# FAUX GUE

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MAR 2020 | ISSUE NO. 1

#### **JUST IN!**

FAT-PHOBIA The ins and outs of obesity stigma

#### SOCIAL MEDIA'S CURSE What you do on your phone is

What you do on your phone is likely harming your health

# THE OBESITY PARADOX

Everything you need to know about the controversy scientists cannot stop talking about **EXCLUSIVE!** 

WHA 7

FAVE

TO SAY?

**EXPERTS** 



TRACY'S OBESE BODY

WHO HAS IT?

Obesity and the Gut

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#### THERE ARE MANY WAYS TO DIAGNOSE OBESITY

In the past, clinicians would diagnose obesity in many ways, such as waist circumference and body fat percentage. But today, the only method used to diagnose obesity is body mass index (BMI), which takes into account height and weight. Thus, #1 is a myth (1)!

#### 2

#### CHILDREN'S DIET AND EXERCISE HABITS ARE INFLUENCED BY THEIR ENVIRONMENT

Social and economic development as well as policies in agriculture, transport, urban planning, environment, education, food distribution, and marketing influence children's dietary preferences as well as their physical activity opportunities. #2 is a fact, and these influences are promoting unhealthy weight gain, leading to a steady rise in the prevalence of childhood obesity (2).

#### DIETARY SUPPLEMENTS ARE "NATURAL," SAFE, AND CAN HELP YOU LOSE WEIGHT

When you think of poison ivy, do you think of safe and beneficial because it's found in nature? Most likely not. Thus, the same criticism should be given to dietary supplements. In fact, FDA does not regulate over-thecounter dietary supplements for safety and efficacy. At best, supplements can have no effect or worst case scenario, faulty supplements have resulted in death or major organ damage (3). Therefore, #3 is a myth and natural doesn't denote safe.

4

#### OBESITY RESULTS FROM AN IMBALANCE OF CALORIES IN AND CALORIES OUT

An increased consumption of energy dense foods, without an equal increase in physical activity, leads to an unhealthy increase in weight, so #6 is a fact! Decreased levels of physical activity will also result in an energy imbalance and lead to weight gain. It is important to consume high-nutrient foods, such as a fruits and vegetables, and maintain regular physical activity (2).

#### 5

FACT OR MYTH?

#### LOW BMI = HEALTHY AND NOT OBESE

Since high BMI is commonly used to measure obesity, It is often inferred that a low or normal BMI is a sign of good health. But #5 is actually a **myth** because many individuals who are normalor even under-weight have excess visceral fat, or fat that surrounds the critical organs of the body. This distribution of fat, or Sarcopenia, can have a greater risk to health complications than a high BMI (4). 6

#### OBESITY HAS ALWAYS BEEN CONSIDERED A SERIOUS DISEASE

In the United States, obesity only became categorized as a disease in 2013 by the American Medical Association. #6 is a myth because before 2013, obesity was a risk factor for other illnesses. Even today many scientists and public health officials argue that obesity should be considered a disease (1).

# WHAT IS OBESITY? Who has it?

#### By Tara Shooshani

Obesity is a disease diagnosed based on body mass index (BMI), which takes into account a person's weight and height (1). Currently, an individual with a BMI greater than 35.0 is considered obese (1). No other diagnostic tools are used to classify people with obese, so their weight distribution and overall health in terms of other illnesses varies greatly.

In the United States, over 30% of adults were obese in 20182, and the percentage is expected to increase to an estimated 86% by 2030(1). In general, obesity is more prevalent in groups with less income and who did not graduate college (2).



There is considerable diversity within the obese population. On a basic, classificatory level, obesity can be split up into class 1, class 2, and class 3 based on increasing BMI (1). Morbid obesity usually refers to patients with either class 2 or class 3 obesity who also have other severe severe illnesses, or co-morbidities (1).

Many professionals make an even more nuanced distinction between metabolically healthy obesity (MHO) and metabolically unhealthy obesity (MUO): researchers explain that this distinction is important because the current criteria to diagnose obesity, BMI, does not take into account the proportions of fat and lean tissue in one's body, and because

treatment should differ between the two types(3). These distinctions are essential when considering how the obese community is treated in society, which we will explore in detail later in this magazine issue.

"Obesity Categories ." Bariatrix Florida , 2019, drwizman.com/about-obesity/obesity.

### How do people become obese?

By Sarah Tan

#### **Genetics and Biology**

The "thrifty genotype" hypothesis was proposed by geneticist James V. Neel in 1962 to describe the result of the disconnect between prehistoric human biology that positively selected for traits that promote efficient energy storage in periods of food scarcity and current environments of food abundance (4). Our thrifty genotypes therefore confer susceptibility to retaining fat as stored energy that is misaligned with the high-calorie fast foods circling every street and the capitalist American habits of over-consumption.

In addition to this hypothesis, specific genes have been discovered to directly affect biological processes that relate to obesity. Twin and adoption studies demonstrate the heritability of obesity seen through genes that directly implicate the hypothalamic regulation of appetite and glucose-and lipid-sensing and regulation (4). The leptin gene is commonly associated with obesity as variation in the 5' region of the gene is associated with a predisposition for weight loss (4), and the hormone leptin acts on nerve cells to regulate food intake and body weight (5). A decrease in body fat leads to a decrease in leptin levels, stimulating food intake and activating a hormonal response characteristic of a starved state; in contrast, increased body fat is associated with increased leptin, reducing food intake. This tightly regulated mechanism maintains weight when in working order; conversely, genetic mutations that cause leptin deficiency can have tremendous effects on homeostasis of the nutritional state as well as many organ systems, which can lead to obesity (5).



Chronic diseases associated with obesity

- Cardiovascular disease
- Chronic obstructive pulmonary disease
- Coronary heart disease
- Heart failure
- Hypercholesterolemia
- Hypertension
- Type 2 diabetes mellitus

This variable sensitivity to leptin also serves to explain why some individuals are obese and others are not despite consanguinity or similar upbringings.

Kapoor et al. add that genes are responsible for 45-75% of individual variation in BMI, operating through a range of potential pathophysiological pathways. Several candidate genes may not only contribute to the cause but also predict management strategies for obesity based on an individual's genetic makeup (6).

Further, genetic differences by race appear to influence obesity risk. New African-specific variants have been discovered that are associated with obesity and obesity-related traits, such as variants near genes with significant biological roles in metabolic syndrome, which is highly correlated with obesity and insulin resistance (7). A Genome Wide Association Study (GWAS) in polygenic obesity in Africans identified roughly 300 polymorphisms in about 40 genes that are involved in interrelated biological functions such as glucose and lipid metabolism, energy balance, and body weight and appetite control.



These loci appear to explain less than 3% of the variance in BMI, suggesting that many more undiscovered loci exist that may influence BMI (7). South Asian populations also show unique obese phenotypes with high rates of consanguinity, but minimal literature exists to inform healthcare approaches (6). Instead of racializing obesity, this evidence actually speaks to the biases in current GWASs. of which over 70% are constituted of European-descent populations. Doumatey et al. add that, "the underrepresentation of African-ancestry populations in genomics limits the extent to which they can benefit from genomic discoveries including, but not limited to, risk prediction in the context of precision medicine" (7). Genetic factors are more pronounced in extreme forms of obesity, also known as morbid obesity. A previous study on a consanguineous population revealed that "genetic variants in only 3 genes could attribute towards nearly 30% of the causes of morbid obesity" (6). Genomics is an important discipline to include in obesity research and prevention and treatment strategies, especially because individuals with genetic predispositions are likely to have early onset obesity and therefore a greater number of affected years. Genetic factors partially explain the emergence of heterogeneity in obesity and its consequences on health since not everyone responds to and processes obesity or weight gain the same (8), but the plasticity of the system allows factors such as diet, environment, age, and physical activity to shape the pathogenesis of obesity (5). Friedman explains, "the system that regulates weight sets a range of body weight in an individual and that range can be further influenced by other factors" (5). Yes, genetics are involved in differential obesity prevalence across sex, ethnicity, and other groups, but genes do not determine these differences; the accumulation of many factors and their complex interactions impact an individual's susceptibility to obesity.

#### Beyond Disparity: Social and Political Factors in Health Inequality

Genetic predisposition to obesity is not the only player in the game. Instead, twin and adoption studies also reveal the cumulative effect of gene-environment interactions. Nuclear genetic variation alone is unlikely to account for such a recent and rapid change in phenotype to explain the exponentially growing obesity prevalence seen in recent years; rather "a complex variety of interacting environmental, nutritional, microbial, epigenetic, behavioral, sociocultural, economic, and other factors likely contribute as well" (4).



Obesity is commonly perceived as "the result of a fundamental lack of discipline on the part of affected individuals" (5). These messages of individual blame, lack of self-discipline, and weakness are perpetuated in both professional and public spheres by physicians, powerful industries, and the media. Contrary to this criticism of the individual, obesity is a political issue that extends far beyond independent agency and responsibility.

#### **Obesogenic Environments**

Although genetics and biological factors regulate body weight and affect weight gain to a certain degree, many other significant contributors to obesity exist that are beyond the individual's control. Seng Lee states that "we have created a biology-environment mismatch, as the human weight regulation is unable to evolve fast enough to keep pace with the environmental change" (9).

Examples of modern Western society's divergence from biological human evolution are advancements in workplace technology that reduce physical labor and result in decreased energy expenditure, density of food stores and restaurants that increase accessibility to inexpensive calorie-dense foods, high costs and lack of accessibility to fresh produce and whole foods, and geographic barriers of unsafe or unwalkable neighborhoods (9).

