

# INCIDENCE AND PREVALENCE OF TYPE 2 DIABETES IN AMERICA: IS THERE CULPABILITY IN THE FOOD INDUSTRY?

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**Abstract:** In this paper, the authors introduce the topic of type 2 diabetes, offering definitions as well as discussing its major symptoms and causes. We also analyze trends in diagnoses over time, and most significantly, examine how the conventional food system plays a role in the etiology of the medical condition. The topic is of interest to criminology and criminal justice, we argue, because of moral and potential legal culpability in the food industry. When placed in the context of state-corporate crime, outcomes of the conventional food system begin to look a lot like crimes. That is, global corporations produce, process, market, and sell the foods that are killing more humans than nearly anything else on the planet, including drugs and crime. State agencies created and organized to protect consumers not only fail to stop this, but also enable and encourage the production and consumption of unhealthy foods.

**Keywords:** diabetes; conventional food system; state-corporate crime; elite deviance

The “conventional food system” refers to widespread and commercialized production, distribution, and sales of the nutritious (and non-nutritious) substances that we consume to function, grow, and maintain life. It can be differentiated from “alternative food systems” such as local food production, small organic farming, food cooperatives, fair trade systems, and so on (Eames-Sheavly and Wilkins 2006). A large majority of Americans, a large majority of the time, rely on the conventional food system to bring them nourishment. This system—made up of numerous producers, processors, distributors, and retailers of food—provides us “with a varied, relatively inexpensive, and widely available supply of food” (Nesheim, Oria and Yih 2015). Figure 1 illustrates a conception of this system.

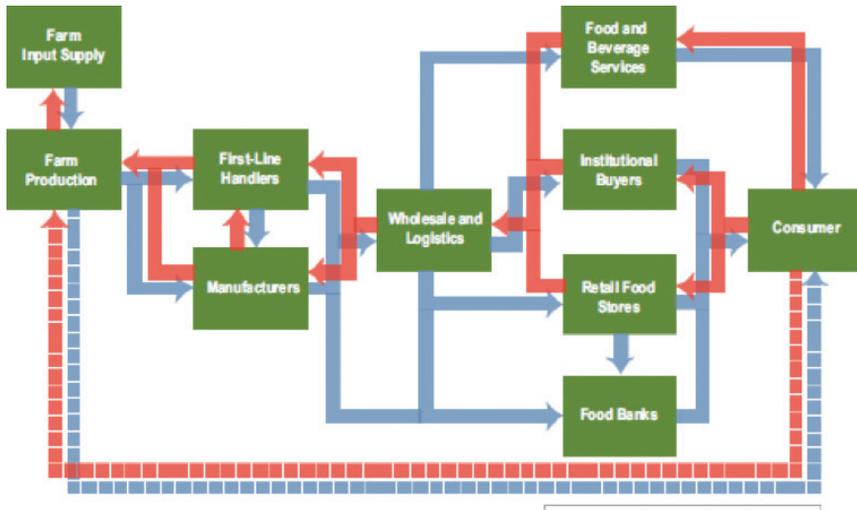
As with any system—although each component organization, group, and individual is vital to the success of the system as a whole—each part also has its own goals and objectives. Some aim simply to grow food to make a living, others to sell food for profit, and still others to improve public health or help

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Figure 1 America's conventional food system



Source: National Academies Press (2017).

[https://www.ncbi.nlm.nih.gov/books/NBK305173/figure/fig\\_2-1/?report=objectonly](https://www.ncbi.nlm.nih.gov/books/NBK305173/figure/fig_2-1/?report=objectonly)

protect the environment. This wide-ranging food system has significant, far-reaching consequences, impacting “the environment (e.g., effects on biodiversity, water, soil, air, and climate), human health (e.g., direct effects on diet-related chronic disease risk, and indirect effects associated with soil, air, and water pollution), and society (e.g., effects on food accessibility and affordability, land use, employment, labor conditions, and local economies)” (Nesheim, Oria, and Yih 2015). The conventional food system is important to capitalistic economies, but it also poses a threat to all of human existence, due to its effects on human health and the physical environment.

Starting with the basics, the US conventional food system is composed of a “food supply chain” (Kinsey 2001; Oskam, Backus, Kinsey and Frewer 2010; Senauer and Venturini 2005). This food supply chain comprises every actor and institution involved in growing (e.g., grains, vegetables, fruits), catching (e.g., fish, other seafood), and raising (e.g., cows, other livestock) our food, as well as those who provide the necessary capital and machinery to do so. It also includes all the people and organizations who turn the raw ingredients into edible food and get it to places where it can be purchased as food (Nesheim, Oria, and Yih 2015). This chain is composed of actors who process foods from their sources (e.g., washing, wrapping, and packing food; aggregating and storing food; providing and utilizing other raw materials

needed to finalize food products), ship to wholesalers and then to stores, stock shelves, set up advertisements, etc. A massive transportation infrastructure is needed to achieve all of this, and includes, obviously, the nation's interstate highways system as well as an enormous system of warehouses. The "state"—composed of numerous agencies and institutions, including lawmakers, regulatory agencies, and more—is charged with overseeing the entire system or food chain.

Taken as a whole, the food system provides nourishment at a relatively affordable price for the US population, not to mention much of the rest of the world. It also comprises a significant portion of economic value in the country (approximately \$776 billion of gross domestic product [GDP] in 2012, or 5% of the total) (Nesheim, Oria, and Yih 2015). Yet, the system, as it is currently organized, also ensures that a large portion of the population consumes unhealthy foods at rates that are not tolerable and that lead to terrible health outcomes, including serious illness and death from conditions such as obesity and type 2 diabetes (the latter is the focus of this paper). Stated simply, the damage caused to humans by the foods we consume vastly outweighs that caused by street crime. That there is culpability by economic elites in these outcomes—both in industry and government—makes them relevant for criminologists, and in particular, state-corporate criminologists, who study crimes resulting from the interactive actions of states and corporations (Kramer and Michalowski 1991).

In this paper, we introduce the medical condition, type 2 diabetes. We discuss its nature, incidence and prevalence, trends, and causes. Throughout, we discuss culpability of key actors in the conventional food system, placing the discussion in the context of state-corporate criminality.

## **State-Corporate Criminality**

State-corporate crime refers to acts of elite deviance (some illegal, some not), conducted by corporations for profit, with the assistance, approval, reward, and/or complicity of government(s) (Kramer 1990; Kramer and Michalowski 1991; Kramer, Michalowski, and Kauzlarich 2002; Ross 2017; Whyte 2014). One fundamental purpose of scholarship on state-corporate crime is to illustrate that such crimes would not be possible without the assistance of the state. As an example, a study by Friedrichs and Rothe (2014:146) illustrated how large-scale fraud by banks and investment banks is committed with the assistance of "government-sponsored enterprises and international financial institutions". Other scholarship supports this conclusion, implicating, at a minimum, individual actors, corporate actors and enablers, and failing regulatory agencies (Hansen 2009; Pontell 2005). A recent analysis of the collapse of the US economy in 2008 examined reports by the US Senate Permanent Subcommittee on Investigations and the Financial Crisis

Inquiry Commission, and clearly illustrated that both corporate and state organizations were responsible for the “financial crisis” (Robinson and Rogers 2018).

As globalization continues and the influence of capital continues to spread across the globe, it is increasingly clear that state-corporate crime is not limited to a nation-state such as the United States, but is instead international in nature (Tombs 2012). In this paper, we examine rising rates of diabetes in the United States, and identify corporate and state entities that play a role in it. Yet, diabetes is also rising across the globe. One major reason this is happening is that large-scale companies, with international reach and assisted by states and international organizations, produce, manufacture, market, and sell their foods to citizens of nearly every nation. One could even argue that the behaviors of powerful entities that assure the continuation of diabetes across the globe constitute violent state-corporate crime (Kramer 1994), for the outcomes are widespread suffering, illness, and death. Although some might take issue with the term “crime”—most of what is involved in the food industry is not explicitly illegal (Tappan 1947)—their actions are nevertheless dangerous and often deviant in nature (e.g., when companies lie about the contents of their food products or adulterate them in ways that are dangerous to human life).

### **Food Crime**

A growing body of literature on the crimes of the food industry has emerged (e.g., see Gray and Hirsch 2018). The term “food crime” was first used by Hazel Croall (2007: 206) to describe the “many crimes that are involved in the production, distribution, and selling of basic foodstuffs.” Later, Croall (2013: 167) defined food crime as the behaviors in the food industry that are “morally dubious” and also sometimes illegal, which involves “manipulation and exploitation of the planet.” Gray and Hinch (2015: 97) add that food crimes involve “serious harms . . . addressed beyond the traditional definitions of crime” that have “negative consequence for a variety of both human and non-human victims.” Later, these scholars suggested that food crime includes “illegal, criminal, harmful, unjust, unethical or immoral food-related” behaviors and omissions of behavior (such as poor regulation of harmful foods by the government; Gray and Hinch 2018: 12).

As examples, Croall (2013) discusses food poisoning (also see Leighton 2018), fraud, misleading advertisements, inequality of food availability, illegal trade and pricing in the food industry, labor exploitation, animal cruelty (also see Beirne 1999), and other behaviors that are typically “lawful but awful” (Passas 2005). Some food crimes are illegal, yet are not handled as criminal offenses but instead through regulatory laws. With regard to fraud, Croall examines foods that are watered down as well as companies that sell branded foods that are no better or different than generic foods. Croall also examines foods that are actually deadly

based on additives or inadequate regulation for safety. Poor regulation also produces widespread food poisoning, which causes illness and occasionally death.

Smith, Manning, and McElwee (2017: n.p.) define food fraud as “the deliberate and intentional substitution, addition, tampering, or misrepresentation of food, food ingredients, or food packaging; or false or misleading statements made about a product for economic gain.” These behaviors are “carried out intentionally to avoid detection by regulatory bodies or consumers.”

Croall (2013) identifies the following as documentable harms produced by food crime: environmental degradation, increased greenhouse gases, food waste, airborne pollution, less soil fertility, erosion of land, increased flooding, crop resistance to antibiotics, species decline, reduced farm labor, monopolization, wage deflation, hunger, and various health conditions such as obesity, illness, and death. Monopolization and unfair trade practices can also logically be seen as unethical and even illegal behaviors, as can wage deflation, bullying, and control of prices by suppliers.

Other unethical and potentially illegal behaviors by food companies include exploitation of labor, such as in the case of seasonal and migrant workers—described as the “new slavery” by some (Lawrence 2008: 111)—and forcing employees to work in hazardous conditions. Factory farming is not only horribly cruel to animals, but also is often harmful to employees as well as the environment, as in cases where animal waste and chemicals pollute waterways (e.g., see Mugni, Demetrio, Paracampo, Pardi, Bulus, and Bonetto 2012).

