



# The Rise of Obesity and Diabetes with the Adoption of A Western Diet: A Case Study of Native American Communities

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**THE RISE OF OBESITY AND DIABETES WITH THE ADOPTION OF A WESTERN DIET:  
A CASE STUDY OF NATIVE AMERICAN COMMUNITIES**

*by*

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## Abstract

Since the mid-1900s, rates of obesity and diabetes among Native American populations have been much higher than the rates of those disorders for Americans as a whole—and yet, before 1950 or so, diabetes was extremely rare among Native Americans. This paper suggests that the influence of Western culture in Native American communities in the last 60 years, and particularly Native American adoption of the Western diet, is the primary reason for the rapid increase in obesity and diabetes. This paper reviews the history of Native American interaction with Europeans and the U.S., and analyzes several theories regarding the specific mechanisms by which Western influence has high rates of obesity/diabetes in Native American communities. It concludes that the obesity/diabetes epidemic is driven by several factors: the historical U.S. policies of relocating Native Americans and attempting to assimilate them into Western culture; the resulting extreme poverty of Native American tribes and their reliance on government food programs; and the destruction of environmental resources that tribes depended on for sustenance, compel many tribes to adopt a Western-style diet. In turn, the Western diet, high in glucose and simple carbohydrates, causes significant obesity- and diabetes-related problems among Native Americans who possess genetic and physiological propensities to efficient energy metabolism.

**THE RISE OF OBESITY AND DIABETES WITH THE ADOPTION OF A WESTERN DIET:  
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This paper will explore the dramatic rise in rates of obesity and diabetes among Native American populations since the mid-1900s. The paper will provide an overview of the statistics underlying the obesity/diabetes epidemic, and will give a historical account of the transition of Native American tribes from traditional cultures, diets, and rituals, to a current lifestyle that is strongly influenced by Western culture. The paper will also discuss theories regarding the specific mechanism by which the influence of Western culture drove the increasing rates of obesity and diabetes among Native American tribes.

**I. THE PROBLEM: HIGH RATES OF OBESITY AND DIABETES IN NATIVE AMERICAN COMMUNITIES**

Since World War II, a complex and problematic health trend has been occurring in Native American communities: Native Americans are much more likely to be afflicted with obesity and/or diabetes than are Americans as a whole. The National Institute of Diabetes and Digestive and Kidney Diseases reported in 2000 that “over one half of adult Pima Indians [a Native American tribe in the Southwest] have diabetes and 95% of those with diabetes are overweight.”<sup>1</sup> Furthermore, diabetes was the fourth most common cause of death among American Indians in 2000-2002; during those years, the occurrence of diabetes in Native American populations was 200% higher than in the American population at large.<sup>2</sup>

Throughout this paper, I will endorse and analyze the theory that the most significant contributing factor to this sudden and drastic increase in obesity/diabetes among Native

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<sup>1</sup> Timothy J. Richards & Paul M. Patterson, “Native American Obesity: An Economic Model of the ‘Thrifty Gene’ Theory.” *American Journal of Agricultural Economics* 88(3), 542, 543.

<sup>2</sup> Meriah Gille, “The Role of Culture in Native American Food Choices and Perceptions of Physical Activity.” Presentation. Nutritionist/Clinical Data Manager, Seven Directions Native American Health Center.

Americans is the influence of the Western diet and lifestyle on Native American communities. I will discuss, from a historical perspective, why many Native American tribes eventually adopted much of the Western lifestyle, and specifically how this lifestyle change contributed to the rise in obesity and diabetes. I will also discuss some social and cultural implications of this theory.