Geographic and social distribution of facilities that promote physical activity and disparities in access to such facilities align with obesity patterns. Minority and low-education populations have the highest risk for obesity as well as most other major non-communicable diseases (10). A study on the relationship between socioeconomic status and obesity, physical activity, and other health-related behaviors demonstrated that higher socioeconomic status neighborhoods had a significantly greater likelihood of having one or more physical activity and/or recreational facilities while low socioeconomic status and high-minority block groups were less likely to have any facilities, and a higher number of facilities was associated with reduced prevalence of overweight (10).

Education levels revealed a similar trend: increased proportions of individuals with at least a college education in a census-block group correlated with increased facility access. And relative to having zero facilities, having just one physical activity facility per block group was associated with a 5% lower risk of overweight. Other important factors are the affordability, quality, and accessibility of such facilities since even those expected to be distributed equitably. such as public facilities, youth organizations, parks, and YMCAs were not (10). The inequitable distribution of safe and accessible spaces for physical activity harms high-minority, loweducated, and low-income neighborhoods. which often all overlap to buttress a built environment that promotes obesity.

Blüher, Matthias. "Obesity: Global Epidemiology and Pathogenesis." Nature



Biology

#### **Psychological Factors**

The attribution of obesity to socially and politically constructed environments instead of pure individual responsibility is evident in the fact that our species has not always been plaqued by obesity. Pickett et al. explain. "during the epidemiological transition, in which chronic diseases replaced infectious diseases as the leading causes of mortality, obesity changed its social distribution-where once the rich were fat and the poor were thin, in developed countries these patterns are now reversed." Polly Toynbee reiterates in an article published by The Guardian that "fat is a class issue." Wider income inequality in developed countries is positively associated with percentages of obesity in both men and women, diabetes, mortality rates, and average calories per capita per day (11).

Causes of obesity include over-consumption of low-cost, energy-dense foods and lack of physical activity: both behaviors are heavily shaped by economic and social factors, and the U.S. has the most unequal ratio of the income share of the richest to the poorest 20% of the population. In the 1990s this ratio was 9.0, and this number has only increased in the last few decades (11). Based on this data, Pickett et al. assessed the association of this ratio and obesity: "in unweighted analyses, for every unit increase in the ratio of the top 20% to the bottom 20% of income the percentage of obese men in the population increased by 1.34% ... and the percentage of obese women rose by 2.10%." Increasing nutritional problems may therefore be a consequence of the psychosocial impact of living in a highly hierarchical society with extreme divisions in access to nutritious food and physical activity. Psychosocial effects of inequality also critically impact sedentarism, calorie intake, food choice, and the physiological effects of stress. The social distribution of obesity is likely explained by structural elements of the overwhelming marketing and low cost of energy dense foods (11).

Social disadvantages can also affect obesity through chronic stress, anxiety, and negative mood. These may increase risk for obesity by activating physiological mechanisms that increase appetite and reduce satiety, increasing fat retention and food intake. Racial discrimination is also associated with numerous chronic conditions. from heart disease to respiratory illness (9). Zhang and Wang study these influences of gender, age, and ethnicity on the socioeconomic inequality of obesity in the U.S. They found stronger disparities in obesity prevalence across socioeconomic status in women in contrast to an almost equal distribution among men. They also discovered a striking polarity of men of higher socioeconomic status with a greater risk of obesity than men of lower socioeconomic status and women of higher socioeconomic status with a lower risk of obesity than women of lower socioeconomic status. And in men, there was a positive association between socioeconomic status and obesity for African and Mexican American men but negative association for white men (12).

Both genetic and epigenetic factors that play a role in the development obesity show that overweight and obesity are not simply personal failings. And the domination of obesogenic environments in which a multitude of social, political, and economic institutions interact to exacerbate existing health inequalities, including obesity, proves that genes come nowhere close to determining obesity. People become obese for reasons largely out of their control; the story is about more than just individuals who lack self-discipline, eat too much, and exercise too little.

#### **Microbiome and obesity**

By Connie Tran

As new data emerges hailing that the gut is the body's "second brain", research suggests that the gut microbiota (GM) may be an important factor in the development and progression of obesity. Made up of trillions of bacteria, fungi, archaea, and viruses, the diversity and composition of the gut microbiota is affected by diet, disease, medications, antibiotics, smoking, and stress on top of other environmental factors and is thus unique to each individual.

Accordingly, research has found that the composition and diversity of GM are different between healthy-weight and obese individuals (13). The GM's importance in relation to obesity lies in that it helps to regulate metabolism and homeostasis through a variety of mechanisms: energy balance, inflammation and the immune system, intestinal barrier function, and production of metabolites that communicate with the GM, brain, liver, and adipose tissue (15). Reflecting the GM's sensitivity to environmental factors such as diet, individuals who consume a Western diet tend to have low microbial diversity (14, 15), as opposed to individuals whose diets include fermented foods and a higher fiber content being "associated with healthier and more diverse microbiota" (15).

In specific, individuals with obesity are found to have lower numbers of Bacteroidetes and Bifidobacteria as well as increased numbers of Firmicutes and Enterobacteriaceae, all of which are associated with obesity (13). Increased numbers of Firmicutes and decreased numbers of Bacteroidetes result in an increased Firmicutes/Bacteroidetes (F/B) ratio, which contributes to obesity by increasing energy storage in adipose tissue. Generally, mechanisms by which the GM manages weight include "an increased capacity of some bacteria to extract energy, improved transfer of calories from food to host, and changes in host absorption metabolism." Furthermore, the GM can regulate proper energy intake and appetite, which disrupted in individuals with obesity, by production of shortchain fatty acids (SCFAs) of non digestible polysaccharide (13). SCFAs help to modulate satiety and food consumption and help stimulate secretion of peptide YY and glucagon-like peptide-1, which reduces food intake and is a mechanism used by liraglutide, a prescription medication to treat obesity (13, 16).

However, the way in which GM affects metabolism is not well understood (14). Nevertheless, research using animal models of germ-free (GF) mice, which are resistant to highfat diet (HFD)-induced obesity, even with a higher food intake. Using GF mice, it was found that when transplanted with "obese microbiota, these mice showed an increase in total body fat significantly greater than when colonized with lean microbiota." Additionally, when GF mice received fecal microbiota transplantations from an obese donor as opposed to a lean donor, the GF mice gained more weight. Furthermore, in reference to the importance of SFCAs, GF mice who were administered antibiotic therapy showed an increase in adipose and metabolismrelated hormone levels, and these changes altered copies of genes that are involved in the metabolism of SFCA (14). The effect of antibiotics helps to show how different environmental influences, outside lifestyle choices of diet and exercise, can affect the GM and influence the pathogenesis of obesity.

Due to the newfound importance of the gut microbiota in relation to obesity, future treatments using this paradigm should include stimulating gut hormones to reduce appetite as well as manipulating the bacteria profile in the gut in order to control weight. Methods in consideration to change the bacteria profile in the gut focus on the use of prebiotics and probiotics.



#### PEELING BACK THE LAYERS OF



#### By Tara Shooshani

Joseph Connor was offered a job at McDonalds only to be told months later that he would not be able to work because he required a special uniform(1). Joseph, like millions of other Americans, was obese. Stigma against obesity prevented him from getting a job that he was fully qualified for. Unfortunately, individuals with obesity face stigma and discrimination in many settings other than the workplace. Within the medical field. physicians and other medical professionals treat the obese with an overall lower quality of care, considering obesity an "avoidable risk factor that prevents [professional's] ability to treat and prevent disease" (2). In the courtroom, the jury is more likely to place responsibility on a plaintiff who is overweight or obese (3). Even laws, both on the federal and local levels, use language that makes obese individuals feel inadequate, undesirable, and deviant (4).

The same anti-fat ideals are introduced and extended into

society through television shows and social media platforms, which are discussed on page 37 of this issue. These outlets perpetuate the concept of the ideal body type, while simultaneously encouraging weight loss and shaming larger body types (5). As a result, the reach of obesity stigma touches all aspects of an obese individual's life: their job, their healthcare, their legal rights, and their social life.

# Biological effects of stigma

Stigma changes the lives of the obese not only in society, but also on a biological level within their bodies. Feelings of stigmatization coming from any source (employers, doctors, judges, etc.)

#### Ē

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Advertisements like this contribute to the stigma and eelings of inadequacy obese individuals face on a daily basis by normalizing, glamorizing, and encouraging weight loss, while companies profit off of it 1

cause the body to release cortisol, a stress hormone. The effects of cortisol change an obese person's biology immediately, and can result in sustained changed over time (2). The continuous release of cortisol due to repeated exposure to stigma can lead to "heart disease, stroke, depression, and anxiety disorders" (2).

Hormone mechanisms and environmental triggers create a perpetuating cycle of ill health in the obese. There is irony in the fact that people with obesity go to the doctor to try and ameliorate their illness. but the stigma and stress that often accompanies a trip to the doctor's office will cause them to feel more stress and anxiety. which in turn worsens their condition.

#### Origins of stigma in society

While a biological response to stressors is a vital aspect of humanity, stigma is a fairly new concept that arose in the past couple centuries. The statistical concepts of "the norm" and "average" were introduced in the mid-1800s (6). Sir Francis Galton applied these statistical definitions to society when he created eugenics and propagated the notion that people who are not within the norm or the average are deviants of society who should be looked down upon or eliminated (6). Hence. individuals defined "deviant" were stigmatized, including the obese. Through the decades, society's impression of the obese has changed, and obesity stigma embodies itself in people's minds in unique ways.