Gray and Hinch (2015) also discuss different forms of potential deviant and criminal behavior in the food industry. These include low pay for farm workers, child labor and slavery in the production of food (e.g., see Coe and Coe 2013; Schrage and Ewing 2005), the dominant power held by agribusiness over traditional farmers (e.g., see Culp 2005; Fairley 1999; Fatka 2013), pesticide use on crops (e.g., see Del Prado-Lu 2018; Goodman 2011), patented seeds and unintentional violations of those patents, laws that tend to better protect agribusiness than farmers and consumers, and weak enforcement of existing regulations. Later, the same authors (Gray and Hinch 2018) add a focus on acts such as forced labor and slavery in the food industry (e.g., see Hinch 2018; Satre 2005), the use of hazardous chemicals in farming, food poisoning through corporate negligence, animal slaughter, unethical food labels and trade policy (e.g., see Lawrence 2004), unhealthy school lunches, the impact of food production on climate change (e.g., see White and Yeates 2018), and more.

Other scholars have written about monopolization of numerous parts of the conventional food system, including bio-technology involved in genetically modified foods (GMOs) (Walters 2006), potential harms associated with GMOs themselves (Boone 2013; Morgan and Goh 2004; Nottingham 2003; Walters

2008), environmental harms such as threats to the quality of air, soil, and water (White 2014), buying up or seizing land for food and biofuel production and extracting valuable natural resources, referred to as “land grabbing” (White 2012), food waste (Long and Lynch 2018), and numerous other crimes such as bribery and corruption that stem from activities of organized crime syndicates involved in the food industry (White 2014). White (2014: 835) describes the extensive government and corporate security mechanisms that have grown to protect “a platform of state, corporate, organized group wrongdoing and injustice.” This is another reminder of the close connections between food corporations and the state.

All of these behaviors are confined in the context of “cheap capitalism,” which is “characterized by degraded business morality, low prices and/or unsafe goods or services, and low-waged labour to maximize profits” (Asomah and Cheng 2018: 194). This makes sense given that practices such as “industrialization, corporatization, and neoliberalization have drastically reformed the modern practices of the food industry, as well as the regulations which govern them” (Gray & Hinch 2015: 97).

Such behaviors are certainly relevant for criminology, although only a handful of scholars have examined these behaviors (Croall 2012, 2013; Fitzgerald 2010; Gray & Hinch 2015, 2018; Nally 2011; Walters 2006, 2008; White 2012, 2014). These are the behaviors meant to be studied by the new “Food Criminology” (Robinson 2017). Food criminology has a “social harm” focus, thereby not being constrained by the criminal law, which typically benefits the powerful people who write and fund it through political campaigns (Robinson 2015). This focus encourages social scientists to focus on acts (and failures to act) in the food industry that are “threatening to public health and safety, or ha[ve] negative consequences on either human or non-human victims, including environmental harms,” whether legal or illegal (Gray and Hinch 2018: 16). These outcomes can be traced back to the corporations and government agencies that produce and assist in the production of the foods we consume.

### **Major Food Companies**

The production, manufacture, and distribution of unsafe, hazardous, unhealthy, and deadly foods occur in part because many national and international organizations permit, encourage, and reward the activities of powerful entities involved in the conventional food system. It is not possible to fully understand these behaviors without acknowledging this reality (Griffin and Spillane 2016). Consider the biggest food companies in the world for an example of how large and powerful these entities are, and how they rely on state actors for their successes.

Information collected by Oxfam demonstrates that only a dozen companies control nearly all of the world's food supply. These companies include Mondelez, Kraft, Coca-Cola, Nestlé, PepsiCo, Proctor & Gamble, Johnson & Johnson, Mars, Danone, General Mills, Kellogg's, and Unilever (Ryan 2017). That only twelve companies dominate the conventional food system is highly suggestive of the incredible power that these actors have over the production, processing, marketing, and sales of food in the United States and across the world. According to McGrath (2017), the top 25 companies in the food industry brought in \$741.2 billion in revenue in 2016, resulting in \$86 billion in profit. Jusko (2017) reports that 31 food companies are among the top 500 revenue-generating publicly held manufacturing companies in the United States. The top ten revenue-generating food companies from 2017 are shown in Table 1. A description of these companies is contained in the Appendix.

In addition to these individual global corporations, there are additional organizations that act on behalf of them as well as their particular interests (e.g., restaurants, sugar, corn, milk, etc.). These include, but are not limited to, the National Restaurant Association, the Sugar Association, the American Sugar Alliance, Corn Refiners Association, the American Dairy Association, National Dairy Council, International Dairy Foods Association, Dairy Alliance, the North American Meat Institute, American Association of Meat Processors, and the National Meat Association. Each of these organizations lobbies on their own behalf, as well as that of the companies above. Finally, it should be pointed out that these food companies do not include corporations such as Coca-Cola and Pepsi, although they undeniably share culpability for medical problems such as diabetes. According to Mourdoukoutos (2018), Coca-Cola ranks sixth among the nation's most valuable brands (with about \$34 billion in revenue in 2017), while Pepsi ranks 29th (with about \$64 billion in revenue in 2017).

Table 1 The top ten revenue-generating food companies (2017)

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1.	Archer-Daniels-Midland Co. (\$62.3 billion in 2016 revenue, \$1.3 billion in 2016 net income)
2.	Bunge Ltd (\$42.7 billion in 2016 revenue, \$745 million in 2016 net income)
3.	Tyson Foods (\$36.9 billion in 2016 revenue, \$1.8 billion in 2016 net income)
4.	Kraft Heinz Co. (\$26.5 billion in 2016 revenue, \$3.6 billion in 2016 net income)
5.	Mondelez International Inc. (\$25.9 billion in 2016 revenue, \$1.7 billion in 2016 net income)
6.	General Mills Inc. (\$16.6 billion in 2016 revenue, \$1.7 billion in 2016 net income)
7.	Kellogg Co. (\$13 billion in 2016 revenue, \$694 million in 2016 net income)
8.	Conagra Brands Inc. (\$11.6 billion in 2016 revenue, \$677 million in 2016 net income)
9.	Hormel Foods Corp. (\$9.5 billion in 2016 revenue, \$890 million in 2016 net income)
10.	Campbell Soup Co. (\$8 billion in 2016 revenue, \$563 million in 2016 net income)

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Without any question, these companies do an enormous amount of good as they are the largest businesses involved in feeding the people of the world. Moreover, many of these companies are engaged in responsible and prosocial charitable activities around the world. Each is, to at least some degree, helping to provide healthier food products in response to growing consumer demand for them. At the same time, these companies produce a large number of products that unquestionably contribute to the development of diabetes as well as obesity. As such, there is logically legal and moral culpability in these companies for these outcomes. The same is true for government agencies involved in our conventional food system.

### **Major State Agencies**

A very large number of government agencies at many levels of government (e.g., local, state, federal) are involved in the US food system. The agencies are responsible for the quality and safety of and/or regulation of farming, fishing, ranching, water, land, labor, shipping, handling, processing, storing, trading, and shipping, as well as the overall safety of workers and the food they produce. These agencies include, but are not limited to, those most known to the American people—the US Department of Agriculture (USDA), the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA)—but also many other agencies at a federal, state, and local level.

The USDA “provide(s) leadership on food, agriculture, natural resources, rural development, nutrition, and related issues based on public policy, the best available science, and effective management” (USDA 2018). Table 2 shows the many agencies that are part of the USDA. As illustrated in the table, the USDA not only regulates food products to assure consumer safety (Food Safety and Inspection Services), but also promotes the health and well-being of consumers by creating dietary guidelines (Center for Nutrition Policy and Promotion); assists in the regulation of animals and plants (Animal and Plant Health Inspection Service); helps protect forests and grasslands (Forest Service); helps conserve natural resources (Natural Resources Conservation Service); directly helps farmers through loans, conservation efforts, marketing, and risk insurance (Farm Service Agency, Risk Management Agency); assists in the development of rural areas (Rural Development); conducts different types of research (Agricultural Research Service, Economic Research Service, National Institute of Food and Agriculture); helps market agricultural products in and beyond the United States (Agricultural Marketing Service, Foreign Agricultural Service, Grain Inspection, Packers and Stockyards Administration); maintains a library about agriculture (National Agricultural Library); and provides helpful data for people involved in food production (National Agricultural Statistical Service).

Table 2 Agencies part of the United States Department of Agriculture (USDA)

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Agricultural Marketing Service (AMS)

AMS facilitates the strategic marketing of agricultural products in domestic and international markets while ensuring fair trading practices and promoting a competitive and efficient marketplace. AMS constantly works to develop new marketing services to increase customer satisfaction.

Agricultural Research Service (ARS)

ARS is the USDA's principal in-house research agency. ARS leads America towards a better future through agricultural research and information.

Animal and Plant Health Inspection Service (APHIS)

APHIS provides leadership in ensuring the health and care of animals and plants. The agency improves agricultural productivity and competitiveness and contributes to the national economy and the public health.

Center for Nutrition Policy and Promotion (CNPP)

CNPP works to improve the health and well-being of Americans by developing and promoting dietary guidance that links scientific research to the nutrition needs of consumers.

Economic Research Service (ERS)

ERS is the USDA's principal social science research agency. Each year, ERS communicates research results and socioeconomic indicators via briefings, analyses for policymakers and their staffs, market analysis updates, and major reports.

Farm Service Agency (FSA)

The FSA implements agricultural policy, administers credit and loan programs, and manages conservation, commodity, disaster, and farm marketing programs through a national network of offices.

Food and Nutrition Service (FNS)

FNS increases food security and reduces hunger in partnership with cooperating organizations by providing children and low-income people with access to food, a healthy diet, and nutrition education in a manner that supports American agriculture and inspires public confidence.

Food Safety and Inspection Service (FSIS)

FSIS enhances public health and well-being by protecting the public from foodborne illness and ensuring that the nation's meat, poultry, and egg products are safe, wholesome, and correctly packaged.

Foreign Agricultural Service (FAS)

FAS works to improve foreign market access for US products. This USDA agency operates programs designed to build new markets and improve the competitive position of US agriculture in the global marketplace.

Forest Service (FS)

FS sustains the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

Grain Inspection, Packers and Stockyards Administration (GIPSA)

GIPSA facilitates the marketing of livestock, poultry, meat, cereals, oilseeds, and related agricultural products. It also promotes fair and competitive trading practices for the overall benefit of consumers and American agriculture. GIPSA ensures open and competitive markets for livestock, poultry, and meat by investigating and monitoring industry trade practices.

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National Agricultural Library (NAL)

NAL ensures and enhances access to agricultural information for a better quality of life.

National Agricultural Statistics Service (NASS)

NASS serves the basic agricultural and rural data needs of the country by providing objective, important and accurate statistical information and services to farmers, ranchers, agribusinesses and public officials. This data is vital to monitoring the ever-changing agricultural sector and carrying out farm policy.

National Institute of Food and Agriculture (NIFA)

NIFA's mission is to invest in and advance agricultural research, education, and extension to solve societal challenges. NIFA's investments in transformative science directly support the long-term prosperity and global preeminence of U.S. agriculture.

Natural Resources Conservation Service (NRCS)

NRCS provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

Risk Management Agency (RMA)

RMA helps to ensure that farmers have the financial tools necessary to manage their agricultural risks. RMA provides coverage through the Federal Crop Insurance Corporation, which promotes national welfare by improving the economic stability of agriculture.

Rural Development (RD)

RD helps rural areas to develop and grow by offering Federal assistance that improves quality of life. RD targets communities in need and then empowers them with financial and technical resources.