### **A. Obesity**

Obesity, often defined as having a body mass index over 30 kg/m<sup>2</sup>, is a growing problem among Native American communities. A recent report from the Department of Health and Human Service's Office of Minority Health states that 34% of American Indian adults (over age 18) are obese. By contrast, only 21.3% of Caucasian Americans are obese; the ratio of American Indian obesity occurrence to Caucasian American obesity occurrence is 1.6.<sup>3</sup> Although obesity was uncommon in Native American communities before World War II, throughout the 20<sup>th</sup> century, the average body mass index of Native Americans increased substantially.<sup>4</sup>

An increasing trend of obesity is especially a concern because obesity is strongly correlated with non-insulin dependent diabetes mellitus (Type II diabetes).<sup>5</sup> One study analyzed the Native Americans of the Pima tribe, and concluded that, compared to individuals in the same tribe with a BMI of less than 20 kg/m<sup>2</sup>, individuals with a BMI of 20-25 exhibit a 13.6-fold higher occurrence of diabetes.<sup>6</sup> Individuals with a BMI of 25-30 kg/m<sup>2</sup> showed a 21.6-fold higher occurrence.<sup>7</sup> Furthermore, for obese individuals in the tribe, the incidence of diabetes was

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<sup>3</sup> Gille, Presentation, *supra* note 2.

<sup>4</sup> Mary Story et al., "The epidemic of obesity in American Indian communities and the need for childhood obesity-prevention programs." *American Journal of Clinical Nutrition* 69 747S, 748S (1999) (noting that the average weight of Native American children increased by approximately 24% since 1955).

<sup>5</sup> As stated in the introduction, when I refer to "diabetes" throughout this paper, I will be referring to Type II diabetes (non-insulin dependent diabetes mellitus). Type I diabetes, or insulin-dependent diabetes, remains relatively rare among Native American communities.

<sup>6</sup> K.M. Venkat Narayan, "Diabetes Mellitus in Native Americans: The Problem and Its Implications." *Population Research and Policy Review*, Vol. 16, No. ½, Demography of American Indians and Alaskan Natives 169, 175-76 (Apr. 1997).

<sup>7</sup> *Id.*

related to the number of years that the individual was obese; among individuals who had been obese for ten years or more, the occurrence of diabetes was 2.4 times that among individuals who had been obese for only five years or fewer.<sup>8</sup>

## **B. Diabetes**

Diabetes, like obesity, has become increasingly prevalent in Native American communities after World War II. Before 1950, Native Americans had a very low rate of diabetes, but only 17 years after that—in 1967—the Pima Indian population had the highest recorded prevalence of Type II diabetes in the world.<sup>9</sup> Additionally, diabetes among Native Americans is almost always Type II diabetes (non-insulin dependent diabetes); occurrence of Type I diabetes remains rare.<sup>10</sup>

Diabetes, in brief, is a group of metabolic-based disorders that are characterized by “high levels of blood glucose secondary to inefficient insulin action and/or secretion.”<sup>11</sup> Diabetes may lead to significant secondary problems, such as kidney failure, blindness, destruction of lower limbs, and premature death.<sup>12</sup> Other related problems include heart disease, pregnancy complications, gum disease, neuropathy, and social problems.<sup>13</sup> Among Pima Indians, the death rate due to diabetes is 11.9 times the diabetes-related death rate of the U.S. as a whole.<sup>14</sup>

## **C. Overview of causes of obesity/diabetes epidemic**

The high incidence of obesity and diabetes among the Native American population in

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<sup>8</sup> *Id.*

<sup>9</sup> P.H. Bennett & W.C. Knowler, “Increasing Prevalence of Diabetes in Pima American Indians over a 10 Year Period.” *Diabetes* 1979, from Proceedings of the Tenth Congress of International Diabetes Federation, Vienna, Austria, Sept. 9-14, 1979. WK Waldhausl (ed.). International Congress Series 500. *Excerpta Medica* 507-511 (1980).

<sup>10</sup> *Id.*

<sup>11</sup> Narayan, *supra* note 6, at 169.

<sup>12</sup> *Id.*

<sup>13</sup> *Id.* at 177-78.

<sup>14</sup> *Id.*

general does not mean that different Native American tribes should be lumped into one “culture.” Native American tribes are heterogeneous, existing in a broad range of geographic locations, from the tundra of Alaska to the forests of the Northeast; from the vast Great Plains area to the deserts of the Southwest. Additionally, different tribes have very different traditions and lifestyles. Despite this, however, many tribes in the U.S. do exhibit this disproportionately high rate of diabetes and obesity. Many studies that have examined this issue conclude that common genes among many Native American tribes predispose Native American individuals to obesity, which in turn contributes to the occurrence of diabetes.