Many scholars, like Dr. Rebecca Puhl, believe that obesity stigma may have arisen in society through the conservative ideals of selfdeterminism and individualism. These concepts suggest that the overweight and obese are responsible for their state through poor choices or laziness. Thus, being overweight or obese becomes a sign of a shortcoming in one's personality or character. As a result, society treats these individuals with less sympathy and more anger (7).

Although the mindsets of people who show obesity stigma are misguided, they prevail in society. Self-determinism and individualism are not compatible with obesity based on its causes (see page 4), yet society continues to think lowly of the obese due to gaps in knowledge and misunderstanding.

#### The issue of legal protection

To protect the obese from the destructive effects of stigma, including discrimination by employers and medical professionals, many activists argue that the obese should be protected under the Americans with Disabilities Act (ADA). The implications of this type of activism are complicated, and even oppose other obesity rights activists.

For years, court cases claiming discrimination against obese individuals have tried to apply the ADA to the obese, but in each case, the court has held that the ADA only applies to the morbidly obese in some cases. In fact, only a couple of states have laws that protect from discrimination based on appearance, while the majority of judges conclude that discrimination of fat people is acceptable (1).

Activism to consider obesity a disability might help the obese in specific situations, but it would undermine other obesity activists. Many other groups believe that obesity should not be considered a disease because it represents an evolutionary mechanism of energy storage (8). Body positivity activists argue that the mindset embedded into society – not the law – must change to treat all people, regardless of body type, the same.

The biological consequences, origins, and legal aspects of obesity stigma illustrate the deeply convoluted impacts of stigma not only on the obese, but on all members of society.

# Tracy's DBESEBody

Living with obesity is not simple. Let's see what it is like for our friend, Tracy.

Stigma against obesity increases Tracy's stress levels and makes it harder for her to get a job (1) Drug makers profit off of Tracy by selling her weight loss medications that usually do not result in sustained weight loss (4)

> Tracy is not alone in having obesity; over 30% of adults in the US are also obese (3)

Social media makes Tracy feel inadequate and deviant because she sees skinny bodies being glorified on a daily basis (5)

> Having obesity makes it more likely for Tracy to have other chronic illnesses, such as type II diabetes (6)

Large companies like Coca-Cola promote advertisements and sponsor biased research to encourage Tracy to consume fattening foods (2)

"Want to lose weight FAST?"

#### By Lisa Bang

THESE ARE ONLY a few of the many slogans featured in commercials, advertisements, and magazine covers that infiltrate our daily lives. With obesity rates on the rise and **diet culture** dominating the U.S., people more than ever are looking to lose weight and be skinny. Our society idolizes and idolizes being thin and equates it with health and morality. Thus, people with excess fat, including the overweight and obese, are stigmatized and criticized as being lazy and "just need to diet and exercise."

One on hand, the most common treatments for obesity are behavioral and lifestyle modifications, such as recommendations for dietary changes, physical exercise, and cognitive behavioral therapy. However, if these treatments are not sufficient, medication and bariatric surgeries are also options to aid with weight loss. This section will mainly focus on obesity medication, examining its history and pharmacological mechanism in order to understand its development within a

"Lose Weight, Feel Great"

biological and social context. Overall, obesity medication can be classified based on their mechanisms of action: drugs that increase energy expenditure, drugs that reduce food intake and drugs that interfere with fat absorption (1). Furthermore, we will delve into the world of dietary supplements and unpack how governmental policies encourage diet culture.

#### 1930s

Introduced in 1933, one of the first anti-obesity medication of modern times was 2,4-dinitrophenol (DNP), which caused weight loss by uncoupling oxidative phosphorylation, and was used by 100,000 individuals in the U.S. in its first year (2). Its mechanism of action was increasing energy expenditure through enhanced metabolic rate and fat metabolism, but resulted in toxic hyperthermic effects, leading to the drug being discontinued in 1938.

#### 1940s-1970s: Age of Amphetamines

Not too long after, amphetamines emerged as the primary drugs for treating obesity in the 1940s (2). Amphetamines aid in weight reduction by acting as an adrenergic agent on hypothalamic receptors to release norepinephrine, which increases central nervous system activity (CNS) and resting energy expenditure while decreasing appetite and food intake (2). Amphetamines-based drugs, such as benzphetamine, mazindol, and phentermine, were FDA-approved and commonly prescribed from the 1940s to 1960s. Phentermine, which causes dopamine and serotonin release as opposed to norepinephrine, has a lower potential for addiction

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So start taking amphetamines today and make sure of looking and feeling your best in 1940

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than amphetamine-based therapies and is still used today for short-term treatment of obesity (2). During this period, the Kefauver-Harris Amendment (1962) was passed, "mandat[ing] the provision of substantial evidence of efficacy for all new drug applications (NDAs)". Thus, all obesity drugs approved prior to 1962, including amphetamine-based drugs, were investigated for its efficacy and safety (2). However, by the next decade, concerns over abuse of amphetaminebased medication, due to their addictive property as well as cardiovascular risk, led to decline in its use (3, 4).

also relieves the tensions of dieting



AN EXTENSIVE REVERT aboves that in 64% of overweight persons there is not enclosual hasis for balaves to lists food instake. Appendix has been foremained in help you enverones this periodism and to keep your overweight patient on your dat. THE NEW ANNECTIC does more than give you dos too-amplementing to cach your patient's upperior. It is an environment to be an your patient's upperior. It is an environment to be an your patient's set of the set of the

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#### **1990s: Innovation of New Targets**

#### In the 1990s, the FDA implemented

a landmark guideline that required any newly developed weight-loss drug to promote statistically significant difference in weight loss from baseline of at least 5% compared with placebo after 1 year. In the pursuit of efficacy, the FDA approved two highly effective drugs, dexfenfluramine and fenfluramine (2). In 1996, dexfenfluramine was also combined with phentermine to create the popular treatment known as Redux, which acted on the CNS as serotonin-releasing agents to cause weight loss by suppressing appetite (4). However, reports of cardiac valvulopathy resulted in withdrawal of dexfenfluramine from the market as well as one of the largest litigation payouts by a pharmaceutical industry at the, totaling to US\$14 billion (5).

Amidst the dexfenfluramine contro-, versy another amphetamine derivative, sibutramine was approved or weight loss in the U.S. and Canada, but worked differently from preceding derivatives. Instead of suppressing appetite, sibutramine blocked the uptake of serotonin and norepinephrine to induce satiety. Sibutramine underwent several years of clinical trials before FDA approval but was ultimately withdrawn from US and Canadian markets in 2010 due to increased cardiovascular risk (2).

At the end of the decade, nonamphetamine-based anti-obesity drugs were introduced. The most popular, orlistat (Xenical), is still available today. Orlistat induces weight loss by inhibiting digestion absorption of dietary fat by ~30% (2), and is one of the few obesity drugs approved for long-term use and the only obesity medication approved for adolescents (4, 6).

#### LETHAL OBSESSION

Weight loss is a vital part of cardiovascular risk management and weight loss with Xenical can have a significant impact upon key risk factors.<sup>15</sup> When you help change their weight, you help change their future.



Block fat and help change their future

#### 2000-present: Combination therapies and Targeting Gut Microbiota

In the last two decades, pharmacotherapies have developed in the direction of polytherapy as well as creating safer and more tolerable medications that can be used long-term (2, 4). Approved in 2010, liraglutide is a glucagon-like peptide-1 agonist that mediates weight loss through reducing appetite and decreasing food intake (2, 3). Afterwards, lorcaserin, an appetite suppressant, was developed with a lower specificity for serotinin's receptor, decreasing the risk of developing heart-valve abnormalities with long-term use and was thus approved by the FDA in 2012 (2).

Following, combination therapies developed for obesity include phentermine and extended-release (ER) topiramate and naltrexone/bupropion, which are both FDAapproved for long-term use to manage obesity by reducing appetite and food consumption" (2).

Advantages to poly-therapies or combination therapies is that they can potentially result in additive weight loss, less serious side effects, and reduced potential for counter-regulation" (4).

Future research for obesity medication involves exploring different combination therapies, developing single-peptide molecules to combine different modes of action, and targeting genes that affect weight (4, 7). Future research is also focusing on the gut to promote weight loss, either through manipulating gut hormones or changing composition of bacteria in gut to control weight (2, 7).



# DIETARY SUPPLEMENTS



#### Regulation of supplements

Despite the limited number of FDA-approved obesity medication available, a plethora of non-FDA-approved dietary and weight loss supplements are available for purchase as over-the-counter products due to the Dietary Supplement Health Education Act (DSHEA) of 1994. Based on this legislation, companies are not required to disclose all of the ingredients in their supplements, and the FDA does not need to check for safety and efficacy before such products are available for public consumption (8). Furthermore, the FDA cannot regulate the claims that companies use to advertise their products, as long as claims are not for disease treatment (8). Not until after complaints have been made can the FDA step in and remove products from the shelves.

Due to the lack of regulation, dietary supplements are a multibillion dollar industry. Companies often promote weight loss, using trigger words such as "detox", "fat-burning", "natural", and "essential" (9). They are typically made of herbs, chemicals, vitamins, and protein powder, and none of these compounds have resulted in more than minimal weight loss (1). However, there are several cases of adverse effects due to supplements, either caused by side effects of the product or products being contaminated with unlisted or illegal compounds (10). Liver damage and cardiovascular injury are among the most common health consequences from taking dietary supplements advertised for weight loss, such as OxyELITE Pro and ephedra, but more serious cases have resulted in death or necessitated organ transplants (10).





In addition to being unregulated and potentially fatal, supplements are commonly used, with half of adults in the US reported that they have taken at least one supplement in the past 30 days (11). Therefore, dietary supplements need to be under FDA regulation to ensure safety and effectiveness since there is such widespread use.