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Source: US Department of Agriculture (2019). <https://www.usda.gov/our-agency/agencies>

The FDA has the simply stated but extremely complex mission of “protecting human and animal health” (FDA 2018). The agency has jurisdiction over much of the nation’s food products but also deals with drugs, medical devices, radiation-emitting products, vaccines, blood and biologics, animals and veterinary issues, cosmetics, and tobacco! With regard to food, the FDA helps prevent foodborne illness and provides information for labeling on most packaged foods. The agency also provides information on food additives, ingredients, allergens, and dietary supplements, as well as on “pathogens, chemicals, pesticides, natural toxins, and metals” in food. The FDA also conducts research on food and food production, issues food recalls due to illness outbreaks, and helps defend the food system from criminal and terrorist attacks. Additionally, the FDA offers “guidance and regulatory information” directly to the industry about many topics related to food, as well as assuring compliance with and enforcing federal regulations related to food.

The mission of the EPA is to help assure Americans have access to “clean air, land and water” (EPA 2018). The EPA creates and enforces regulations meant to assure this goal, but also conducts research on environmental problems; provides grants to states, non-profit agencies, educational institutions, etc.; partners with corporations, state and local governments, and non-profits to conserve natural resources; and provides educational materials about environmental protections. The role of the EPA in the production of food primarily centers around protecting natural resources to make food production as effective and efficient as possible.

In addition to these agencies, other agencies such as the US Centers for Disease Control and Prevention (CDC) assist with assuring safe foods. The CDC tracks foodborne germs and illnesses, provides information on food poisoning—which it claims impacts one in six Americans every year—and works with federal, state, and local health officials to investigate sources of food poisoning (CDC 2018c).

It should be obvious from the brief descriptions of the missions of these agencies that they are closely aligned with the corporations that produce the food that is the main source of food for Americans and citizens around the world. So, too, are regulatory agencies in other countries. That these state agencies help directly market products for companies and assist with assuring their successes in the marketplace domestically and abroad may surprise some. What is well-known is that regulation of food companies (and other corporations) is often negligent due to the “revolving door” between corporations and regulatory agencies—meaning officials move back and forth between the two—so that companies are being regulated by people with more information about but also stronger loyalties to the companies (Lima 2018). This makes effective regulation for consumer health and safety less likely. So too does deregulation generally, as in the case of deregulation of fast food products and its effects on body mass index (BMI) (De Vogli, Kouvonon, and Gimeno 2014).

In part because of the cozy relationship between government agencies and corporate entities, food companies are freer to market their products through corporate-friendly studies (Marion 2018). They are also free to encourage us to eat more and more and more, towards the goal of greater profits and in spite of the negative health effects on consumers (Nestle 2013). And the system of US government generally allows companies who produce and market unhealthy products such as sodas to guarantee billions of dollars in sales through advertising to vulnerable populations, lobbying government officials and political parties, making financial donations to health organizations and researchers to muddy conclusions of scholarship on food and health, and producing advertisements claiming corporate responsibility (Marion 2017).

The close relationships between government agencies and the corporations that produce, market, and sell food exemplifies state-corporate criminality given the detrimental health outcomes associated with the conventional food system. Now that we've identified the main actors in corporations and states involved in the production, distribution, and regulation of food in the United States and around the world, we now turn to one outcome of our conventional food system—type 2 diabetes. When reading the material that follows, consider the harms associated with food, which clearly dwarf those of street crime every year.

## Type 2 Diabetes

Diabetes is a medical condition resulting from the interactive effects of poor nutrition, physical inactivity, and genetics. Diabetes causes blood glucose (i.e., sugar) levels to rise higher than normal (American Diabetes Association 2017). Thus, the condition is also frequently referred to as *hyperglycemia*. Diabetes is a metabolic disorder, meaning it impacts the way the body uses food to help us grow and use energy (WebMD 2017).

Under normal circumstances, the pancreas releases the hormone insulin so that the body can store and use sugar and fat from the foods we eat in order to generate energy we need to live and move. The amount of insulin produced by the pancreas directly impacts glucose levels in the blood. Insulin is constantly released by the pancreas to regulate the amount of sugar in the blood. When glucose levels rise to a certain level, more insulin is released into the body to force more glucose into the body's cells, causing blood sugar levels to drop.

If glucose levels drop too far, the condition *hypoglycemia* occurs, creating a shaky feeling that signals it is time to eat. This also releases glucose into the blood stream that is normally stored in the liver. Diabetes occurs when the pancreas produces no insulin or very little insulin or the body does not appropriately respond to insulin (this is called *insulin resistance*), leading to higher levels of blood sugar.

There are three types of diabetes—gestational, type 1, and type 2. Gestational diabetes occurs during pregnancy. The primary difference between type 1 and type 2 diabetes is that the former has its roots in genetics and the latter is mostly caused by environmental or lifestyle factors (yet also impacted to some degree by genetics). Specifically, type 1 diabetes occurs when beta cells (the cells that produce insulin in the pancreas) are attacked by the immune system. This is produced by certain genes passed down from parent to child, and is also thought to be impacted by viral exposure. The result is the production of no insulin, requiring insulin injections. According to the CDC (CDC 2017a), type 1 diabetes tends to appear quickly and be diagnosed in childhood, adolescence, or early adulthood.

Historically, it was called “juvenile diabetes” and “insulin-dependent” diabetes. Only 5% of people with diabetes have type 1 diabetes.

Type 2 diabetes is far more common and develops over time, typically in adults. People with type 2 diabetes produce insulin, but the insulin is not at sufficient levels or the person has insulin resistance. Historically, type 2 diabetes was also called “adult-onset diabetes” because it only occurred in adults. Yet, a rapid rise in overweight and obese children has led to a surge in type 2 diabetes in children. We argue in this paper that both corporate and government agencies share responsibility for this reality.

### **Symptoms of Type 2 Diabetes**

The major symptoms of diabetes include hunger, dry mouth and thirst, the need to urinate, fatigue, blurred vision and vision loss, itchy skin, slowly healing cuts, increased yeast infections, red or sore gums, and numbness, tingling, or pain in the extremities (American Diabetes Association 2017; CDC 2017a). Many of the symptoms of diabetes are relatively minor; others are quite severe and even life threatening. Diabetes can cause macrovascular disease (damage to large blood vessels) and microvascular disease (damage to small blood vessels). Stroke and heart attack can be complications of macrovascular disease and microvascular disease can lead to eye, nerve, and kidney problems.

Diabetes is also a risk factor for heart disease and, according to the CDC, adults with diabetes have a 200–400% increase for risk of stroke or dying of heart disease. Diabetics can also develop neuropathy, which is nerve damage. The most common type of neuropathy is peripheral neuropathy, which causes numbness and pain in legs, feet, toes, and arms. High blood sugar can cause damage to the blood vessels in the retina, which can cause vision problems and even blindness. Additionally, the poor circulation of diabetics means they do not heal as well as non-diabetics due to the reduced flow of blood, oxygen, and nutrients (Dresden 2017); this may lead to amputation of body parts in extreme cases (McDermott 2016).

As will be shown in the section below, far more people suffer from the health effects of diabetes than from serious criminal victimization in the United States. We contend this makes the paper of great import to the academic disciplines of criminology and criminal justice.

### **Incidence and Prevalence of Type 2 Diabetes in the United States**

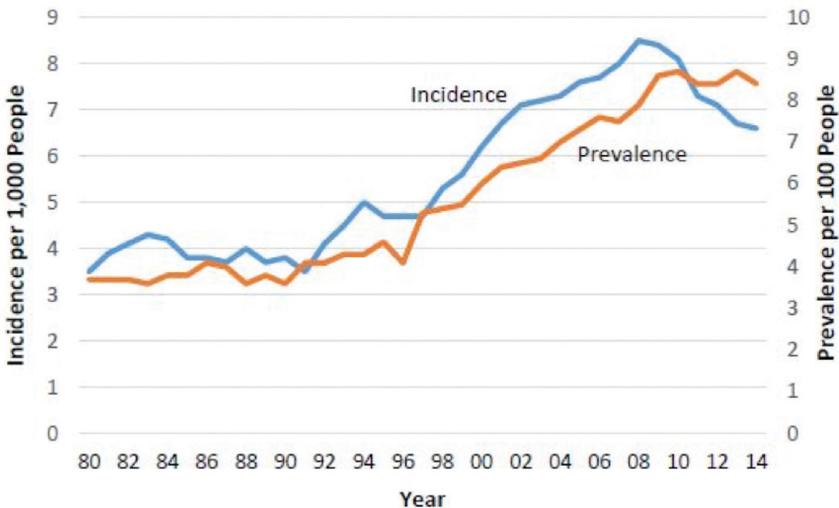
As noted earlier, type 2 diabetes makes up approximately 95% of all diabetes (Geiss, Wang, Cheng, Thompson, Barker, Li, and Gregg 2014). Given that type 2 diabetes is environmentally produced, nearly all diabetes can be prevented through environmental intervention. Yet, the prevalence of diabetes in America has been

steadily increasing since 1958, according to data from the National Health Interview Survey (NHIS) (Skyler and Oddo 2002). There have been more and more cases diagnosed over the years, with prevalence increasing with age. Diabetes will only continue to grow as people continue to become obese and live sedentary lifestyles (Skyler and Oddo 2002).

Figure 2 shows trends over time in the incidence and prevalence of diabetes in the United States. This figure demonstrates that diabetes began to rise around 1990, roughly one decade later than increases in obesity; this makes sense given that obesity raises the risk of diabetes over time.

By 2015, 30.3 million Americans (9.4% of the US population) had diabetes. Additionally, more than 84 million Americans had prediabetes, “a condition that if not treated often leads to type 2 diabetes within five years” (CDC 2017b). According to the CDC (2017a), “Prediabetes is a serious health condition where blood sugar levels are higher than normal, but not high enough yet to be diagnosed as diabetes”. Prediabetes increases your risk for type 2 diabetes, heart disease, and stroke. It has been estimated that the prevalence of diabetes in the United States will increase by 165% between 2000 and 2050 (Narayan, Boyle, Thompson, Sorenson, and Williamson 2003). For comparison purposes, there were 5 million victims of

Figure 2 Trends in incidence and prevalence of diagnosed diabetes among adults aged 20–79, United States 1980–2014



Source: Centers for Disease Control and Prevention (2016). <https://www.cdc.gov/chronicdisease/resources/publications/aag/diabetes.htm>

violent crime in 2015, 1.8 million of which were victims of serious violent crime. Of those, only 658,040 were physically injured (Truman and Morgan 2018).

The National Diabetes Statistics Report found that in 2015 there were approximately 1.5 million new cases of diabetes among Americans aged eighteen years and older (CDC 2017b). The mean age at which diabetes was diagnosed has also decreased over the years (Koopman, Mainous, Diaz, and Geesey 2005). From 1988 to 1994 the mean age was 52 years and from 1999 to 2000 the mean age decreased to 46 years (Koopman, Mainous, Diaz, and Geesey 2005). This change could indicate an earlier detection of type 2 diabetes or an earlier onset of the disease (Koopman, Mainous, Diaz, and Geesey 2005).