For example, one study examined the rates of diabetes among three tribes, the Mandan, Arikara, and Hidatsa.<sup>15</sup> The study found a strong correlation between the degree of Native American inheritance possessed by individuals in the study, and the rate of diabetes prevalence. The study found that full-inheritance Native Americans aged 35 or older possessed a diabetes prevalence rate of 22.3%, whereas people between half and full inheritance showed a 14.9% diabetes prevalence rate.<sup>16</sup> People with less than half Native American inheritance showed a diabetes rate of 4.1%, which was the same rate as that of Caucasians living on the reservation.<sup>17</sup> Therefore, this study seems to demonstrate a strong link between common inheritance of at least some Native American tribes—i.e., genes shared by Native Americans—and the prevalence of diabetes.

It is important to note, however, that genetics cannot be the whole story; as mentioned above, Native American communities had a very low rate of diabetes before World War II. The spike in obesity rates after World War II provides part of the explanation, since many studies

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<sup>15</sup>J.D. Brosseau et al., “Diabetes Among the Three Affiliated Tribes: Correlation with Degree of Indian Inheritance.” *American Journal of Public Health* 69 (12): 1277-78 (1979).

<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

strongly link diabetes with obesity. For example, a study among the Seneca Indians of New York, which noted that 1/3 of the adults in the tribe are diabetic, discussed a strong link between diabetes and obesity in the tribe.<sup>18</sup>

However, there is still a compelling underlying issue: assuming that the spike in obesity rates in Native American populations since the mid-1900s triggered the diabetes epidemic among Native Americans, what was responsible for the rising obesity rates in the first place? There are several theories that seek to answer this question. One of the most commonly cited theories is that Native Americans inherit a strong propensity to obesity which, when combined with a sudden inundation of Western diet and traditions, result in a disproportionately high incidence of obesity. This in turn contributes to the high incidence of diabetes among Native Americans.<sup>19</sup>

It is important to note that this theory has strong cultural and ethical implications. Namely, since the arrival of European settlers in North America and continuing until the early 20<sup>th</sup> century, the history of Native Americans has been marked by forced dislocation and assimilation into U.S. culture; resulting in powerful environmental change and destruction of resources on which Native American tribes rely for food and medicine.<sup>20</sup> Problems that continue to this day among tribes are the extreme poverty experienced by Native American communities and the reliance, in some cases, on the federal government for food provisions and health care.<sup>21</sup> This reliance, along with the location of reservations in the U.S., has contributed to the powerful influence of the Western diet and traditions among Native American communities. Some commentators suggest that the factors contributing to the influence of the Western diet among

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<sup>18</sup> R.A. Judkins, "Diabetes and Perceptions of Disease Among Seneca Indians." *New York Journal of Medicine* 78(8): 1320-23 (1978).

<sup>19</sup> P.H. Bennett & W.C. Knowler, *supra* note 9, at 507-11.

<sup>20</sup> See Donald A. Grinde & Bruce E. Johansen, "Environmental Destruction of Indian Lands and Peoples," in *ECOCIDE OF NATIVE AMERICA*. San Diego: Clear Light Publishers, 1995, at 80 (noting that the destruction of the environment of the Yamasee Indians constituted a fundamental alteration and destruction of the Yamasee society).

<sup>21</sup> Gille, *supra* note 2.



Native American tribes, and the corresponding strong increase in obesity and diabetes levels among tribes, are recent manifestations of the cultural and lifestyle destruction committed by Western forces against Native Americans.<sup>22</sup>

My goal throughout the rest of this paper is to explore the underlying causes of the recent obesity and diabetes epidemic in Native American communities, with a particular focus on the theory mentioned above—that the adoption of a Western diet and lifestyle is the primary factor contributing to the obesity/diabetes epidemic. I will first discuss the traditional Native American diet and lifestyle prevalent before the European settlers began arriving on North America; I will then analyze how the Native American lifestyle has changed as North America has become populated with Western-based cultures. Finally, I will discuss specifically how the Western culture, diet, and lifestyle have contributed to the obesity and diabetes epidemic among Native Americans.