## CONCLUDING THOUGHTS

While diet and exercise remain the gold standard of treatment for people with obesity, anti-obesity medications provide a non-invasive therapy that can be coupled with diet and exercise to enhance the weight loss potential. Furthermore, medications help to reduce the health risks of co-morbidities associated with obesity. Nevertheless, weight loss is often hard to maintain long-term and many experience weight cycling, in which people regain weight. Furthermore, obesity medication is neither a cure nor quick-fix. Therefore, in addition to managing weight gain from co-morbidities, people must make lifestyle changes to have sustained weight loss.

Despite the complex origins and treatments for obesity, it wasn't recognized as a chronic disease by the National Institute of Health until 1998 and the American Medical Association until 2013 (12). Therein lies the discrepancy of when obesity became recognized as a chronic disease that can be helped with medication and when obesity medication became introduced to the public in the 1930s. Within those 70 years, obesity itself has been stigmatized in addition to obesity medication, which is usually seen as being used for cosmetic purposes rather than for health benefits (3).

#### special section: WOMEN AND OBESITY

Physiologically, it is apparent that males and females are apparent, especially in how much body fat they have and its distribution. In specific, women store more fat than men and have higher levels of total body fat and leptin levels than men



as well (13). These differences can be attributed to women's reproductive biological role and their hormones, in which leptin, estrogen, and progesterone control energy homeostasis, fat storage, menstruation, pregnancy, lactation, and postmenarche (13). Even when women are not experiencing pregnancy, hormonal contraceptives, mostly progesterone and estrogen, can affect weight gain and fat distribution. Following, obesity in women may be affected by other diseases such as polycystic ovary syndrome (PCOS), in symptoms include insulin resistance, abdominal fat, propensity to gain weight. Furthermore, maternal obesity has epigenetic effects that predisposes children of women with obesity to have a greater risk of being obese (13). Thus, there are many biological factors that can make women more vulnerable to obesity than men.

In turn, women biological predispositions to store more fat manifest themselves through more women than men being obese in the U.S. (14). Held by a different societal standard, women experience more weight-based stigma and discrimination than men in the U.S. (15). As a result. women may feel more pressure to be skinny, which could explain why more women have eating disorders, use dietary supplements, and go on diets that result in weight cycling despite obesity rates being similar between men and women (3). Research shows that weight cycling is harmful and put women at greater risk of weight regain and obesity (13). That is, low energy interventions for obesity through dieting interferes with energy homeostasis mechanisms, which promote fat redistribution and increased visceral fat deposition (13). Dieting can also result in leptin resistance, which is linked to obesity, and make women more prone to depression and sensitize the brain's reward circuitry and function that can result in negative, addictive behaviors involving food (13). Additionally, it has been found that women of color. Black and Hispanic in particular, are disproportionately affected by obesity (16). Thus, this suggests that there are additional underlying factors that predisposes women to becoming obese such as gender roles, education, being a minority, and income.



Overall, however, federal regulation lacks sufficient oversight to keep consumers safe from dietary supplements with claims of weight loss, and the large majority of insurance plans not providing coverage for obesity drugs, and if so only in a limited number of states (17). Medicare, a federal insurance program, strictly excludes drug therapy for obesity from its prescription coverage package, dismissed as cosmetic treatments (18).

This reveals how as a society,

### AMERICANS VALUE APPEARANCE AND PROFIT OVER HEALTH.

Therefore, although obesity is at epidemic proportions in the U.S., Americans lack the resources to prevent and reduce obesity. Obesity continues to be systematically stigmatized as a personal problem brought on by the individual, with lack of understanding of the complexity of the causes and treatments obesity. Lack of coverage and reimbursement by health insurers for obesity medication in addition to more stringent standards by the FDA serves as policies that make it more difficult to have sufficient options to treat obesity. Consequently, there is less incentive for the pharmaceutical industry to develop weight loss drugs yet more barriers for consumers to obtain the medication. As a result, regulatory changes need to be made to encourage the development of safer and more effective drug therapies while making treatments more individualized and accessible to the public.

## H E A L T H A N D O B E S I T Y

IS OBESITY UNHEALTHY?



#### By Tara Shooshani

If you asked a group of sixth graders what healthy means, they would probably point you to the food pyramid and tell you that eating a balanced diet makes a person healthy. If you asked an oncologist, the definition of healthy changes: anyone not dying of cancer is healthy. But what about exercise and the number of pushups a person can do or their mile time? Does one's appearance determine if she is healthy? What about the air quality she lives in? Needless to say, what classifies as "healthy" is complicated. The definition of health is based on context. And yet, one thing that society has agreed upon unequivocally in the last several decades is that obesity is unhealthy. Body fat is unhealthy. A high BMI is unhealthy.

What makes obesity unhealthy? Society does not offer a clear answer.

#### A closer look into health

By Sarah Tan

We cannot examine health outcomes associated with obesity without first defining what it means to be healthy.

The World Health Organization (WHO), established in 1948, defines health "as a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity" (1). This definition deserves recognition for aiming high, but it also problematically imposes pressures to meet unattainable standards of "complete" wellbeing. Not only is it unrealistic to aspire for a perfect health record but it is also fairly abstract and unactionable.



In "The Meanings of Health and its Promotion," Norman Sartorius describes three common and more specific types of definitions of health that circulate throughout different sectors of society today. The first is that health is the absence of any disease or impairment, the second that health is "a state that allows the individual to adequately cope with all demands of daily life," and the third that health is "a state of balance, an equilibrium that an individual has established within himself and between himself and his social and physical environment" (1).



Adherence to the first definition authorizes medical professionals to declare an individual as healthy or unhealthy and disregards the individual's own feelings about her condition. Giving physicians and clinicians complete jurisdiction over an individual's state may reinforce feelings of inferiority and inadequacy of members of the public to understand their own bodies. Additionally, as medical and scientific research constantly progresses, "individuals who are declared healthy today may be found to be diseased tomorrow because more advanced methods of investigations might find signs of a disease that was not diagnosable earlier" (1). Both the first and second definitions also do not consider individuals who may have symptoms of a disease but do not feel unwell and so are able to function as expected in their population.





On the other hand, the third definition considers person-environment interactions and situates an individual's health within her unique context. By defining health by an ability to establish internal equilibrium with one's environment despite the presence of disease, this perspective acknowledges that disease does not necessarily replace a person's health or identity. People are affected by disease and illness in different dimensions, and their well-being is not defined entirely by one condition. This third definition therefore prefers the designation of "a person with schizophrenia" to "a schizophrenic," for example, to permit the coexistence of various dimensions of health and disease (1). Additionally, to establish whether or not an individual is in good health urges physicians to investigate how the individual feels about her disease, how it influences her life, and how she proposes to address the disease. In summary,

"laboratory findings and the presence of symptoms are thus important and necessary ingredients in thinking about the state of health and the presence of a disease but are not sufficient to reach a decision about someone's health: it is necessary to view the disease in the context of the person who has it in order to make a judgment about his or her level of health." (1)

Treating disease in this way will improve medicine by contextualizing the individual in her environment and accounting for the interaction of social, political, economic, and historical factors in influencing health that humanizes a patient as more than a physical entity with a list of symptoms to diagnose. The third definition of health is therefore most appealing to our discussion of what it means to be healthy in contrast to unhealthy. There is no strict designation. and it is important to look at health not as a list of boxes to check-off in order to attain but as a host of interdependent components that contribute to a state of balanced well-being. And despite highlighting the strengths of this definition, it is important to reiterate that no perfect definition of health exists. Our goals in examining various perspectives on health are not to pick one that is superior or allencompassing but to portray how these definitions are conducive to different goals and methods for approaching health problems, disease, and what is considered unhealthy. This consideration of multiple definitions also conveys that health is dependent on the person and their environment or context.



This is evident in a study conducted by Jennings and his colleagues that aims to improve health and obesity rates among Indigenous children in the United States; in order to do this they assessed the children's conceptualization of health. Indigenous perspectives of health often conflict with Western worldviews. To indigenous people, "health is typically perceived as a function of balance between multiple interrelating elements, including spiritual forces" (2). In contrast, Western perspectives, rooted in European and mainstream American thought, often attempt to generalize health, which counterproductively limits the understanding of health problems by not considering the associated context. Cultural context significantly shapes attitudes towards health and health behaviors. especially around diet and exercise. Rather than creating barriers to care through a narrow definition, the authors advocate for a socioecological approach towards health in order to understand the lived experiences of the population under study. This would challenge the idea that an individual has sole responsibility over her life and recognize the role of institutions. environments, access to resources, and education, just to name a few, on health. "Health promotion policies and interventions are inextricably linked to the historical, prejudicial biases of their era" (2). It is perplexing then that our culture has created a much more narrow and often unattainable definition of health and the absence of health, whether through diet trends, exercise regimens, or ideal body weight. Realizing that the definition of health is neither universal nor constant is critical to understanding how changes in perceptions of what it means to be healthy subliminally shape social, cultural, and scientific perspectives on obesity.

#### **Categorizing obesity**

By Tara Shooshani

Obesity is not necessarily unhealthy.

Before 2013, obesity was not officially considered a disease in the United States (3). Instead, doctors categorized it as a risk factor for other diseases. When the American Medical Association (AMA) met to decide on the state of obesity, its own Committee on Science and Public Health presented their reasons for why obesity should not be considered a disease: obesity "has no symptoms, and [is] not always harmful;" "involves the body's normal functioning" by "efficiently storing calories as fat;" and "that medicalizing obesity could potentially hurt patients, creating even more stigma around weight and pushing people into unnecessary—and ultimately useless—'treatments'" (3).

