amounts:** Cooking oils like olive oil, canola oil, avocado or fish oil that are known to be healthy in small amounts, but when used in excessive amount each day, these calories add up as hidden calories.
- (m) **Any unplanned food consumption in addition to regular meals:** Eating unplanned foods or meals in addition to main meals (breakfast, lunch, and dinner) tend to result in hidden calories unless the consumers can track what they eat. For example, free food tasting in the mall, test kitchens, whole sale stores, or at super markets in addition to regular meals eaten at home can contribute to increasing total daily calories. Unplanned intake of certain foods, such as those consumed during ‘happy hour’, office parties and impromptu celebrations in addition to a person’s regular meals results into consumption of hidden calories that sneak in on the consumer and wreck havoc on a person’s weight loss plan. Such unplanned consumption can cause an increase in weight gain and extended waistline.
- (n) **Ethnic and Imported traditional foods:** Ethnic foods described as natural or traditional but filled with high caloric

ingredients unknown to consumer can contribute hidden calories. For example, tortillas, burritos wrapped with caloric ingredients, Indian foods, Thai foods, African foods such as ‘fufu’, pounded yam, bean porridge, etc are highly caloric but not so described or labeled. Similarly, imported foods sold without food labels and whose caloric or nutrient contents are not verifiable and not listed on the packaging can contribute to hidden calories.

Many sources of hidden calories exist in our food supply (Table 3). Being aware of the sources of these hidden calories will enable the consumer to take them into account when counting calories or trying to minimize caloric intake to achieve a healthy weight and combat obesity and overweight.<sup>30,33</sup> Understanding and controlling the hidden calories is a cost effective way of managing weight as it puts the responsibility of weight control in the consumers’ hands.

**How consumers undercount calories especially hidden calories**

**a. Using Under-estimation, downplaying statement or minimizing words to describe caloric foods:** Consumers who tend to down play the amount of food calories eaten from healthy food tend to overeat and accumulate hidden calories. Consumers down play the effect of these foods with minimizing words or statements such as: “just one cup of Latte coffee” or “one little cup of creamy Cappuccino” or “just one little snack”, or “one little cupcake”, or a “medium bowl of salad sprinkled with mayonnaise” or one little slice of cheese, “a mere scoop of ice cream does not hurt”, or “Eating a handful

of fries and chips will not kill you” or “One small cookie will not cause you problems”. Overconsumption of downplayed food calories leads to hidden calories.

**b. Liquid and semi solid foods erroneously portrayed as non-calorie or non-fattening:** Another group of under-estimated caloric foods are liquid and semi solid foods. Sometimes people erroneously believe that liquid calories from beverages ‘do not stick inside the body’ but are ‘passed out as water in the urine’. Some people say: ‘Liquids like beer and wine cannot give you calories or fat, since they are easily eliminated as waste water in urine’. Similarly some people erroneously claim that ordinary soup like minestrone soup (even if loaded with caloric ingredients like pasta, rice, noodles and peas) does not count as calorie giver and will not result in caloric intake because soup is regarded to be healthy and moreover, many soups are watery.

**c. How to substitute high calorie foods with low calorie alternatives:** Consumers can still enjoy their favorite foods by using lower calorie options without sacrificing the taste or flavor of foods they cherish. Knowledge of hidden calories would enable consumers to find better ways of substituting with healthier alternatives or options (Table 4). Best approach is to find the culprit food and remove or substitute it with a better less caloric item in the menu. Another useful method of reducing these hidden calories is by cutting down the portion size if there is no appropriate substitute e.g. dried fruits, energy bars and dark chocolate.

**Table 4** Substituting Hidden High Calories Foods (a) with low calorie versions (b)

High caloric foods with hidden calories	Healthy low caloric substitutes
1a. Creamy coffee	1b. Lite coffee
2a. Sweetened ice tea	2b. Unsweetened ice tea
3a. Sushi with white rice	3b. Sushi made with whole grain(brown) rice
4a. Sugary corn flakes cereals	4b. Plain corn flakes
5a. Burrito wrap with high fat mayonnaise, butter, fatty meat, bacon, sausage, cheese, refried black bean, white rice	5b. Whole grain burrito with low fat ingredients
6a. Oily tofu	6b. Low fat tofu
7a. Two slices of whole wheat bagel per serving	7b. One or half a slice whole wheat bagel per serving
8a. Sugary trail mix	8b. Plain trail mix
9a. Omelet with butter, fried onion and ham/ sausage	9b. Omelet paired with vegetables
10a. Several cheese slices per serving	10b. One cheese slice per serving
11a. Canned creamy soup	11b. Homemade lite soup
12a. Whole milk	12b. Low fat or fat-free milk
13a. Sugary ketchup	13b. Low sugar ketchup.
14a. Sweetened smoothies	14b. Smoothies made with plain yogurt
15a. Tuna salad with vegetables, cheese and mayonnaise	15b. Tuna salad with vegetables
16a. Veggie burgers high in butter, oil, salt , cheese & fried vegetables	16b. Veggie burger with little olive oil, less cheese and fresh vegetables
17a. Sweetened energy bars	17b. Unsweetened energy bars
18a. Yogurt with fruits or honey on the bottom	18b. Plain yogurt
19a. Several servings of wine , beer	19b. Moderate serving -one serving (women); 1 to 2 servings (men).
20a. Gluten free foods	20b. Fat -free, sugar free food varieties.
21a. Whole avocado fruit per serving	21b. Cut avocado piece(1/4 or 1/8) per serving

## Action needed to combat obesity & its consequences

The consequences of obesity and overweight have prompted not only government agencies, but also professional organizations, non-governmental organizations (NGOs), as well as for-profit and non-profit organizations, to take active steps to raise awareness, reach out to the general public to curtail the obesity and overweight trends. These organizations include among others the Academy of Nutrition & Dietetics ([www.eatright.org](http://www.eatright.org)), American Heart Association ([www.heart.org](http://www.heart.org)), American Diabetic Association ([www.diabetes.org](http://www.diabetes.org)), and the Young Men's Christian Association (YMCA) and many other foundations.