## **II. NATIVE AMERICAN LIFESTYLES PRE-EUROPEAN CONTACT: TRADITIONS IN FOOD ACQUISITION, PREPARATION, AND RITUALS**

Traditional Native American societies mostly acquired food through hunting and gathering, along with some deliberate cultivation of crops (agriculture).<sup>23</sup> Due to the unpredictable nature of much of the traditional food sources, Native American societies often experienced feast-or-famine cycles, and developed many rituals around the cyclic bounty of food.<sup>24</sup> The majority of a traditional diet was high-protein and had almost no salt; only small

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<sup>22</sup> See *id.* (noting that the current eating and exercise patterns of Native Americans are related to the loss of traditional culture and the historical trauma from the systematic genocide and forced removal that marked the European and U.S. relationship with Native Americans).

<sup>23</sup> Gille, *supra* note 2.

<sup>24</sup> See Gille, *supra* note 2; and AMERICAN INDIAN CULTURE, Carole E. Barrett & Harvey J. Markowitz, eds. Salem Press, Inc. (2004), at 282 (discussing the Green Corn festival centered around the first harvest of corn).

amounts of sugar were consumed (in the form of naturally occurring honey or stevia).<sup>25</sup> Some examples of traditional food sources include wild game, fish, corn, beans, squash, root vegetables, wild greens, herbs, nuts, seeds, berries, mushrooms, prickly pears, Jerusalem artichokes, watermelon, pumpkin, wild grapes, rose hips, cactus, and water.<sup>26</sup> Furthermore, Native American societies were traditionally very physically active; with rituals and activities such as games and dancing. Additionally, the process of hunting and gathering food constituted physical labor on a daily basis.<sup>27</sup> Finally, the rituals surrounding the acquisition, preparation, and consumption of food was a central element in traditional tribal culture and community solidarity.

### **A. Evolution of Native American subsistence patterns and culture**

The evolution of Native American methods of subsistence—from hunter-gatherer to, in many regions, agricultural—was influenced by many factors, including migration to new areas, geographic characteristics of tribal lands, availability of wild game or fish, and availability of plants that could be cultivated as crops. Furthermore, the demands of food acquisition played a powerful role in shaping tribal government, culture, and traditions.

The development of traditional subsistence practices in Native Americans tribes has its roots in the tribes' initial crossing of the land bridge from Asia, millennia ago.<sup>28</sup> The tribes who crossed the land bridge were almost entirely nomadic hunter-gatherers; in fact, some scholars have posited that the tribes were driven to cross the land bridge to follow their primary food source, which likely was roaming herds of elk or caribou.<sup>29</sup>

The hunter-gatherer lifestyle practiced by these tribes is characterized by utilizing food

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<sup>25</sup> Gille, *supra* note 2.

<sup>26</sup> *Id.*

<sup>27</sup> *Id.*

<sup>28</sup> Barrett & Markowitz, *supra* note 24, at 692.

<sup>29</sup> *Id.*

sources as they occur naturally.<sup>30</sup> However, hunting and gathering may include some level of human modification and cultivation of the environment—for example, hunter-gatherers might selectively burn areas of a forest in order to encourage the growth of starchy plants and berry bushes, and to increase the number of deer grazing in the area.<sup>31</sup> Hunting and gathering is also characterized by tool use—hunters use traps, spears, and bows and arrows to capture game.<sup>32</sup> Overall, hunting and gathering is an efficient and effective way to obtain food, particularly in the plentiful months; it is possible to obtain enough food for a day in a few hours' amount of work, which left the rest of the day free for other activities.<sup>33</sup> Generally, hunter-gatherer cultures had simple government structures, based in part on the necessity for these cultures to be mobile,<sup>34</sup> and religions that were centered on shamanism, which stresses the relations of individuals with spirits.

Eventually the hunter-gatherer cultures began transitioning to agricultural, or semi-agricultural, modes of subsistence. One driving motivation for the shift to agricultural practices was the pressure to ensure a supply of food for the lean season (winter),<sup>35</sup> one of the tradeoffs of a hunter-gatherer lifestyle is the difficulty of providing a stable food source for a family during winter. Early agriculture took the form of plant cultivation; it is thought that the earliest plants that were domestically grown in the Americas were chile peppers, avocados, beans, gourds, and squash,<sup>36</sup> all of which originated in Central America. As agricultural practices developed, some tribes began systems of selectively breeding seeds and crops to optimize nutritional benefit,

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<sup>30</sup> *Id.*

<sup>31</sup> *Id.* at 692-93.