Ultimately, the doctors at the AMA's conference were not convinced, and obesity became a disease overnight (3). The implications of their decision have been profound and lasting. Insurance companies, the pharmaceutical industry, patient care methods, and overarching perceptions of obesity have been influenced. Research regarding obesity also shifted: scientists conducting studies began with the biased notions that obesity is a disease that, like other diseases, should be cured and eradicated. As a result, many high-profile publications declare "patients with overweight or obesity cannot be considered 'healthy'" (4).

Other scholars critique this mindset, and present research findings that refute it all together.

Dr. Shira Shafir from the University of California, Los Angeles's Fielding School of Public Health reiterates that "there are plenty of people with a BMI in the healthy range who are unhealthy and people with a BMI in the obese range that do not have any other comorbid conditions." From a public health perspective, being overweight and obese are therefore not inherently unhealthy (5).

One author analyzing the established paradigms surrounding obesity remarks that "researchers and clinicians cannot agree… whether obesity is a disease of metabolism, inflammation, brown fat, chronobiology, the blood-brain barrier, the right brain, or even of infectious origin" (6). This observation calls into question the scientific origins of considering obesity unhealthy. Since the basic definition of obesity as a disease is ambiguous in the healthcare setting, it becomes evident that science may not be the origin of negative beliefs about obesity, and instead societal values have carved the narrative that obesity is an unhealthy disease.

Meta-analysis data corroborates this idea and reveals a phenomenon called 'the obesity paradox,' discussed in the upcoming sections.

#### **Trends in obesity**

#### By Lisa Bang

According to the WHO, obesity is a global epidemic with more than 1.9 billion overweight adults and over 650 million clinically obese adults worldwide. Obesity affects both developed and developing countries. often increasing more rapidly in developing countries in which obesity coexists with undernutrition. Obesity affects people of all ages and socioeconomic status, and high rates of obesity globally can be attributed to increased consumption of nutrient-poor foods with high levels of sugar and saturated fats, reduced physical activity, and increased sedentary lifestyles. Thus, with the help of modernization. economic growth, urbanization, globalization of food markets, and advancement of technology, people have had greater access to nutrient poor foods such as fast-food and junk-food, automated transportation, less physically demanding jobs, and more time for leisure (7). In turn, these gradual social and behavioral changes have contributed to the worldwide obesity epidemic by facilitating the ease and normalization of high caloric input and low caloric output.

Similar patterns of social and behavioral changes have contributed to the rise of obesity in the U.S. Within the Organization for Economic Cooperation and Development (OECD), the U.S. is the most obese country in the world (40%), followed by Chile (34.4%), Mexico (33.3%), New Zealand (32.2%), and Hungary (30%) (8). Japan and Korea have the lowest rates of obesity, with less than 6% of their populations being obese (9). A possible explanation for the differences in prevalence of obesity between Japan and the U.S. is societal structure. For example, food prices are higher and dietary habits are relatively healthier in Japan, and Japanese people tend to be more physically active due to greater reliance on public transportation and fewer people owning cars (10).

With rates of obesity in the U.S. at historic heights (11), in the past 40 years, the percentage of obese adults in the U.S. has risen from 15.1% in 1980 to 39.8% in 2016 (11, 12). For both adults and children, overall prevalence of obesity is higher among non-Hispanic black (46.8%) and Hispanic (47.0%) individuals than among non-Hispanic white (38.0%) and non-Hispanic Asian (12.7%) individuals (11), revealing significant racial disparities in obesity that are influenced by a number of social determinants of health. Overall, the rapid increase in obesity since the 1980s is associated with a multiplicity of factors that have become mainstays in American society: food choices, work-related factors, and sedentary behavior (13, 14).









**Dr. Rushi Parikh, MD, FACC** Interventional Cardiologist and Advance Heart Failure Specialist

"Part of the problem is that jobs in general, and even being a student, means being more reliant on screens. Most people's jobs have them sitting all day.



Not a lot of places are moving towards...standing desks or treadmills desks...This is part of the challenge to cardiovascular activity as jobs move ... to behind the desks."



American life is structured around work and productivity. Despite most full-time jobs being 40 hours per week, nearly 40% of Americans work multiple jobs for more than the 40-hour minimum, putting them at higher risk for obesity especially when combined with a hostile work environment (15, 16). Furthermore, sedentary occupations are a significant risk factor for obesity, especially among middle-aged males in the U.S. (17). Sedentary behavior in leisure activities has also been associated with obesity, as TV viewing is consistently associated with obesity and adiposity markers among adults (18). As Americans spend more time working and in leisurely activities, less time is spent engaging in physical activity, with only 54.2% of Americans meeting the minimum aerobic physical activity guideline of "moderate-intensity for at least 150 minutes/week, or vigorous-intensity for at least 75 minutes/week, or an equivalent combination" (19).

Long work hours can also shape eating patterns, as Americans who work more hours may have less time to buy and prepare homemade meals, opting for convenient fast-food and take-out meals. This trend is reflected in food-away-from-home accounting for 54.4% of total food expenditures in 2018, and the share of household consumption expenditures devoted to at-home food is less than 10% in the U.S. while U.S. per capita calorie availability was among the highest in the world at 3,682 calories per day (20). Since the 1970s, the modern American diet has also increased in fats, sugars, and grains, all of which are high in calories and staples in meals, snacks, and sugar-sweetened beverages (14). Portion size of restaurant meals and fast food has also increased while the cost of food has decreased (21).

Further, the average American woman weighed 170.5 pounds in 2016, which is comparable to the average man who weighed 166.3 pounds in 1960 (22, 23), and the average male now weighs 197.8 pounds (23). The increase in average weight also corresponds with self-reported average ideal weights. In 1991, on average men reported their ideal weight to be 171 pounds compared to 185 pounds in 201; for women, the ideal weight was 129 pounds in 1991 and 140 pounds in 2011. Overall, only 16% of adults reported that they were at their ideal weights (23).

Thus, a number of cultural norms and environmental factors have influenced the rise of obesity in the U.S., as people are eating more calories but expending less energy.



#### **Obesity and chronic illness**

#### By Connie Tran

Obesity is much more than being overweight. Often times, individuals who are obese also deal with a range of chronic illnesses. The epidemic derives from a multitude of reasons and affects nearly a third of the world's population. The three most common obesity-related chronic diseases are type 2 diabetes mellitus, hypertension, and hypercholesterolemia, all of which are extremely costly in regards to healthcare expenditures and premature mortality. Physicians suggest that adipose plays a large role in these diseases and because of this, lifestyle modification is strongly recommended. Studies have proven that lifestyle modification is the most effective way to lose weight and, furthermore, prevent the development of obesity-related chronic illnesses. This is essential because it impacts patients' quality of life and increases morbidity (24).

Every "anthropogen," which are man-made environments, is capable of inducing a type of chronic inflammation, which is also known as meta-inflammation.

A study conducted by Gary Egger and John Dixon aimed to connect these anthropogens to obesity-related chronic illnesses by shifting a focus to social and environmental determinants of obesity rather than just lifestyle choices. Furthermore, obesity prevalence indicates issues in the broader environment that suggest the need to simultaneously manage obesity and chronic disease (25).

Epidemiological studies conducted in Western countries have highlighted the importance of dietary and lifestyle choices in regards to major chronic diseases. When an individual is on the verge of developing diabetes, they are most likely susceptible to other chronic illnesses because there is an overlap in the anthropogens that create these diseases. Experts say that transforming lifestyle risk-factors such as diets high in processed foods and minimal physical activity are pertinent in reducing an individual's chances of developing coronary artery disease, stroke, type 2 diabetes, and certain cancers related to obesity (24). Additionally, there is a recognizable discrepancy between clinical guidelines and practice patterns. Physicians offer the solution of designing office interventions and mentioning lifestyle changes more often to encourage chronic disease management (26). Statistically speaking, 18% of deaths among Americans ages 40-85 are due to obesity-related chronic illnesses. The obesity epidemic is just as deadly as the opioid epidemic, which should be a concerning matter to those who fall in between those age categories. Cancers that derive from excess body weight have resulted in 40,000 deaths each year, and compares to the annual 64,000 deaths from opioids. Additionally, economic losses from obesity, as billions of dollars are spent on diagnosis, prevention, and treatment (27). Those who are obese may be prone to more than one chronic illness. It is important to acknowledge the chronic illnesses that are related to obesity because of how easy it is to develop a chronic disease once being diagnosed with obesity and vice versa, causing detriment to one's overall health.



#### 'The Obesity Paradox'

#### By Sarah Tan

As obesity prevalence has proliferated over the past few decades, more and more researchers have investigated the correlation between obesity and the onset of common chronic illnesses. Obesity should be seen as the most serious health epidemic in the world, according to Bosello and Vanzo in their article titled "Obesity Paradox and Aging." They go on to say that 239 prospective studies of subjects in Asia, Australia, New Zealand, Europe, and North America determined that, in all four continents, both overweight and obesity have an "indisputable" correlation with increased mortality from any cause (28).

The term "obesity paradox" was coined in 2002 by Gruberg et al. to describe the occurrence of better outcomes, defined by lower mortality, among overweight and obese than normalweight or underweight patients with coronary artery disease (28, 29). This paradoxical relationship is also evident in obese patients with cardiovascular disease (CVD), type 2 diabetes mellitus, and chronic obstructive pulmonary disease (COPD), to name a few.