There has also been evidence that type 2 diabetes has been diagnosed more in adolescents (Koopman, Mainous, Diaz, and Geesey 2005). Data analyzed from the SEARCH for Diabetes in Youth study show that there is a relative 4.8% increase in youth with type 2 diabetes annually, after adjustments are made for ethnicity, age, and sex (Mayer-Davis, Lawrence, Dabelea, Divers, Isom, Dolan, and Wagenknecht 2017). It was also estimated that there were 3,800 cases of type 2 diabetes diagnosed among youth annually from 2002 to 2003, while the number grew to 5,300 cases per year in 2011–2012 (CDC 2017c; Mayer-Davis, Lawrence, Dabelea, Divers, Isom, Dolan, and Wagenknecht 2017).

### **Outcomes of Type 2 Diabetes**

According to the American Diabetes Association, “Diabetes was the seventh leading cause of death in the United States in 2015 based on the 79,535 death certificates in which diabetes was listed as the underlying cause of death” (Statistics about Diabetes 2017). Diabetes was also listed as a cause of death in a total of 252,806 death certificates. It is also possible that diabetes is being under-reported as a cause of death in the United States; studies have shown that only about 35–40% of diabetics had the illness listed on their death certificate after they died, and only 10–15% had diabetes recorded as the underlying source of death (Statistics about Diabetes 2017). For comparative purposes, there were 15,696 acts of murder and nonnegligent manslaughter in the United States in 2015 (FBI 2019).

Some of the indirect costs of diabetes include missed days at work, reduced productivity at work, and an inability to work due to health conditions (Petersen 2013). Type 2 diabetes also causes other significant economic burdens. In 2007, the total approximate cost of diagnosed diabetes in the United States was \$147 billion. This number increased to \$245 billion in 2012, \$176 billion due to direct medical costs, and \$69 billion due to reduced productivity. Medical costs include “hospital inpatient care (43% of the total medical cost), prescription medications to treat the complications of diabetes (18%), antidiabetic agents and diabetes

supplies (12%), physician office visits (9%), and nursing/residential facility stays (8%)” (Petersen 2013). For comparative purposes, the direct costs to victims of street crime were between \$12.5 billion and \$13.1 billion in 2008 (Robinson and Tauscher 2019).

It was estimated that the lifetime cost of treating type 2 diabetes and its complications in men diagnosed at age 25–44 was \$124,700. The lifetime cost for men diagnosed between 45–54 was \$106,200; for men diagnosed between 55–64 the cost was \$84,000; and for men above the age of 65 the cost was \$54,700. The lifetime cost for women was found to be slightly higher. Women diagnosed at 25–44 years had a lifetime medical cost of \$130,800. Women who were diagnosed between the ages of 45–54 had a cost of \$110,400; women diagnosed at ages 55–64 had a cost of \$85,500; while women diagnosed over the age of 65 had \$56,600 in medical costs (Zhuo, Zhang, and Hoerger 2013).

### **Causes of Type 2 Diabetes**

Like virtually every behavioral and medical condition, the causes of type 2 diabetes are complex and involve a combination and interaction of various factors, including genetics and environmental factors. Whereas many Americans believe in the idea of free will and thus likely hold that we are solely responsible for how much we weigh and how (un)healthy we are, research shows that weight and health are impacted by many variables, including genetics/epigenetics, as well as the foods and drinks we consume, and the amount of physical activity in which we engage. The latter two factors are impacted by community level factors, advertising by businesses, and other decisions made by elites in the conventional food system. Due to the poor diet and nutrition promoted and even celebrated by companies that comprise the food industry—with the assistance of the state—Americans suffer from heart disease, many forms of cancer, strokes, type 2 diabetes, numerous other health conditions, diminished quality of life, and even death, many of which are produced by type 2 diabetes and obesity, its antecedent.

The CDC notes that both genetics and behavior contribute to the problem of being overweight or obese. In addition, where people live directly impacts their weight, based on factors such as availability of quality food and access to exercise opportunities. The behaviors that influence weight “include eating high-calorie, low-nutrient foods and beverages, not getting enough physical activity, sedentary activities such as watching television or other screen devices, medication use, and sleep routines” (CDC 2018b). Conversely, eating healthy foods, remaining physically active, and getting enough sleep are associated with healthier weights as well as reductions in “chronic diseases such as type 2 diabetes, cancer, and heart disease.” Access to low quality and high quality foods, and availability of exercise

opportunities, are heavily dependent on actions of both food companies and government agencies. We revisit this later in the paper.

## The Role of Food in Overweight, Obesity, and Type 2 Diabetes

Clearly, food is significantly involved in being overweight, obesity, and diabetes, as well as in many chronic illnesses (Naqvi 2017; Sami, Ansari, Butt, and Hamrid 2017). CDC suggests that people should follow the

2015–2020 *Dietary Guidelines for Americans*. This means eating more healthy foods like fruits, vegetables, and whole grains, and less unhealthy foods like sugars, salts, and fats.

Further, “The *Physical Activity Guidelines for Americans* recommends children aged 6 years or older do at least 60 minutes of physical activity every day.” Americans do not eat well, nor generally exercise enough.

Specifically, the typical American diet is too low in minerals, vitamins, whole grains, fruits, and vegetables, as well as being too high in fat, saturated fat, cholesterol, processed grains, sugar, and salt. This statement is based on an assessment of what Americans actually eat, compared with the measure of the Daily Value (DV), which is a combination of the Daily Reference Value (DRV) and Reference Daily Intake (RDI) (FDA 2017).

Table 3 shows the DV for adults and children over the age of four years, based on a caloric intake of 2,000 calories. Actual caloric needs for individuals vary by size (i.e., weight) as well as activity level, but this table gives an idea of what the average person needs.

When the DV is compared to what Americans actually eat, the disparities are startling. According to the Office of Disease Prevention and Health Promotion (ODPHP)—created in 1976 as part of the US Department of Health and Human Services—Americans eat too little of what they are supposed to eat and too much of what they are not supposed to eat. Specifically:

- About three-fourths of the population has an eating pattern that is low in vegetables, fruits, dairy, and oils.
- More than half of the population is meeting or exceeding total grain and total protein foods recommendations, but . . . are not meeting the recommendations for the subgroups within each of these food groups.
- Most Americans exceed the recommendations for added sugars, saturated fats, and sodium.

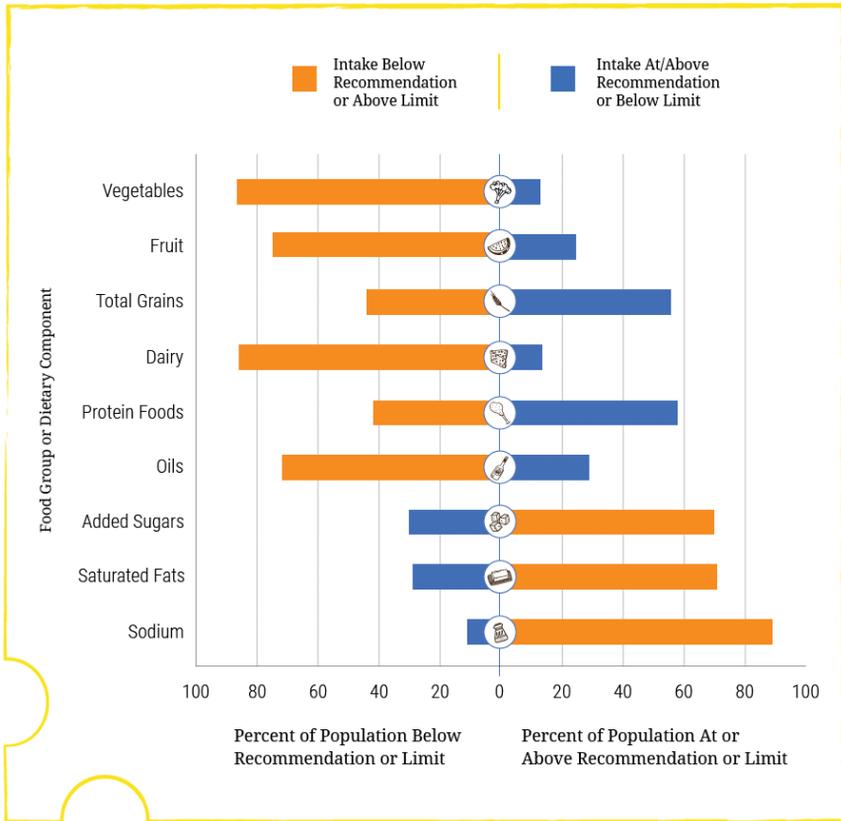
- The eating patterns of many are too high in calories.
- The American diet falls short in potassium, fiber, choline, magnesium, calcium, and vitamins A, C, D, and E (ODPHP 2017).

Figure 3 shows the percentage of the US population age one year and older who are at, below, or above each dietary goal or limit.

Table 3 Recommended Daily Values (DV) for adults and children four years and older

Food Component	DV
Total Fat	65 grams (g)
Saturated Fat	20 g
Cholesterol	300 milligrams (mg)
Sodium	2,400 mg
Potassium	3,500 mg
Total Carbohydrate	300 g
Dietary Fiber	25 g
Protein	50 g
Vitamin A	5,000 International Units (IU)
Vitamin C	60 mg
Calcium	1,000 mg
Iron	18 mg
Vitamin D	400 IU
Vitamin E	30 IU
Vitamin K	80 micrograms (µg)
Thiamin	1.5 mg
Riboflavin	1.7 mg
Niacin	20 mg
Vitamin B6	2 mg
Folate	400 µg
Vitamin B12	6 µg
Biotin	300 µg
Pantothenic acid	10 mg
Phosphorus	1,000 mg
Iodine	150 µg
Magnesium	400 mg
Zinc	15 mg
Selenium	70 µg
Copper	2 mg
Manganese	2 mg
Chromium	120 µg
Molybdenum	75 µg
Chloride	3,400 mg

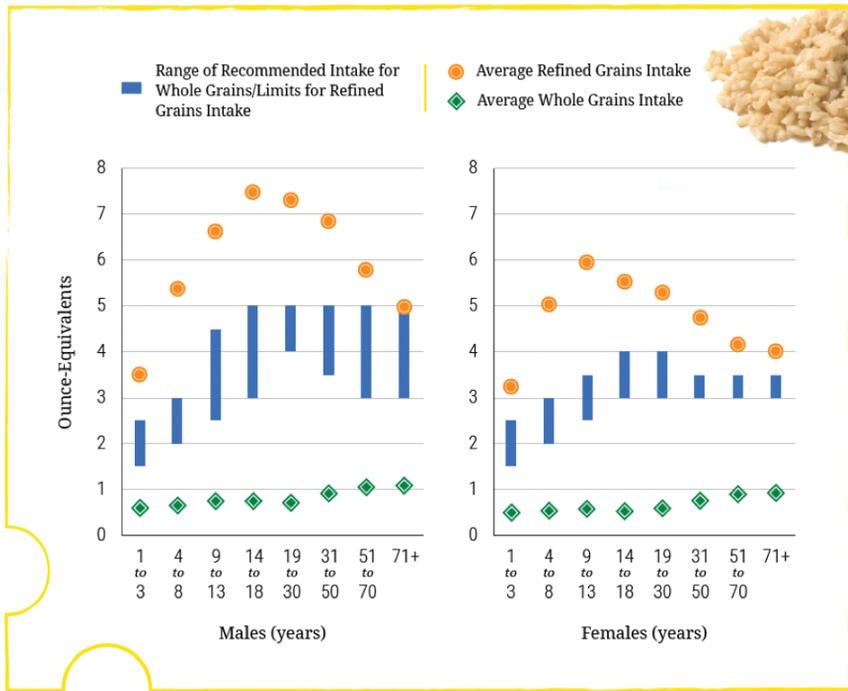
Figure 3 Dietary intakes compared to recommendations. Percentage of the US population aged 1 year and older who are below, at, or above each dietary goal or limit



Source: Office of Disease Prevention and Health Promotion (2015). <https://health.gov/dietaryguidelines/2015/guidelines/chapter-2/current-eating-patterns-in-the-united-states/>

Data from the ODPHP show that Americans eat too few vegetables (including dark green vegetables, red and orange vegetables, legumes, starchy vegetables, and other vegetables), too few fruits (but too much sugar from fruit juices), not enough whole grains, not enough dairy, and not enough “nutrient-dense foods”—foods that do not contain “added calories from components such as added sugars, added refined starches, solid fats, or a combination.” Americans also eat too many refined grains. Figure 4 illustrates how far Americans fall short of eating enough whole grains and that we tend to eat far too many refined grains.