<sup>32</sup> *Id.*

<sup>33</sup> *Id.*

<sup>34</sup> *Id.*

<sup>35</sup> *Id.* at 694.

<sup>36</sup> *Id.*

hardiness, and other desirable traits.<sup>37</sup>

It is unclear when Native Americans began relying on deliberately cultivated crops, but the earliest location of agriculture was in Mexico, and agricultural practices subsequently radiated northward.<sup>38</sup> All agriculture was conducted by hand labor, as there were no metal tools or domesticated large animals that could assist in plowing and harvesting.<sup>39</sup> By the time of European contact, some tribes were supplying around 60% of their nutritional requirements from agriculture, although all tribes obtained at least some nutrients from hunting and gathering.<sup>40</sup>

In the thousand years or so prior to European contact, tribes that engaged in agricultural practice lived in relatively permanent groups, and a driving cultural force was the importance of producing food for the community as a whole, not just for an individual or a family.<sup>41</sup> Women of the tribe were in charge of farming, whereas men tended to be charged with hunting.<sup>42</sup> The process of farming in Native American tribes followed several steps; first, the land would be cleared for cultivation. It was usually cleared by burning it, which had the benefit of supplying the soil with lime and potash.<sup>43</sup> Then, women planted vegetables and weeded the crops, although in Southwest tribes, the men were usually in charge of irrigating the fields.<sup>44</sup> Once the crops were harvested, the harvested material was usually dried so that it would keep for winter.<sup>45</sup>

By the end of the prehistoric period, Native American tribes cultivated several types of plant crops. They grew squash, maize, and beans; they also grew some wild seeds, such as

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<sup>37</sup> *Id.*

<sup>38</sup> *Id.* at 5.

<sup>39</sup> *Id.* at 6.

<sup>40</sup> *Id.*

<sup>41</sup> *Id.*

<sup>42</sup> *Id.*

<sup>43</sup> *Id.*

<sup>44</sup> *Id.* at 7.

<sup>45</sup> *Id.*

sunflower and cottonseed, that were rich in oil.<sup>46</sup> In the north, wild rice was harvested.<sup>47</sup>

Additionally, several other types of plant species for cultivated for medicinal or cultural use; for example, in some areas, tobacco was grown for use in ceremonies and cotton was cultivated for clothing.<sup>48</sup>

One cultural effect of the transition to agricultural or semi-agricultural subsistence patterns was that tribes which engaged in agriculture had a sufficient and renewable food supply to enable them to abandon a nomadic lifestyle and settle down into larger communities.<sup>49</sup> These larger communities often were led by chiefs of great authority, who often wielded coercive power; a quintessential example is the Aztec empire in what is now Mexico.<sup>50</sup> Another cultural effect of the rise of agriculture involved a changing emphasis on family relationships in some tribes. Whereas hunter-gatherer tribes generally recognize kinship through the male line (patrilineal descent), many agricultural societies began recognizing kinship descended from women (matrilineal).<sup>51</sup> One potential reason for this shift may have been the role of women in agricultural societies as the predominant providers of food, whereas in hunter-gatherer societies much of the cultural emphasis was on the importance of the hunt, which was led by male members of the tribe.

Although many Native American tribes engaged in the cultivation of plants, tribes did not domesticate animals (as far as is known).<sup>52</sup> One possible reason for this is the comparative lack of large animals in North America that were suitable candidates for domestication; for example, there were no horses, and the predominant cattle species was the buffalo, which roamed in vast

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<sup>46</sup> *Id.* at 8.

<sup>47</sup> *Id.*

<sup>48</sup> *Id.*

<sup>49</sup> *Id.* at 697.