A study published by the Journal of American Medical Association, collected data from 5 cohorts used to find a connection between BMI at diabetes onset and all-cause mortality, cardiovascular mortality, and non-cardiovascular mortality:

"In all cohorts combined, 89% of people who developed diabetes were overweight or obese. However, interestingly, when data of these overweight/obese patients with diabetes were compared with that of healthy weight patients with diabetes, it was shown that overweight/obese patients with diabetes had a significantly lower all-cause mortality and non-cardiovascular mortality while cardiovascular mortality was non-significantly (p=0.06) lower." (30)

Among type 2 diabetes patients, those with a BMI of 29-31kg/m2 had the lowest cardiovascular mortality and 28-30kg/m2 had the lowest overall mortality rates (30). Obesity is understood to strongly predict CVD and CVD risk factors, but the relationship between obesity and poorer health outcomes is less clear in patients who have already developed CVD: hello, paradox (31).

A study on the obesity paradox in chronic obstructive pulmonary disease in smokers found that overweight individuals with smokingrelated COPD had a lower risk of death than normal-weight individuals (32). Additionally, obese patients with non-cardiovascular chronic disease, such as cancer, have exhibited an increased survival advantage (28).

A meta-analysis in 2013 assessed 8 studies to evaluate the effect of metabolic status and BMI on incidence of all-cause mortality and cardiovascular events (29). This analysis showed that patients with metabolically healthy obesity, or obesity lacking components of metabolic syndrome, such as hypertension, dyslipidemia, high fasting glucose levels, and type 2 diabetes, "had a 24% increased risk of major cardiovascular events compared with lean individuals who were also metabolically healthy." On the other hand, all metabolically unhealthy groups, regardless of BMI, had an increased risk of cardiovascular events. 2.65-3.14 fold. compared with metabolically healthy participants. They concluded that among metabolically healthy patients, obesity conferred a slightly higher risk of cardiovascular events; but metabolically healthy obese patients had a significantly lower risk of cardiovascular events than metabolically unhealthy lean individuals (29).

Metabolic health is also associated with higher levels of fitness. Patients with a combination of metabolically healthy obesity and high fitness had a better prognosis than those without obesity but with low fitness. Fitness effects how adiposity influences the risk of major cardiovascular events and contributes to muscular fitness, or stamina and strength. Metabolically healthy obesity may therefore involve greater fat mass but also greater nonfat mass, especially muscle mass, than lean patients with normal or low BMI. Having low levels of nonfat mass increased subsequent mortality risk by a factor of 3.1-3.9 (29).





This research imparts the potential need to distinguish metabolically healthy from metabolically unhealthy obesity in order to critically assess the merit of the obesity paradox (30). Is it that excess body weight itself confers a survival advantage among patients with chronic disease or that these studies included metabolically healthy obese participants that resulted in better health outcomes to metabolically unhealthy nonobese participants? And although weight loss is commonly proposed by physicians to prevent CVD and type 2 diabetes, a recent analysis conveyed that cardiorespiratory fitness played a more significant role in mitigating the risk of developing heart failure and coronary heart disease (31). Therapeutics targeting obesity may reduce subsequent risk for CVD, but this evidence shows that improving fitness may be a more effective primary prevention method (31).

Although certain studies have obtained results that confirm the existence of the obesity paradox with regards to mortality rates, others have asked important questions about morbidity and quality of life. Oreopoulos et al. look into the association of obesity with healthrelated quality of life (HRQOL) outcomes in coronary artery disease (CAD) patients. Substantial evidence from previous studies show that obesity is associated with depression and worse HRQOL outcomes in the general population, and research on the surprising relationship between increased BMI and survival rates in CAD patients has confirmed the obesity paradox in these cases: but it is unclear whether or not the paradox extends to HRQOL. By measuring HRQOL outcomes based on four domains of health status, physical limitation, angina frequency, treatment satisfaction, and disease perception, the researchers found that general HRQOL significantly decreased in individuals with mild, moderate, and severe obesity compared to those with normal BMI. Prevalence of depression and physical limitation increased as BMI increased, especially in severely obese patients, defined as those with a BMI  $\geq$  40.0kg/m2. Patients with obesity were also younger and more likely to have hypertension, hyperlipidemia, and type 2 diabetes (33).

Similar studies by Kalantar-Zaadeh et al. and Evangelista et al. also revealed that a higher BMI is associated with lower physical, mental, and overall HRQOL in patients with chronic hemodialysis and heart failure, respectively. All of these studies were conducted on populations that had exhibited the obesity paradox when measuring mortality, concluding that the paradox does not extend to HRQOL outcomes. So even if the combination of obesity and CAD, heart failure, or a number of other chronic diseases is correlated with lower mortality rates, "these potential additional years of life may not be quality years" (33).

Also, no paradox is seen in non-smokingrelated COPD in Wu et al.'s study, suggesting that the obesity paradox may be explained by factors related to smoking rather than established COPD. A proposed explanation for the evidence of the obesity paradox in obese smokers but not in obese non-smokers is that "smoking is associated with weight loss and with numerous diseases that increase mortality (diseases that could in turn further alter weight), biases through confounding, misclassification, and selection are likely" (32).





Critical limitations to these studies to note are their cross-sectional nature and consequent inadequacy to prove causation. This research can only provide associations between obesity and HRQOL in these patients, which informs our understanding of the obesity paradox and its ramifications but also reminds us to refrain from drawing cause-and-effect relationships. Another potential source of error in this study is that it does not include severely obese individuals due to instrumentation limitations.

These studies highlight the importance of considering the overall and disease-specific quality of life of individuals with obesity and associated illnesses that is excluded from only examining mortality rates. The aversion of death does not promise a healthy or high-quality life. It does not say much that people are living longer with obesity if these years of life are of poorquality and characterized by physical pain and inhibited function, financial costs associated with healthcare and treatment, and social stigma that may have a significant toll on all aspects of health. Changes in weight and body fat may affect more than just survival, and the extensive effects of obesity on quality of life may be attributed to intense stigmatization. This also reveals the importance of maintaining balance in all areas of health since mental. emotional, and physical health are all interdependent.

Even still, the obesity paradox has been met with much opposition. For example, Banack and Kaufman claim that the obesity paradox is explained by selection bias. Common in epidemiological research, selection bias is the result of conditioning on a variable that is affected by exposure and shares common causes with the outcome, known as a collider, that distorts the association between exposure and outcome among the subjects being studied. Applied to a study on the obesity paradox among patients with heart failure, Banack and Kaufman assert that selection bias is the culprit for the observed protective association of obesity and mortality because after adjusting for selection bias, overweight and obesity no longer appeared to be protective (34).

Additionally, the negative association apparent between obesity and mortality may be attributed to the populations being investigated. The majority of reports on the obesity paradox study elderly and clinical populations, which has revealed to have the most bias due to reverse causality, referring to the fact that body weight may be a reflection of illness (35). Reverse causality is "the common error of mistaking cause for effect and vice versa" (36). This interaction may explain the evidence as confounded by illness-induced weight loss; thus the obesity paradox is incorrectly interpreted as low BMI causing poor health outcomes rather than poor health causing low BMI. In a study isolating these effects, Stokes finds that using maximum BMI as opposed to traditional measures of BMI at the time of survey was able to reduce reverse causality and that using traditional BMI at the time survey as a measure of excess weight has the potential to substantially underestimate the mortality burden associated with obesity in the US. Stokes's research finds that weight

loss is a strong predictor for mortality because it is often associated with illness rather than resulting from the effects of lifestyle modification (38). Other research supports this finding that weight loss and illness rather than excess weight predict health outcomes and risk for death (37). As Stokes puts it, "are we mixing up cause and effect?"(35).

Next, misclassification bias may be an explanation for the obesity paradox because of the use of BMI to measure obesity. Misclassification bias implies that BMI may be an inadequate measure for adiposity since it does not account for distribution of fat and body composition and fails to discriminate fat from lean tissue (39). Despite BMI having received substantial criticism, it is still a strong prognosticator and the best available option (31). BMI is widely accepted, providing a common measurement among health practitioners that is affordable and efficient. Other assessments such as body composition analysis would be desirable for their accuracy and precision, but this would not be feasible. Also, the obesity paradox is evident in studies on both heart failure and coronary heart disease that used fat mass and waist circumference measurements instead of BMI (31). BMI therefore cannot assume all blame as a quantitative measurement technique. Instead, the restraints of BMI serve as an example of the limitations of all scientific methods and instruments.



# CAUSE

# EFFECT



Using BMI is not perfect, but rather than upheaving the widely accepted system of using BMI to measure overweight and obesity, we should make a shift towards acknowledging its flaws and away from reliance on BMI to provide complete explanations of obesity. Obesity should not carry the connotation of unhealthy because high BMI is not inherently unhealthy. Rather, high BMI is one of many possible methods to quantitatively define obesity for clinical and research purposes, not for stigmatization and discrimation of an arbitrary number that only has significance because of the authority that society's elite award it. Another rejection of the obesity paradox is that obese individuals show symptoms for chronic conditions at earlier stages of the disease and may therefore receive treatment earlier, prolonging survival due to timely intervention (28). To add to that, the "fat but fit" paradigm described by Bosello and Vanzo refers to people defined as obese, or having a BMI  $\geq$  30.0kg/m2, but with high fitness levels who have lower mortality rates than lean but unfit individuals (40). This reveals limitations in the appropriateness of BMI to measure obesity rather than in the health effects of obesity itself.

These findings emphasize that proposed paradoxes that undermine well-studied phenomena should be met with skepticism. This is not to say that this one study debunks all scientific research on the obesity paradox or that all controversial discoveries are invalid. Many current issues have supporters and sound evidence on both sides of the argument, but it is crucial to analyze the claims, methods, and potential sources of error or bias held by both parties before jumping too quickly onto yet another bandwagon.