Figure 4 Average whole and refined grain intake in ounce-equivalents per day by age-sex groups, compared to ranges of recommended daily intake for whole grains and limits for refined grains



Source: Office of Disease Prevention and Health Promotion (2015). <https://health.gov/dietaryguidelines/2015/guidelines/chapter-2/a-closer-look-at-current-intakes-and-recommended-shifts/>

With regard to sugars, ODPHP (2017) writes: “Added sugars account on average for almost 270 calories, or more than 13 percent of calories per day in the U.S. population.” The problem of elevated sugars is particularly bad among children, adolescents, and young adults. According to ODPHP (2017):

The major source of added sugars in typical U.S. diets is beverages, which include soft drinks, fruit drinks, sweetened coffee and tea, energy drinks, alcoholic beverages, and flavored waters. The other major source of added sugars is snacks and sweets, which includes grains-based desserts such as cakes, pies, cookies, brownies, doughnuts, sweet rolls, and pastries; dairy desserts such as ice cream, other frozen desserts, and puddings; candies; sugars; jams; syrups; and sweet toppings.

The American Heart Association (AHA) recommends that women have no more than 25 grams of added sugar per day and that men consume no more than 38 grams of added sugar per day. In addition, the World Health Organization (WHO) recommends that no more than 10% of an adult's calories should be from added or natural sugars, though ideally it should be less than 5%. Despite these recommendations, the average American adult consumes 82 grams of sugar every day. The US Dietary Guidelines for Americans recommends that discretionary calories, which include fats and added sugars, be limited to 5–15% of total caloric intake per day. However, American children and teens get about 16% of their total calories a day just from added sugars (UCSF n.d.). It's easy for adolescents and adults to consume such high amounts of sugar when you look at the amount of sugar in so many of our foods.

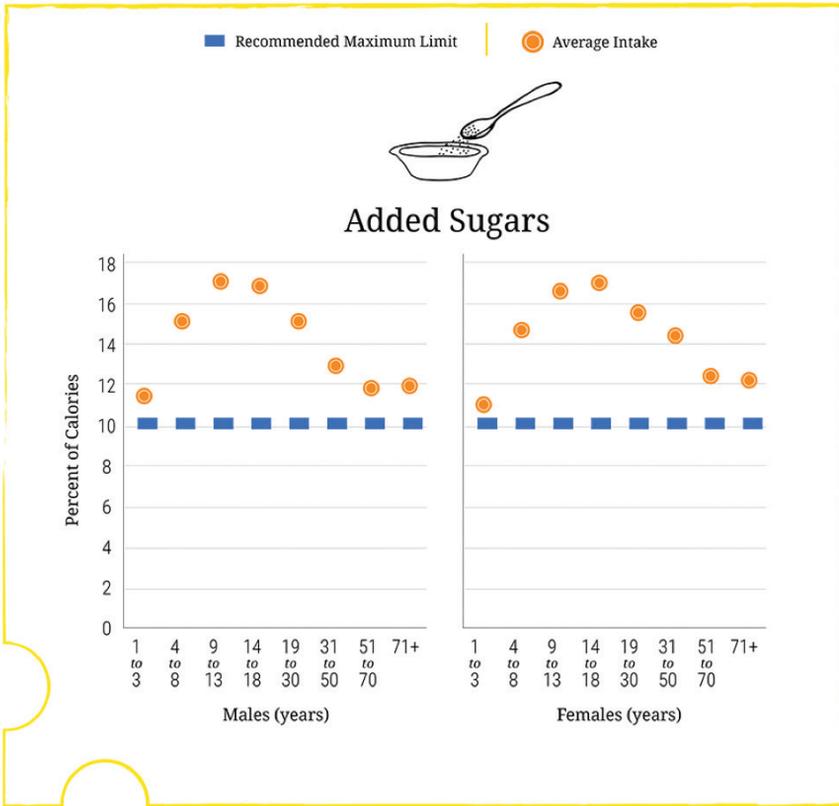
Regular consumption of sugar sweetened beverages (SSBs) such as soft drinks, energy drinks, iced tea, and fruit drinks has been increasing over the past few decades. In the United States per capita consumption of SSBs rose from 64.4 kilocalories per day in the 1970s to 141.7 kilocalories per day in 2006, and SSBs are now the primary source of added sugar in the US diet. SSBs contain sweeteners, such as high fructose corn syrup, sucrose, and fruit juice concentrates. This is problematic because it is believed that these added sugars lead to weight gain. High consumption of SSBs is also associated with the development of type 2 diabetes, as noted earlier. Obviously, corporations produce, market, and sell these unhealthy products. And government agencies allow it, in spite of their addictive and harmful nature.

The same is true for other sugary products. For example, cereals, especially children's cereals, also have large sugar contents. Children's cereal contains about 40% more sugar per serving than adult cereals. The serving size listed is unrealistically small for most people; FDA scientists have calculated that the average person consumes 30% more than the serving size listed on the box, so sugar intake ends up being higher than what the labels indicate (EWG 2014).

Many of the foods in America have high sugar contents, which can partially explain unhealthy eating habits, but healthier foods are also more expensive, which can also make it harder for people to eat healthily. A meta-analysis of 27 studies determined that in the United States, a diet of healthy foods cost an average of \$1.49/day more than unhealthy foods (Rao, Afshin, Singh, and Mozaffarian 2013). This is partly because of the foods most subsidized by taxpayers—including meat, cheese, corn, and grains that are heavily processed and refined.

Figure 5 shows the average intake of added sugars in the typical American diet, in contrast with the recommended maximum limit. Figure 6 illustrates that nearly half of all the added sugars we eat come from beverages.

Figure 5 Average intake of added sugars compared to the recommended maximum limits

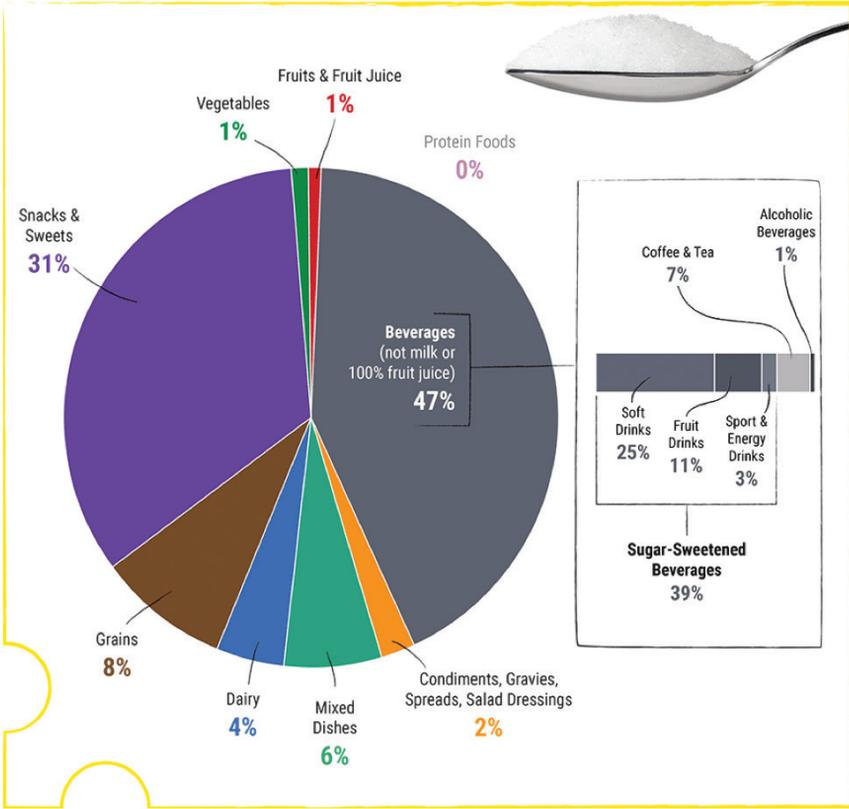


Source: Office of Disease Prevention and Health Promotion (2015). <https://health.gov/dietaryguidelines/2015/guidelines/chapter-2/a-closer-look-at-current-intakes-and-recommended-shifts/>

Not only do Americans consume too much sugars, but they also consume too much sodium. This is depicted in Figure 7.

According to Pew Research Center (2016), Americans in 2010 consumed far more than in 1970. Pew reports, “we eat a lot more than we used to: The average American consumed 2,481 calories a day in 2010, about 23% more than in 1970.” This includes “a lot more corn-derived sweeteners” in 2010 than in 1970, such as high fructose corn syrup. It also includes more chicken, as chicken consumption has “more than doubled since 1970” while consumption of “beef has fallen by more than a third.” We also ate 29% more grains in 2010 than 1970, but these were “mostly in the form of breads,

Figure 6 Sources of added sugars in the typical American diet

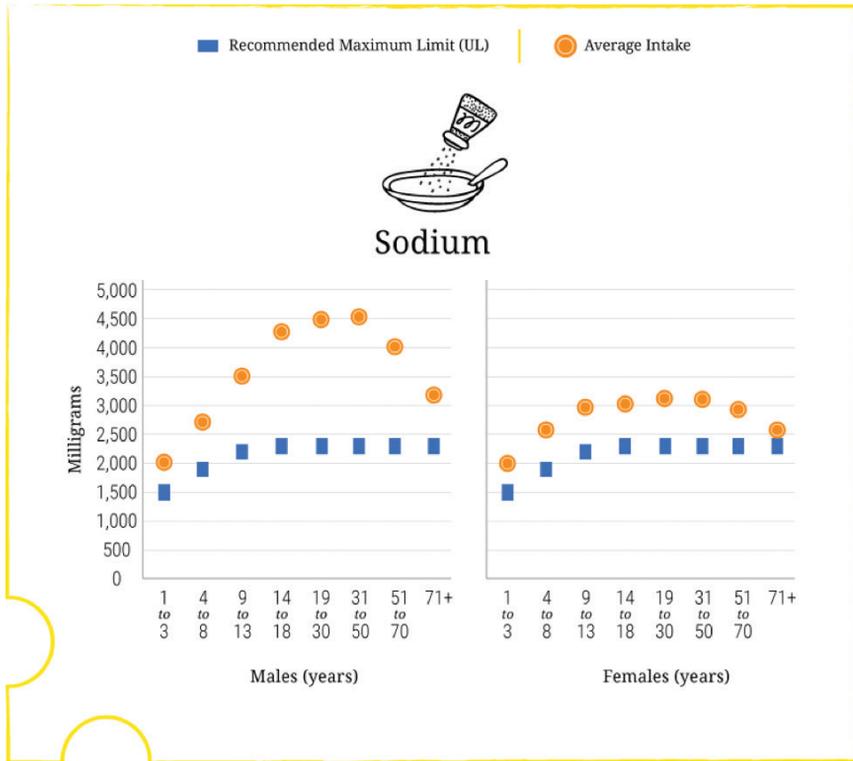


Source: Office of Disease Prevention and Health Promotion (2015). <https://health.gov/dietaryguidelines/2015/guidelines/chapter-2/a-closer-look-at-current-intakes-and-recommended-shifts/>

pastries and other baked goods”. Data reported from the Pew Research Center (2016) illustrate that, from 1970 to 2010, Americans consumed far more grain products, fats and oils, and sugars/sweeteners, as well as slightly more legumes, nuts, and soy, and fruits/fruit juices. This is depicted in Figure 8.