Recent reports<sup>2,8,9</sup> have stated that the percent of US adults aged 20 years and above who are obese was 35.1 % between 2011 & 2012, while the percent of US adults in the same age group who had excess body weight (overweight and obesity) in the same period was 69.0%. This increasing trend in obesity and overweight has also been reported in other developed and developing countries of the world.<sup>3-5,7</sup> Proper understanding of the various causes of obesity, especially obvious and hidden calories will help in the control of the obesity epidemic. Consumers should follow strategies to recognize and reduce all sources of calories.

## Strategies for recognizing and reducing excess caloric intake from food calorie sources

**Consumer awareness through education, food label reading and nutrient claims interpretation:** There are various strategies to reduce calories in foods and no single strategy can work for all individuals or organizations. In addition, there is no “magic bullet” or “one solution approach” to reducing calories. Sometimes “multiple approaches” work best. These strategies include creating consumer awareness and education on consequences of overweight and obesity, reading food labels and properly interpreting health and nutrient claims on the labels such as calorie free, low calorie, lite, reduced calorie, high calorie, moderate calorie, sugar free, fat free etc.

**Knowledge of hidden calories and food substitutions:** One important strategy is teaching consumers about hidden calories in food (Table 3) and how to substitute them with healthier options (Table 4). Consumers should watch out for the code words in hidden calorie food sources that imply high caloric content especially if a person is on reduced calorie, heart healthy or diabetic diet. Such words include “caloric”, “energy”, “high protein”, “high fat”, “high calorie”, “sugary”, “honey- flavored”, “crispy”, “glazed”, “hydrogenated”, “chocolate or sugar flavored”, “creamy”, “sweet”, “honey”, “fried”, “crunchy”, low fat, low sugar, butter-flavored, chocolate enriched etc in food labels for snacks and other foods, in restaurant meals, cafeteria & grocery store foods.

## Food portion size reduction, behavior modification & daily physical activity

Other strategies include increasing physical activity, reducing food portion size and reduction of caloric macronutrients as well as modifying behaviors around food. In addition, government regulators should encourage physical activity at personal and community levels by building better walk ways, sidewalks, bicycle paths, recreation areas and healthy environments. In short, governments should create policies that encourage physical activity. For example, the Mass in Motion program in the state of Massachusetts has been successful in encouraging physical activity in many communities in the state.

## Adherence to food regulatory guidelines

Consumers should also adhere to the food regulatory guidelines

such as the Healthy People guidelines,<sup>61,62</sup> My Plate food guide<sup>63</sup> and the Dietary guidelines for Americans<sup>64</sup> which encourage healthy eating pattern, limiting calories from added sugars and saturated fats as well as reducing sodium. These efforts will reduce the incidence of cardiovascular and other metabolic diseases such as diabetes, hypertension, stroke, musculoskeletal diseases etc which result from obesity and overweight.

The expanded list of strategies for reducing excess caloric intake from hidden and obvious calorie foods to facilitate the fight against obesity epidemic is displayed in Table 5.

**Table 5** Strategies for reducing excess caloric intake from obvious & hidden calorie sources-to fight obesity epidemic

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Consumer education on consequences of excess calories
Consumer awareness of hidden and obvious calories
Reading food labels & properly interpreting calorie claims
Cutting down calories by eating low calorie foods
Adopting diets known to lower blood sugar e.g. diabetic diet, vegetarian diet, Mediterranean diet, DASH diet
Increase physical activity
Food Portion size control/total calorie intake reduction/Use of small plate size
Use My Plate food guide for selecting food to eat; follow a healthy eating pattern
Follow the recent 2015 DGA which emphasizes healthy food pattern and reducing added sugar, fat and salt as well as following the HP 2020 guidelines

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## Conclusion

- i. There are so many causes of obesity epidemic including obvious and hidden calories. Obesity caused by excess caloric intake has negative consequences and everyone is affected because of the high cost to health and quality of life. The need to reduce excess calories in our diet should be a joint action by all so as to reduce this epidemic.
- ii. Public health education of the general population to recognize obvious and hidden sources of calories in food and their negative impact on health is necessary; an educated public will be able to recognize and control hidden and obvious calories in the diet and will consequently control excessive weight gain from food calories.
- iii. An informed and empowered public, knowledgeable about consequences of excess caloric intake, obesity and chronic disease, will be enabled to make better food choices or make healthy substitutions. This will save lives, increase work productivity and reduce medical cost and improve the quality of life.
- iv. With the help of health professionals & government regulators, consumers will adopt healthy life style changes, make healthy food choices, modify their behaviors and increase physical activity to control obesity epidemic. Healthy food choices include eating fresh, wholesome nutritious foods and ingredients, using low caloric processed foods like snacks, low calorie foods and beverages as well as low calorie home-made foods or restaurant foods. Consumers should also increase physical activity and structured exercises. in their local

communities as modeled in some states.<sup>65</sup> These efforts will reduce not only obesity but also metabolic diseases.

- v. With concerted efforts from all segments of the population, the obesity epidemic will show a downward trend in the near future.

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## Conflict of interest

The author declares no conflict of interest.

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