The obesity paradox provides insight into cultural and scientific definitions and perceptions of obesity that pervade social, political, and professional spheres of life. The pushback against studies supporting the existence of the paradox may serve to show the heavily ingrained and stubborn association of obesity and poor health. Scientific research and discovery circularly inform and are informed by obesity stigma and health stereotypes. Rather than arguing about technicalities in experimental and structural bias, which is present in all human activity, efforts should focus on utilizing these contradictory findings to convey that our preconceptions of what it means to be healthy and obese are not, by definition, mutually exclusive.





#### Shira Shafir, PhD.

Adjunct Associate Professor UCLA Fielding School of Public Health Department of Epidemiology

"We now have pretty good data that shows that risk for obesity starts in the womb. I think that if we really want to have an impact on the population level we need to think about things that impact children and carry that forward."



#### Yvette-Janine Pardo

Biomedical Researcher Charles Drew University Mother of student, Connie Tran Diagnosed with obesity-related Hashimoto's disease

"A woman at 53, for the most part, has already gone through menopause but because of my dysfunction with the thyroid, I am still going through that. There are moments where I'm very weak because of iron deficiency. Hashimoto's disease causes inflammation in the joints, therefore all my joints hurt on and in addition to that, it is also connected to plantar fasciitis which makes it difficult for me to walk, especially in the morning. I feel very tired when I have an episode of Hashimoto's, where my antibodies increase and I feel lightheaded and nauseous and exhausted."



#### **Helen** Zhong **Director of Body Image** Task Force at UCLA

"Chronic stress, poverty, racial discrimination. and weight cycling all harm health and may lead to fatness. Usually when people talk about health, it is very individualized about eating or exercising, but the factors outside of our control, like class and climate change, make such a big difference in a person's health."



#### Michael Prelip, D.P.A

Professor, Department Chair **UCLA Fielding School of Public Health Department of Community Health Sciences** 

"I do think that the solution to the problem of obesity in the United States is not a medical solution, and I would be concerned if it became one, like a drug. That would concern me a whole lot."



In recent years, social media has vastly become a large platform for a means of communication. While media platforms can be an efficient way to spread positivity and purposeful information, it can also be a way to shut others down in various forms. In today's society, people of all ages are active on social media for different reasons. One popular platform, Instagram, is known to be a virtual place where people select the photos that they desire to share. Instagram users tend to share photos of themselves with friends. places they visit, different foods that they eat. and more. Social media has the potential to be a way to enforce healthy habits. In regards to how social media has grown over the years, people are less attracted to educational posts and are more intrigued by simulations that they were unaware of before.

Social media platforms known as Instagram, Facebook, Snapchat, and Twitter are places where people of all ages can share, for the most part, highlights of their day to day life. In regards to obesity, research suggests that sharing photos of foods and drinks that trigger appetite can take excessive measures in how hungry a viewer actually is. In today's world, we are highly influenced by not only what those who surround us do, but strangers from all around the world as well. We are able to share our sociocultural habits. Social media is in a way, a form of detachment from reality in which we disregard our potential at a real identity. Dining out, or even cooking indoors, is one of the easiest ways to socialize and catch up with our loved ones. It is natural to want to take photos of what will be known as a memory, and share it with the rest of the world.



### The Power of Social Media

#### By Connie Tran

Despite a nice snapshot, it can spark interest in those who view these photos and descriptions. Many social media platforms are dedicated to sharing different food fusions around the world and are at times. sponsored. Influencers are paid to travel and try different foods, becoming an attraction for followers. The consistent sharing of food posts can contribute to unhealthy eating patterns for two reasons: to go out with loved ones to try unique platters and to share a photo of what they've just tried on a platform with feedback. In addition, the way that the photos are edited may also trigger an excessive desire for sugar, carbohydrates, and emotional eating and addiction. These advertisements essentially transfer social media posts into tendencies that turn into obesity. Experts studying obesity suggest that those who do not participate in social media are more active and have healthier eating patterns. The longer someone spends in front of a screen is negatively impacted by obesity and related diseases (1). On the other hand, the power of social media can also encourage people to fall into eating disorders such as anorexia and bulimia.

# **Feeding Obesity:** Finding the Food Industry Guilty

By Sarah Tan

How did our species make the drastic jump from malnutrition and infectious disease to over-nutrition and non-communicable disease as the leading global causes of death in such a short time-span?

Most of the greatest public health concerns of this day are entirely preventable: obesity and associated chronic diseases such as type 2 diabetes and cardiovascular disease did not exist at such extortionate rates a century ago. Lack of physical exercise, poor diets and unhealthy dieting, genetic predisposition, failure by health-care professionals to advise patients about obesity, excessive food portions in restaurants, junk-food advertising to children, and eating increasing numbers of meals outside the home, among other factors, all contribute to the boom of the American obesity epidemic (1). And the common denominator for the majority of these sources is: food.





#### **Fast-food frenzy**

Think of fast-food as the food industry's baby: it receives high investment of time and resources, does not sleep, and is the center of attention by youth and adults alike.

The fast-food industry has a political and economic monopoly over many of the nation's pivotal individuals and institutions. In a legal case against Post Foods, the third largest cereal manufacturer in the U.S., plaintiffs Krommenhock and Hadley filed a "putative class action" on behalf of California consumers who purchased high-sugar cereal products manufactured by the defendant. The plaintiffs assert that Post Foods' labels for 44 cereals products at issue in this case contain false and misleading health and wellness claims because the high added sugar content can cause adverse health conditions, violating California consumer protection statutes. Post, on the other hand, moved to dismiss these claims because "no reasonable consumer could be misled by the alleged health and wellness claims." The accusations of intentionally and strategically marketing high-sugar cereals with health claims, omitting their dangers in order to artificially inflate the price and market demand, would violate the Nutritional Labeling and Education Act (NLEA) of 1990 that prohibits misbranding of food and requires nutrition labeling (2).

The plaintiffs also cite numerous studies that show evidence of the association between excess sugar intake and chronic diseases including metabolic syndrome, type 2 diabetes, cardiovascular disease, liver disease, and obesity to support their case. Having suffered from monetary damages and "bodily injury in the form of increased risk of [coronary heart disease] CHD, stroke, and other morbidity" from purchasing these products, Krommenhock and Hadley also rely on the recommendations in the American Heart Association (AHA) Scientific Statement that sugar in excess of 5% of total daily calories is unsafe and impacts liver and other organ health. However, the Food and Drug Administration (FDA) recently set recommended added sugar levels to 10% of total daily calories (2). The FDA requires the disclosure of added sugars in the Nutrient Fact Panel of food products. effective in 2018 (2); but the disagreement of the AHA and the FDA's daily sugar content recommendations is concerning. As the authority over all food products and how they are sold to consumers, the fact that the FDA's regulations do not line up with those of the AHA, an organization that specializes in cardiovascular medical research and disease care, is alarming (3). This provides insight that the government agencies we often rely on to protect and serve the public's best interests are not impenetrable; they are too influenced by wealthy hegemonic industries.





Following a series of legal suits against McDonald's Restaurants for knowingly selling unhealthy food that were rejected on the basis of the inability to prove that eating the food every day is dangerous, documentarian Morgan Spurlock set out on an endeavor to only eat McDonald's food three meals a day for thirty days. His documentary Super Size Me trails Spurlock throughout this self-experiment that also restricts him from doing any exercise and limiting himself to a maximum of 5,000 steps per day since this is characteristic of individuals who consistently consume fastfood. He also had 9 "super-sized" meals during this time (4).

Prior to beginning this journey, Spurlock was tested by a general practitioner, cardiologist, and gastroenterologist who declared that he is in outstanding general health and received consultation from a dietician and exercise physiologist who state that he is above average in fitness. During the experiment, he experiences a multitude of negative physical and emotional changes, not limited to loss in muscle mass, sex drive, and energy as well as having heart palpitations. Post the thirty days of McDonald's, Spurlock visited the doctors who had tested him in his initial state; they conclude marked deterioration to his health and irreversible heart damage that could cause a heart attack even if he eventually lost all of the weight gained during the experiment (4).

Although Spurlock's self-experiment is an extreme method, the documentary reveals both the immediate and lasting health effects of fast-food consumption. Many viewers may react with claims that no one eats McDonald's for every meal every day, but many individuals still consume a variety of fast-foods on a regular or even daily basis (4). The point is clear that such foods are detrimental to not only physical but also mental and emotional health.

Additionally, McDonald's reportedly discontinued the Super Size meal option 6 weeks after the movie's premiere and began to emphasize healthier menu items. They claim that these changes had nothing to do with the film, but we can speculate otherwise. Spurlock also focuses much attention to how McDonald's gears their advertising and products to young children, through Happy Meals that include toys, for example (4). Targeting youth before they even realize that what they are eating is harmful is not unique to McDonald's: unfortunately this is a tactic employed by the fast-food industry at large to maximize profits from those most vulnerable to its deception.



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#### American food gone global

As obesity prevalence has risen in the U.S., similar trends are seen in other Western countries, the Middle East, North Africa, Eastern Europe, and Latin America as a result of more availability of processed and energy dense food spreading from America across the globe. Chopra and Darnton-Hill state that in North America, fat and sugar make up more than half the average total dietary energy intake, and this is now being mirrored in many developing countries at lower income levels. The food market is so oversaturated in developed countries that the food supply contains nearly twice the amount of needed daily calories for every adult and child in the U.S. (5).