Figure 9 shows increases and decreases of various foods consumed by Americans from 1970 to 2010. Perhaps it is not surprising, given our dietary patterns, that 54% of Americans say they believe their eating patterns were less healthy in 2010 than in 1970. Further, 58% said that “most days they probably should be eating healthier” (Pew Research Center 2016).

Figure 7 Average intake of sodium compared to the recommended maximum limits

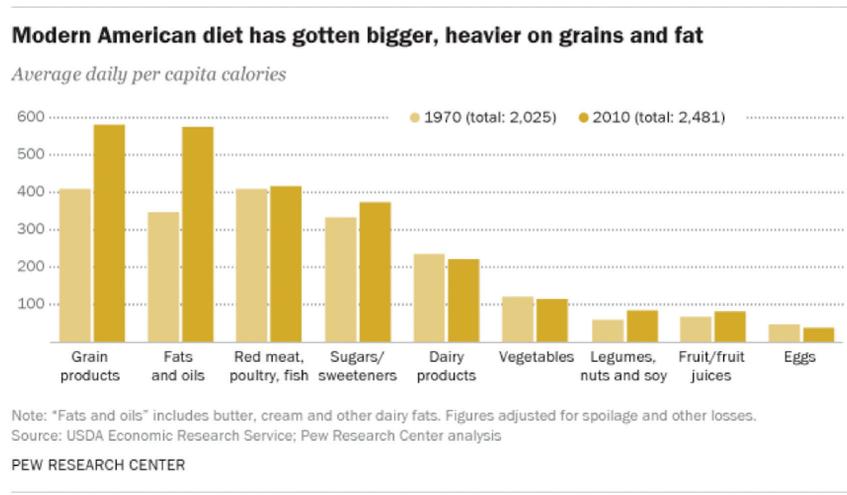


Source: Office of Disease Prevention and Health Promotion (2015). <https://health.gov/dietaryguidelines/2015/guidelines/chapter-2/a-closer-look-at-current-intakes-and-recommended-shifts/>

A majority of calories consumed in 2010 came from just two food groups: flours and grains (582 calories, or 23.4%), and fats and oils (575 calories, or 23.2%). These foods can be healthy or unhealthy, depending on the source of the flours and grains and the fats and oils. Unfortunately, Americans tend to choose unhealthy sources, such as refined grains rather than whole grains, and saturated fats rather than unsaturated fats. Consumption of saturated fats is illustrated in Figure 10.

According to ODPHP (2017), “Current average intake of saturated fats are 11 percent of calories. Only 29 percent of individuals in the United States consume amounts of saturated fats consistent with the limit of less than 10 percent of calories.” In addition to eating too much saturated fat, Americans also eat too much solid fats—“the fats in meats, poultry, dairy products, hydrogenated vegetable

Figure 8 American dietary choices from 1970 to 2010



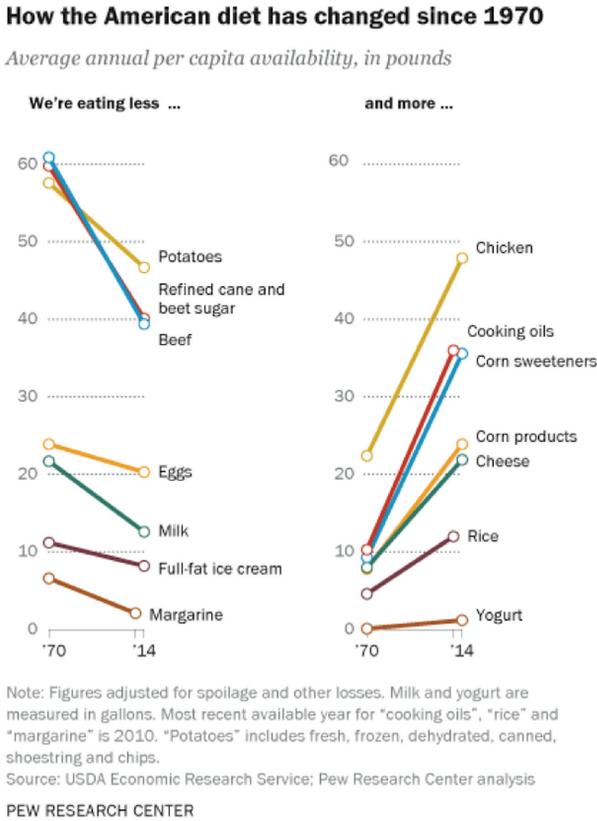
Source: Pew Research Center (2016).  
<http://www.pewresearch.org/fact-tank/2016/12/13/whats-on-your-table-how-americas-diet-has-changed-over-the-decades/>

oils, and some topical oils” (ODPHP 2017). The average consumption of solid fats accounts for 325 calories per day, or more than 16% of the average caloric intake for Americans, even while providing few to no actual nutrients.

Not only are Americans not eating particularly well, they also are not physically active enough. According to ODPHP (2017), “Only 20 percent of adults meet the Physical Activity Guidelines for aerobic and muscle-strengthening activity.” ODPHP (2017) reports that males are more likely than females to do regular physical activity (24% of males versus 17% of females meet recommendations). Still, a large majority of Americans do not engage in enough exercise. Almost “30 percent of adults report engaging in no leisure time physical activity” at all, and “individuals with lower income and those with lower educational attainment have lower rates of physical activity and are more likely to not engage in leisure time physical activity.”

The amount of exercise engaged in by Americans has declined over the most recent decades. ODPHP (2017) asserts that this “can be attributed to less active occupations; reduced physical activity for commuting to work, school, or for errands; and increased sedentary behavior often associated with television viewing and other forms of screen time.” Again, these are realities heavily influenced by corporations and the state.

Figure 9 Changes in American diets from 1970 to 2010



Source: Pew Research Center (2016). <http://www.pewresearch.org/fact-tank/2016/12/13/whats-on-your-table-how-americas-diet-has-changed-over-the-decades/>

Eating well and exercising enough are not as simple as mere choice or will power. According to CDC (2016), healthy foods are not often (and sometimes rarely) available in schools, childcare centers, and even neighborhoods. The same can be said for opportunities for necessary physical activity or exercise. Other factors in the community that impact nutrition and exercise “include the affordability of healthy food options, peer and social supports, marketing and promotion, and policies that determine how a community is designed.” Finally, of course, there is the culpability of companies comprising the conventional food system who produce and advertise these products to consumers. Here, questions such as why are

the worst foods for consumers most often the cheapest and why are unhealthy foods subsidized by taxpayers become relevant.

### **Studies Linking Poor Nutrition and Inactivity to Diabetes**

There is simply no question that one's diet is associated with one's risk of developing type 2 diabetes. According to Sami, Ansari, Butt and Hamid (2017: 65), "Dietary habits and sedentary lifestyle are the major factors for rapidly rising incidence of [type 2 diabetes] among developing countries." And since Americans rely very heavily on the conventional food system—controlled by only a handful of large, multi-national conglomerates who provide us with nearly all the food we consume at home, school, work, and on the road—there is also no question that the conventional food system plays a major role in the epidemic of type 2 diabetes in the United States as well as in the rest of the world.

Published studies show, for example, that diets high sugar and low in fruits and vegetables (like the typical US diet) are associated with a higher likelihood of developing type 2 diabetes (Crosta 2008). These studies are longitudinal in nature and focused on tens of thousands of individuals, and find that greater consumption of sweet drinks such as soda, fruit juices, and other sugary drinks like Kool-Aid lead to diabetes, although part of this effect is moderated by BMI (since obesity also contributes to diabetes) (Palmer, Boggs, Krishnan, Hu, Singer, and Rosenberg 2008). According to Crosta (2008),

drinking two or more soft drinks each day was associated with a 24% increase in diabetes risk and drinking two or more fruit drinks each day was associated with a 31% increase in diabetes risk compared to women who had less than one soft drink or fruit drink per month, respectively. There was no association noted between type 2 diabetes risk and diet soft drinks, grapefruit juice, or orange juice.

Similarly, a meta-analysis of nine cohort studies published in eleven journals found "a relationship between sugars-sweetened beverages [SSBs] and the incidence of type 2 diabetes. The link between sugar consumption and diabetes is both direct and indirect—with sugars-sweetened beverages being directly linked to the incidence of type 2 diabetes, and equally sugar consumption leading to obesity, one of the main risk factors for type 2 diabetes" (Action on Sugar 2017). Another meta-analysis of data from eight studies on SSBs and the risk of type 2 diabetes found that individuals who consumed one to two servings per day had a 26% greater chance of developing type 2 diabetes than individuals who consumed none or less than one serving per month (Malik, Popkin, Bray, Després, Willett and Hu 2010).

Sugar is undeniably an addictive substance that humans naturally crave. Yet, it is global companies who decide how much sugar to add to food products, who advertise those products to consumers (including directly to children), and who sell those products. It is government agencies who allow and even encourage it (Moss 2013; Taubes 2011, 2016). The same findings occur when it comes to carbohydrates, particularly refined carbohydrates, which raise glucose levels in the blood. Of course, there are different kinds of carbohydrates and they impact the body differently. For example, there are simple sugars that are found in processed foods and offer few or no nutrients (e.g., vitamins, fiber), and there are complex carbohydrates that are in their “whole food form” and also provide additional nutrients. Simple sugars raise glucose and contribute to diabetes while complex carbohydrates generally do not because they can help stabilize sugar in the blood by slowing down the absorption of glucose. Thus, dietary experts suggest people eat complex carbohydrates such as brown rice rather than white rice; whole wheat foods rather than processed wheat foods (including pastas); other natural foods such as steel-cut oatmeal and quinoa; and, of course, fruits and non-starchy vegetables, lentils, and beans. White foods such as bread, pasta, potatoes, flour, cookies and pastries, and sugar (including fruit juices and sodas) should be eaten only minimally or in moderation. Yet, the latter foods are highly addictive and advertised, as well as being much more available than the former. Global food corporations and government agencies meant to regulate them share responsibility for this reality.