<sup>50</sup> *Id.*

<sup>51</sup> *Id.*

<sup>52</sup> *Id.* at 697.

and aggressive herds. After European settlers began arriving in North America, bringing livestock with them, some Native American tribes began raising domesticated animals. This was limited, however, by the deaths and dislocations of tribes resulting from European contact; although some tribes in the Southwest, such as the Navajo, took up adopting sheep,<sup>53</sup> pastoralism remained uncommon for tribes until the federal government began initiatives to impose Western-style raising of livestock on Native American communities.<sup>54</sup>

Subsistence patterns were often dictated by geography and necessity, and whether a community primarily relied on agriculture or other means of obtaining food had a powerful effect on the overall culture of Native American communities. For example, in the eastern tribes, most Native American communities relied on agriculture for most of their caloric intake; the major crops were corn, beans, and squash, which had originated in Mexico and took years to migrate north.<sup>55</sup> In the Southeast, most tribes were characterized by a chiefdom form of government, with large towns and civilizations.<sup>56</sup> The Plains tribes had a culture that was strongly influenced by the buffalo; after the European introduction of the horse, the Plains tribes formed highly aggressive cultures that hunted bison in great numbers and often conducted raids on neighboring tribes and on European communities.<sup>57</sup>

On the Northwest coast, most of the societies were hunter-gatherer, but they were able to maintain large communities due to the bountiful supply of their main food source—fish, particularly salmon.<sup>58</sup> These communities often had strong, coercive governments that gained power by exercising control over fishing areas.<sup>59</sup> Finally, hunter-gatherer societies in the far

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<sup>53</sup> *Id.* at 698.

<sup>54</sup> See discussion, *infra*.

<sup>55</sup> *Id.* at 699.

<sup>56</sup> *Id.*

<sup>57</sup> *Id.* at 699.

<sup>58</sup> *Id.* at 700.

<sup>59</sup> *Id.*

north (what is now Alaska) lived in small groups, on a diet dominated by meat—fish, seal, and other animals in the northern waters.<sup>60</sup> These northern societies managed to survive on such a nutrient-limited diet by maintaining strong rituals around the consumption of food; for example, it was customary to eat the internal organs of seals raw.<sup>61</sup> Seal liver is one of the only sources of Vitamin C to be found in the Arctic, but it must be eaten raw—cooking destroys the vitamin. These are all examples of the ways in which Native American tribes evolved traditions and practices that were influenced by the availability, or lack thereof, of subsistence, by the types of naturally occurring food sources and by the methods required to obtain them.

Finally, before European contact, each tribe considered itself a self-sufficient unit, and generally did not rely on trading with other tribes.<sup>62</sup> The lack of trading may also have been due, in part, to a tribal sense of property that focused more on communal rather than individual ownership, and that had no concept of ownership in a piece of property extending perpetually.<sup>63</sup>

In summary, the evolution of subsistence practices by North American Indians encompasses the shift from small, nomadic hunter-gatherer societies, to larger, more stable societies that obtained much of their food from agricultural practices. Throughout this evolution, the methods of obtaining food and the geographical demands of the region strongly influenced the culture and government of each tribe.

## **B. Examples of traditional foods**

In the discussion above, I emphasize how the traditional Native American diet was comprised of food that was obtained or cultivated in its natural state; indeed, much of Native American societies were structured around the specific method of obtaining subsistence that was

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<sup>60</sup> *Id.* at 700-701. Note, too, that until very recently—until the last several decades—these cultures remained largely untouched by Western influence. *Id.*

<sup>61</sup> *Id.*

<sup>62</sup> *Id.* at 748.

<sup>63</sup> *Id.*

best suited to its geographic area. Furthermore, traditional diets were very low in sugar and high in protein; much of the caloric base of the diet came from staple carbohydrates such as corn and beans, but the diets were usually supplemented with a wide variety of grown or gathered plant and animal species.<sup>64</sup> In this section, I will briefly discuss some specific types of traditional food that were most important and influential to the Native American diet and culture: corn, fish, and buffalo.