Globalization has brought along with it the transnational growth of the American industrial food industry, and it is all owned by a few key powers. More than half the food products in the market in both Europe and America is owned by a handful of corporations. Within only a few vears of their introduction to these nations. "65% of the Chinese population recognised the brand name of Coca Cola, 42% recognised Pepsi, and 40% recognized Nestle. Mexicans now drink more Coca Cola than milk." Food corporations could not have augmented the globalization of the fast-food centric obesogenic diet to this degree without employing similar tactics to those used by the tobacco industry in the past: supplying misinformation, using supposedly conflicting evidence, and hiding negative data (5).





#### Tobacco in Disguise? Shaming and Shifting Blame

Smoking and obesity are two of the most important global health risk factors, but that is not the only thing that the two have in common. Fast-food and junk-food corporations rely on marketing and advertising tactics that mimic those of the tobacco industry, especially to prey on youth. The U.S. food industry spends over \$30 billion on direct advertisement promotions, more than any other industry (5).

The public health community has responded to the tobacco epidemic through the Framework Convention on Tobacco Control among other efforts to limit smoking prevalence, but the response to the obesity epidemic has largely been: obesity is an "individual responsibility" (5). The food industry's response has been disappointing if being generous and criminal if being accurate.



Chopra and Darnton-Hill describe a common claim of the food industry,

"Firstly, there is the half true contention that there is no such thing as an unhealthy food, only unhealthy diets. Presumably, an unhealthy diet is more likely to be made up largely of unhealthy foods than healthy foods. Healthy foods might be defined as those foods having characteristics that contribute to a diet that is in line with national dietary guidelines." (5)

Yes, it is important to recognize a need for balance in diet; but leaning on this half-truth disguises the liability of the food industry for creating products that are themselves unhealthy as a responsibility of the individual to limit their intake of these foods and choose to eat more "healthy" foods. But as the food industry floods the public with cheap and widely accessible fast-food and processed junk-food as well as bombards them with mass media advertising and marketing strategies to purchase these foods, emphasis on individual autonomy in making food decisions does not add up.

It seems clear that the sociocultural environment consisting of 170,000 fast-food restaurants and 3 million soft-drink vending machines in America has led to our nation's weight gain. On top of that, only 38% of meals eaten are homemade, and many people have never cooked a meal from basic ingredients (5). This blame on individual responsibility fails to acknowledge the obesogenic environments that foster over-nutrition and obesity. And yet, food corporations still have the audacity to point their fingers at the individuals under their reign.



Another half-truth the food industry imposes is that lack of physical activity, not an excessive diet, is the problem. This ignores the evidence shown by much scientific research that a healthy diet can mitigate weight gaining effects of reduced physical activity, and the food industry does so by mimicking another tobacco strategy of conveying to the public that the scientific knowledge on this subject is much more divided than it is (5). To reframe this issue, "physical activity is beneficial for many health outcomes, but even when practiced regularly, it cannot counteract excessive caloric intake" (6). Preventing weight gain comes down to balancing the "calories in" with the "calories out," so blinding the public to the "calories in" plays a major role in why people who do lose weight cannot keep this weight off in the longrun.

According to Koplan and Brownell, the food and beverage industry have also attempted to avert criticism and government intervention by implementing self-regulation and establishing public-private partnerships. This is a common reaction for industries under public fire, and although they have the potential to promote health and public interest, the tobacco industry has used these methods harmfully to undermine public health mandates. Corporations have done this through the development of self-regulatory standards that contradict the science-based criteria for healthy foods (6).





The FDA's 10% daily recommendation for added sugar in contrast to the AHA's 5% recommendation is an example of this divide. The FDA's response to this was, "[w]e disagree that the DRV for added sugars should be lower than 10 percent of calories or that there is adequate evidence at this time to set a DRV for added sugars of less than 5 percent calories." and the 10% figure "is more realistic considering current consumption of added sugars in the United States" (6). Further, "the FDA also declined to convey that the DRV of 10% is a maximum rather than a recommended amount, noting that 'such language would not be appropriate because we do not require this information for other nutrients with DRVs'" (2).

The food industry is, again, following in these footsteps by partnering with respected medical professionals and health organizations to buy influence. Using defensive behavior, the industry acquires the loyalty of scientists and professional organizations while creating conflicts of interest and portraying those who challenge the industry perspective as "biased advocates." Going a step further, the food industry has created and funded front groups such as Americans Against Food Taxes and the Center for Consumer Freedom, simulating the Tobacco Institute, that appear as grassroots support (6).

#### **Corporate Congress**

As the world's largest producer of sugary beverages, Coca-Cola is a prime example of hegemonic food and beverage corporations that profit from dubious marketing strategies. In 2015, the New York Times published an article stating that Coca-Cola recently backed a new "science-based" solution to the obesity crisis: exercise more worry less about cutting calories. Coke provided financial and logistical support to nonprofit organizations and prestigious scientists to advance its agenda that increasing physical activity should be the focus of obesity intervention (7).

Many health experts refuted these messages, labeling them as "misleading" and "part of an effort by Coke to deflect criticism about the role sugary drinks have played in the spread of obesity and Type 2 diabets." In addition, public health advocates have criticized The American Society for Nutrition and the Academy of Nutrition and Dietetics for partnering with companies such as Kraft Foods, McDonald's, PepsiCo and Hershey's, and dietitians who were found to be receiving payments from Coke to present the soda as "a healthy snack" (7). Although Coca-Cola has shifted the blame of obesity on physical activity for many years, the recruitment of medical professionals and acclaimed scientists to testify for them has been a more recent trend. Barry M. Popkin, a professor of global nutrition at the University of North Carolina at Chapel Hill, spoke out about Coke's support of prominent researchers as "reminiscent of tactics used by the tobacco industry, which enlisted experts to become 'merchants of doubt' about the health hazards of smoking" (7).

The food industry not only has control and authority over the general public and professionals but also governmental agencies, which may explain the lack of regulatory action taken. Burnett delineates that fast-food lawsuits are infrequent and unsuccessful in court, yet the U.S. Congress has responded by implementing Senate and House bills to prevent future state or federal lawsuits. Further, 23 states have passed laws that give food manufacturers immunity from obesity lawsuits in state court (1). The fact that the response to obesity and allegations against the food industry has been legislative bans on fast-food lawsuits reveals the blurred, or non-existent, lines between the corporate and Congress.



The food industry also succeeds in subduing regulation around food products and nutrition facts and labeling by portraying the federal government as paternalistic. And with elected representatives sharing in the profits and power, they are too implicit in "hampering the fight against obesity while providing protection to corporations that may be partly responsible for the problem" (1).

Some unsuccessful law proposals, such as the Menu Education and Labeling (MEAL) Act that would address the lack of accessible information about fast-food ingredients, and the Prevention of Childhood Obesity Act, have attempted to make food products more transparent and address obesity. However, there is evidently much room for progress in policy implementation to combat obesity prevalence. Proposals include imposing restrictions on junk-food ads, providing companies with incentives to create healthier foods, implementing a tax on unhealthy food similar to cigarette taxes, and banning soft drinks and junk-food in schools (1).

In conclusion, reformative interventions at both the national and international scale are necessary to address the monstrous extent that obesity and fast-food has pervaded from a largely American and Western concept to a global public health crisis. The complexity of the issue stems largely from the embeddedness of many key public and private institutions and influential individuals with the food industry and its interests. Exposing the food industry may aid efforts to destigmatize obesity by spreading awareness of the overbearing authority and manipulation it uses to encourage people to eat more. Compounding these messages perpetuated and normalized by the food industry with body shaming and self-blame of overweight or obese people does nothing productive. Instead we should cultivate a culture that curtails the command of the food industry, demands accountability through action from governments and legislative bodies, and empowers individuals with acceptance, support, and education.

### WHERE TO NEXT? Steps to solve the obesity epidemic

By Connie Tran

### How can we solve the obesity epidemic?

Obesity within the United States is growing to be an even larger problem than it was in the 20th century. With the growth of the food industry, social media, and other related health problems, the prevalence of obesity has become an increasingly complex issue to tackle. Feasible solutions to the epidemic are harder than ever to approach because of the multitude of social and biological factors that contribute to how an individual may become obese.



#### Public Health Proposed Solutions

Public Health organizations have ruled out diet-related programs as a solution to the obesity epidemic. The jury hopes to work towards limiting marketing and advertising of unhealthy foods, especially for children. This would be done by altering nutrition labels to be less visually pleasing and more focused on the content to accurately communicate what is being consumed. In addition, they hope to raise taxes for sugary and harmful foods and beverages (1).

#### Disproportionate effects of obesity on low-income and communities of color

People who live in lower-income neighborhoods are more susceptible to diabetes due in part to lack of access to fresh produce. Poverty-stricken communities struggle with both hunger and the inability to retrieve healthy food even when they may have the money for it. In addition, there is a strong correlation between obesity and physical inactivity, poor health, premature death, and other metabolic diseases. Physical inactivity within poverty-dense areas may be attributed to higher rates of violence connected to poverty. Proposed solutions include building local community centers that are specifically catered to victims of poverty and would be used to restore their health. These community gatherings would be held once a week, with facility managers providing attendees a safe space to exercise, learn about exercise, and take a healthy meal home afterwards (2).

#### Individual responsibility VS. social, environmental, political public health problem

Research has shown that public health efforts to encourage the increase of physical activity and intake of proper nutrition have been ineffective, expensive, and unsustainable. As a result, researchers decided to adopt a systems-oriented multilevel framework, which considers the interrelated, dynamic, and adaptive factors that can affect obesity. This framework aims to incorporate the idea that policy can possibly influence population health by shifting a focus on "policy, systems, and environmental change strategies." Public health organizations have been working to replace the act of encouraging people to exercise and eat better with the implementation of nutrition and physical activity policies at local and state levels (3).

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