The American Diabetes Association (ADA 2017) claims the idea that excess sugar consumption causes diabetes is a myth. Yet, it writes: “Being overweight does increase your risk for developing type 2 diabetes, and a diet high in calories from any source contributes to weight gain. Research has shown that drinking sugary drinks is linked to type 2 diabetes.” And it recommends “that people should avoid intake of sugar-sweetened beverages to help prevent diabetes.” This includes regular soda, fruit punch and fruity drinks, energy and sports drinks, sweet tea, and other sugary drinks. According to the ADA (2017), these drinks “will raise blood glucose . . . the main sugar found in the blood and the body’s main source of energy. Also called blood sugar. . . and can provide several hundred calories in just one serving!” The ADA promotes healthy eating, which includes limiting foods that increase glucose such as sweets, carbohydrates, and fruits, meaning they should not be avoided but instead eaten in moderation.

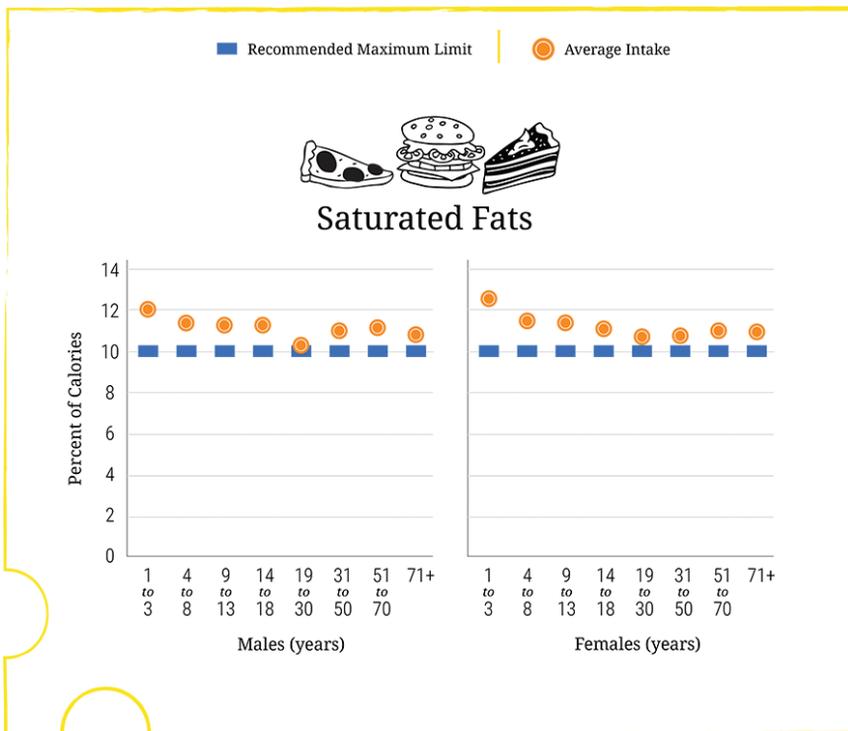
A multi-national study (n=175 countries) over a decade found mere availability of sugar was associated with higher levels of diabetes, even after controlling for many potentially confounding variables. The authors write

every 150 kcal/person/day increase in sugar availability (about one can of soda/day) was associated with increased diabetes prevalence by 1.1% ( $p < 0.001$ ) after

testing for potential selection biases and controlling for other food types (including fibers, meats, fruits, oils, cereals), total calories, overweight and obesity, period-effects, and several socioeconomic variables such as aging, urbanization and income. (Basu, Yoffe, Hills, and Lustig 2013)

Moreover, they found that there was no other food type that “yielded significant individual associations with diabetes prevalence after controlling for obesity and other confounders.” Additionally, “declines in sugar exposure correlated with significant subsequent declines in diabetes rates independently of other socioeconomic, dietary and obesity prevalence changes.” The conclusion of the study is that “[d]ifferences in sugar availability statistically explain variations in diabetes prevalence rates at a population level that are not explained by physical activity, overweight or obesity.”

Figure 10 Average intake of saturated fats as a percent of calories per day compared with maximum recommended limits



Source: Office of Disease Prevention and Health Promotion (2015). <https://health.gov/dietaryguidelines/2015/guidelines/chapter-2/a-closer-look-at-current-intakes-and-recommended-shifts/>

Another study focused on thousands of people over many years found that higher levels of vitamin C in the diet (from higher consumption of fruits and vegetables) lowered the risk of developing diabetes (Harding, Wareham, Bingham, Khaw, Luben, Welch, and Forouhi 2008). According to Crosta (2008),

Compared with men and women in the bottom quintile [fifth] of plasma vitamin C, the odds of developing diabetes was 62 percent lower for those in the top quintile of plasma vitamin C. A weaker inverse association between fruit and vegetable consumption and diabetes risk was observed.

A study of thousands of people over six years compared dietary patterns between two groups:

The pattern labeled “prudent” was characterized by higher consumption of fruits and vegetables, and the pattern labeled “conservative” was characterized by consumption of butter, potatoes, and whole milk—and the prudent diet was associated with lower occurrences of diabetes while the conservative diet was associated with higher occurrences of diabetes. (Montonen, Knekt, Härkänen, Järvinen, Heliövaara, Aromaa, and Reunanen 2005)

Still another study found that consumption of lower fat foods was associated with slightly lower incidence of diabetes (Tinker, Bonds, Margolis, Manson, Howard, Larson, Perri, Beresford, Robinson, Rodríguez, Safford, Wenger, Stevens, and Parker 2008). Similarly, a recent meta-analysis of studies found general evidence that high fat diets, and diets high in fried foods, red meat, and sweets, are associated with higher levels of type 2 diabetes (Sami, Ansari, Butt, and Hamid 2017). Saturated fats serve to activate immune cells and produce inflammatory proteins such as interleukin-1beta (Wen, Gris, Lei, Jha, Lu, Zhang, Brickey, and Ting (2011).

Not only do high fat foods increase the odds of diabetes, so too do processed foods. When foods are processed, the fiber from the bran and germ is removed, as are a large majority of the food’s nutrients. The absence of fiber allows the food to be digested more rapidly, quickly elevating sugar levels in the blood. As noted earlier, global food companies, enabled by the government, produce, advertise, and sell the foods that lead to increases in diabetes and other harmful medical conditions.

In type 2 diabetics, elevated levels of glycated haemoglobin (HbA1c), a protein in red blood cells that combines with glucose in the blood, have also recently been considered as one of the leading risk factors for developing microvascular and

macrovascular complications. Improvement in the elevated HbA1c level are achievable through diet management (Sami, Ansari, Butt, and Hamid 2017).

Nutritional intake does not only impact diabetes by increasing glucose in the blood. The foods and drinks we consume also impact blood flow and can cause inflammation. Markers of homeostasis (which occurs when blood flow stops) and inflammation (an autoimmune response to injury or damage to tissues) are found to be associated with higher likelihoods of developing type 2 diabetes. A study by Liese, Weis, Schulz, and Tooze (2009) was able to determine that certain foods were to blame for this relationship:

High intake of the food groups red meat, low-fiber bread and cereal, dried beans, fried potatoes, tomato vegetables, eggs, cheese, and cottage cheese and low intake of wine characterized the pattern, which was positively associated with both biomarkers. With increasing pattern score, the odds of diabetes increased significantly.

The authors specifically found that the odds of diabetes increased three to four times with that type of dietary intake. This follows earlier an earlier study (Schulze, Hoffmann, Manson, Willett, Meigs, Weikert, Heidemann, Colditz, and Hu 2005) that found two to three times higher rates of diabetes resulting from diets high in processed meats, refined grains, and sugary drinks but low in wine, coffee, and vegetables. Meanwhile another study (Heidemann, Hoffmann, Spranger, Klipstein-Grobusch, Mohlig, Pfeiffer, and Boeing 2005) found two to five times higher risks of diabetes among people who ate a lot of processed meats, red meats, chicken, refined-grain breads, beer, legumes, and sugary drinks but few fruits.

Additionally, chemicals added to foods to make them taste better play a role in the development of diabetes. For example, a study of four generations of lab mice (whose DNA and central nervous systems are very similar to humans) found that mice fed foods with advanced glycation endproducts (AGEs) tended to have lower levels of antioxidants but greater levels of inflammation, body fat, and importantly, more insulin resistance (Cai, Ramdas, Zhu, Chen, Striker, and Vlassara 2012).

## **How Food Companies Are Culpable for These Outcomes**

There is the culpability of companies comprising the conventional food system who produce and advertise these products to consumers. Here, relevant questions include: why are the worst foods for consumers most often the cheapest? Why are

unhealthy foods subsidized by taxpayers? Why are unhealthy foods and drinks marketed heavily to consumers including children? One must look to the law to understand this.

A review of lobbying efforts by Center for Responsive Politics (2017) shows that some of the top lobbying firms in America include beer, wine, and liquor interests (\$30.6 million in 2018), food and beverage (\$29.1 million in 2018), and restaurants and drinking establishments (\$9.2 million in 2018). Additionally, agribusiness companies donated \$134.4 million in 2018 (this includes agricultural products and services, tobacco, crop production and basic processing, food processing and sales, forestry and forest products, dairy, livestock, miscellaneous agriculture, and poultry and eggs). Further, another \$3 million came from fisheries and wildlife, part of donations from energy and natural resource donors. These donations assure that the major actors in the conventional food system will continue to be able to produce and market their products as they see fit. Research into the influence of money in US politics shows that the law largely reflects the interests of those in power, largely because they make the law, vote for it, and fund it (Robinson 2015).

So, the issue is not as simple as mere choice or will power. Even when people are informed and want to choose healthy foods, they are not easily accessible and affordable to many. For example, according to CDC, healthy foods are not often (and sometimes rarely) available in schools, childcare centers, and even neighborhoods. The same can be said for opportunities for necessary physical activity or exercise.

Effectively changing the way Americans eat and exercise thus requires systematic change beyond the individual and his or her ability to show restraint and be motivated to move more. The Office of Disease Prevention and Health Promotion (2017) identifies the following organizations as important contributors to and determinants of what we eat and how much we exercise: government, community, education, health care, public health, agriculture, food and beverage, manufacturing, retail, marketing, entertainment, and media. ODPHP (2017) notes that all of these institutions and organizations “have an important role in helping individuals make healthy choices because they either influence the degree to which people have access to healthy food and/or opportunities to be physically active, or they influence social norms and values” about diet and activity levels. Note that these organizations include both state and corporate actors.

The “social-ecological model” of ODPHP holds that “everyone has a role in supporting healthy eating patterns” including schools and workplaces. ODPHP (2017) asserts that, with regard to these institutions:

... strong evidence from studies with varying designs and generally consistent findings demonstrates that school policies designed to enhance the school food setting leads to improvements in the purchasing behavior of children, resulting in higher dietary quality of the food consumed during the school day. For adults, moderate evidence indicates that worksite nutrition policies can improve dietary intake, and approaches targeting dietary intake and physical activity can favorably affect weight-related outcomes. These examples demonstrate how support and active engagement from various segments of society are needed to help individuals change their eating and physical activity behavior and achieve positive outcomes.

The bottom line is that, although we ultimately decide what we put into our mouths (and how much we exercise), we don't determine what foods are produced, how they're advertised, how much they cost, and whether we have access to them (the same is true with regard to safe and suitable places to exercise). Much of the responsibility for this falls on corporate food companies and the government agencies charged with regulating them. ODPHP (2017) asserts:

Individuals make choices in a variety of settings, both at home and away from home. Away-from-home settings include early care and education programs (e.g., childcare, preschool), schools, worksites, community centers, and food retail and food service establishments. These organizational settings determine what foods are offered and what opportunities for physical activity are provided.

Food access is determined by other factors, as well,

including proximity to food retail outlets (e.g., distance to a store or the number of stores in an area), individual resources (e.g., income or personal transportation), and neighborhood-level resources (e.g., average income of the neighborhood and availability of public transportation. (ODPHP 2017)

So, access is largely determined by state and corporate interests. It is important to note that the US government sees a clear role for "food producers, suppliers, and retailers" in terms of increasing access to healthy foods. That unhealthy foods are so ubiquitous is evidence of corporate culpability.

Studies show that factors beyond our control have huge impacts on outcomes such as obesity and diabetes. Even poor food access is found to be related to higher incidence of these outcomes in the population (Shalowitz, Eng, McKinney, Krohn, Lapin, Wang, and Nodine 2017). So too is the ratio of the price of healthy foods to

unhealthy foods in an area, meaning that the higher the price of healthy foods, the more likely people will eat unhealthy foods and develop diabetes (Kern, Auchincloss, Stehr, Diex, Kair, Moore, Kanter, and Robinson 2017). These are factors that are largely beyond the control of consumers—what foods are available, and how much they cost—and are largely determined by key actors of the conventional food system.

To illustrate some different ways corporate and government agencies share culpability for outcomes such as diabetes, we offer Table 4. As shown in Table 4, the companies that make food are culpable for producing unhealthy food, manipulating it to make it more addictive (e.g., adding large amounts of sugar and salt), adding chemicals to food to make it taste better (e.g., artificial flavoring), and advertising food to make it more appealing. Distributors of food are culpable for advertising unhealthy foods to make them more appealing, as well as determining where food will be placed in stores (e.g., candy bars at checkout lines). Finally, the state is culpable for working with companies to produce unhealthy food, subsidizing the least healthy foods, ineffective regulating foods for safety, regulating in the interests of corporations, accepting donations from industries that produce unhealthy foods, and setting school lunch policy to assure large amounts of fats, sugars and salts are served to young people.

Interestingly, the idea of shared culpability in diet-related medical conditions has already been asserted by at least one other set of scholars. For example, Schrempf-Stirling and Phillips (2018), when writing about obesity, argue that

Table 4 Culpability in food companies and government agencies for deleterious outcomes related to diet/nutrition (e.g., diabetes)

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**Food Producers**

Produce unhealthy food  
 Manipulate food to make it more addictive  
 Add chemicals to food  
 Advertise food to make it more appealing

**Food Distribution**

Advertise food to make it more appealing  
 Determine food placement in stores

**Government**

Work with companies to produce unhealthy food  
 Subsidize unhealthy foods  
 Ineffective regulation for safety  
 Regulate in the interests of corporations  
 Accept donations from industries that produce unhealthy foods  
 Set school lunch policy

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there is shared responsibility in society for the epidemic of obesity in the United States and abroad. These scholars identify responsibility in: 1) consumers (who choose the foods they consume, but with limited knowledge and scientific understanding, following marketing and impacted by access, convenience, affordability, taste, and even addiction); 2) corporations (who make and market the foods, both healthy and unhealthy, and who fund government science and advocacy in their own interests); and 3) governments (who not only regulate food for safety but limit advertising and marketing, as well as subsidizing the production of some foods and determining school lunch policy) (Schrempf-Stirling and Phillips 2018: 111–119). That is, there is undeniably culpability in the corporations who make and market our foods, as well as the government agencies we rely on to regulate our foods for safety (but who clearly fail).

## Conclusion

Although consumers ultimately decide what to put into their mouths (and how much they exercise), they do not determine what foods are produced, how they are advertised, how much they cost, and whether we have access to them (the same is true with regard to safe and suitable places to exercise).

As shown in this paper, responsibility for what we eat and how much, and whether we exercise and how much, involves numerous actors beyond just the individual consumer, and includes global corporations and the state. In this paper, the authors examined type 2 diabetes, identified its major symptoms and causes, and showed how the conventional food system plays a role in the etiology of the condition. Key actors in the conventional food system, which provides the bulk of foods consumed, are culpable for creating the foods we eat, and marketing them to us (including to our children), as well as for assuring (through lobbying of state and federal legislatures) that the least healthy foods for us are the cheapest and most available. This reality makes the topic of food crime of interest to criminology and criminal justice.

Framed in the literature of state-corporate crime, those who study “food crime” can now show the specific actors and actions which create the national and global health crises facing humans in the 21st century. Stated simply, medical conditions such as obesity and diabetes are among the most significant issues which must be addressed to assure healthy lives and increased longevity and to reduce pain, suffering, illness, death, and enormous financial costs associated with these conditions that so clearly dwarf the harms associated with the street crimes of major interest to criminologists and other social scientists who study crime from a “social harm” perspective.

## Appendix: Top Companies of the Conventional Food System

The leading revenue-generating food company, Archer-Daniels-Midland Co. (ADM), has been formally in business since 1923. According to its website (Archer-Daniels-Midland 2018), the company is “one of the world’s largest agricultural processors and food ingredient providers, with approximately 31,000 employees serving customers in more than 170 countries.” Its business includes roughly “500 crop procurement locations, 270 ingredient manufacturing facilities, 44 innovation centers and the world’s premier crop transportation network.” The company, like all major players in the conventional food system, is global in presence and reach.

The company manufactures acidulants (citric acid products), alcohols, beans and pulses, dried fruits, dry bakery mixes and fillings/icings, emulsifiers and stabilizers (thickeners), flavors and extracts/distillates, flours and ancient grains, nutrition and health supplements, nuts and seeds, oils and fats, pastas, proteins, starches, sweeteners and sweetening solutions, and non-GMO and organic products. Thus, many of the company’s products actually comprise the ingredients of a wide variety of food products manufactured by other companies.

Similarly, the number two revenue-generating food company on the list, Bunge Ltd, began as a trading company in 1818 and expanded into a grain trading company in 1884—expanding to South America in 1908 and North America in 1919—and now operates in more than 40 countries (Bunge 2018). The company makes products in the categories of oilseeds (including feed for animals, cooking oils, margarines, and shortenings), grains (including feed for animals as well as grains for use in beer, cereal, snacks, and baked goods), and sugarcane (including sugar and ethanol). The company is involved in producing and processing crops (e.g., corn, wheat, and milled rice) and foodstuffs (e.g., edible oils like soybean, rapeseed, and sunflower seed), and transportation and logistics, as well as marketing and distribution. The company also manufactures fertilizers used on crops by farmers.

The third ranked revenue-generating food company, Tyson, is also located in many countries across the globe. It began as a chicken delivery company in Arkansas in 1931. Its website claims that the company now produces 20% of all the chicken, beef, and pork in the US. It also provides proteins to many national restaurant chains. Its major brands include Tyson, as well as Aidells, Ball Park, Golden Island, Hillshire Farm, Jimmy Dean, Sara Lee, State Fair, Wright Brand, and many other companies (Tyson 2018).

The fourth ranked revenue-generating food company is Kraft-Heinz Co. According to its website, the company is located in at least 28 countries on nearly every continent in the world. It is known for many of the world’s best

known brands, including Heinz and Kraft, as well as Caprisun, Classico, Grey Poupon, Kool-Aid, Jello, Lunchables, Maxwell House, Philadelphia, Planters, OreIda, Oscar Meyer, Velveeta, and many other companies (Kraft-Heinz 2018). Number five among the top ranked revenue-generating food companies is Mondelez International Inc. According to the company's website, the company operates in 165 countries on at least six continents. Among its best known brands are BelVita, Bubbalo, Cadbury, Chips Ahoy, Dentyne, Halls, Honey Maid, Nabisco, Nilla, Nutter Butter, Oreos, Premium, Ritz, Sour Patch Kids, Tang, Tobleron, Trident, Triscuit, Wheat Thins, and many more (Mondelez 2018).

The sixth ranked revenue-producing food company is General Mills Inc. It provides a wide range of food products in more than 100 countries located on six continents. Officially created in 1928, the company is known for its products including General Mills but also Betty Crocker, Cheerios, Gold Medal, Nature Valley, Pillsbury, Wheaties, and Yoplait, as well as organics and natural brands. The company also makes numerous toys and games (General Mills 2018).

Seventh among revenue producing food companies is the Kellogg Co., which has been in business for more than 100 years. Known widely for its products such as All-Bran, Cheez-It, Chips Deluze, Coco Pops, Corn Flakes, Corn Pops, Eggo, Famous Amos, Fiber Plus, Frosted Flakes, Frosted Mini-wheats, Fruit Loops, Garden Burger, Keebler, Morning Star, Nutrigrain, Poptarts, Pringles, Rice Krispies, Special K, and Townhouse, the company makes far more than cereal (Kellogg 2018).

Number eight on the list of top revenue producing food companies is Conagra Brands Inc. The company was formed as Conagra in 1971, after previously being known as Nebraska Consolidated Mills since 1919; that company reportedly started as four flour mills in the state of Nebraska. Now housed in Chicago but in existence in at least 40 places, the company is known for such brands as Duke's, Frontera, Healthy Choice, Hebrew National, Hunt's, Marie Calender's, Orville Redenbacher's, Pam, P.F. Chang's, Peter Pan, Redi Wip, Rotel, Sandwich Bros, and more (Conagra 2018).

The ninth top revenue producing food company is Hormel Foods Corp., founded in 1891 in Minnesota and now operating in 75 countries. Existing as a family of companies, Hormel is known for brands including Hormel Chili, as well as Applegate, Black Label, Buffalo, Chi-Chi's, Curemaster Reserve, Dinty Moore, Don Miguel, Embasa, Evolve, Fontanini, Jennie-O, Justin's, Little Sizzlers, Lloyd's, Mary Kitchen, Muscle Milk, Natural Choice, Old Smokehouse, Sandwich Makers, Skippy, Spam, Valley Fresh, and Wholly Guacamole, including many other brands (Hormel 2018).

Finally, number ten on the list of revenue producing food companies is the Campbell Soup Co. Known mostly for its soups, the company began in 1869 in New Jersey, but is now found on nearly every continent. Among its widely popular brands are Campbell soups, but also Arnott's, Bolthouse Farms, Chunky, Goldfish, Milano, Pace, Pacific, Pepperidge Farm, Plum Organics, Prego, Spaghettios, Stockpot, Swanson, TimTam, and V8 (Campbell 2018).

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