Corn was domesticated as early as 7000 B.C.,<sup>65</sup> and it became a staple crop for many Native American tribes. Many tribes developed traditions and farming practices to ensure that corn was nutritionally beneficial. For example, a healthy corn crop rapidly depletes the nitrogen in the soil, so tribes developed various methods of supplementing the soil with decaying matter from other plants, which would replenish the nitrogen required for corn to grow.<sup>66</sup> Additionally, corn, although it is an efficient and versatile source of calories, lacks an essential amino acid (lysine); this amino acid is provided by beans, which is why many tribes developed traditions of eating corn with beans—the combination provides a complete amino acid profile.<sup>67</sup>

For the tribes that lived on coastal areas or by lakes, fish were almost always a food source, and for some tribes fish constituted the primary source of food.<sup>68</sup> In the Northwest, for example, the tribes relied on the annual salmon run for much of their food source; the tribes would harvest vast amounts of the salmon that were plentiful in spawning season, and would then dry or smoke the fish to preserve it for the rest of the year.<sup>69</sup> Tribes generally fished with hooks, lines, gorges, fish traps, and nets; some tribes also dug up shellfish.

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<sup>64</sup> Note that a significant exception is the Inuit cultures of the Arctic region, whose diet is primarily meat.

<sup>65</sup> Barrett & Markowitz, *supra* note 24, at 187.

<sup>66</sup> *Id.* at 188.

<sup>67</sup> *See id.* at 188.

<sup>68</sup> *Id.* at 291. Note, though, that the Hopi tribe considered fish taboo, and did not consume them.

<sup>69</sup> *Id.* at 293.



For the tribes living in the Plains region, their food source (and some aspects of their culture) were dominated by the vast herds of buffalo that roamed in the areas.<sup>70</sup> In fact, Plains tribes subsisted largely on buffalo until the animals were almost extinguished by the fur trade and buffalo hide hunters of the post-European contact era.<sup>71</sup> Before European contact, however, the bison population numbered approximately 30 million at a time, and tribes would hunt them on foot until they surrounded the herd—they would then make kills by shooting at the herd or driving it over a cliff.<sup>72</sup>

Overall, the predominant food sources for Native American tribes pre-contact varied widely by region, but were usually wild animals and wild or cultivated plant species; the diet, as a whole, was high in protein, full of complex carbohydrates, and had almost no sugar. Additionally, the demands of capturing or growing that food resulted in a significant amount of physical exercise each day.

### **C. Food preparation and rituals**

In traditional Native American tribes, the rituals and social conventions surrounding food acquisition, preparation, and consumption served to optimize the nutritional benefit of the food sources, to reaffirm social and cultural bonds, and to promote religious and spiritual participation.

Most food in traditional Native American societies was eaten cooked.<sup>73</sup> Heat for cooking generally came from wood fires, and the food was generally prepared in ceramic pots.<sup>74</sup> Until ceramic pots came into widespread use, there were only limited means available for cooking,

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<sup>70</sup> *See id.* at 152.

<sup>71</sup> *Id.*

<sup>72</sup> *Id.* at 153.

<sup>73</sup> *Id.* at 295. Notable exceptions were berries and animal livers, which were eaten raw.

<sup>74</sup> *Id.* at 296.

especially for nomadic tribes.<sup>75</sup> Some cooking methods employed by tribes who did not have ceramics include using flat stones as a griddle, or wrapping food in leaves and roasting it in the coals.<sup>76</sup> Tribes with ceramic pots would often cook food in stews and gruels, with cornmeal. It was common to simmer ground seeds with tubers, greens, meat, berries, and whatever else was available.<sup>77</sup> Other common methods of food preparation included roasting meat on racks and vegetables in coals and making corn dumplings from leap-wrapped dough. In the southwest, sautéing with cottonseed oil or sunflower oil was common.<sup>78</sup> The most common method of food preservation was drying food and storing it.<sup>79</sup>

Many Native American tribes had complex rituals, social conventions, and traditions surrounding the consumption of food. For example, some tribes had conventions regarding which food could acceptably be eaten by hand, whereas other food required spoons or scoops.<sup>80</sup> Additionally, many tribes had rituals regarding offering a prayer before eating.<sup>81</sup> Finally, key food sources often became a central element in traditional Native American celebrations and feasts. For example, the tribes of the Pacific Northwest would welcome the first run of salmon by sprinkling the captured fish with goose down, and women who prepared the fish would return the bones and innards to the water to ensure that future catches were profitable.<sup>82</sup> Another example is that of the Green Corn dance, which was a feast centered around the harvest of new corn. The feast consisted of social dancing, kindling fires, and publicly forgiving transgressions.<sup>83</sup> Therefore, in many ways food gathering, preparation, and consumption

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<sup>75</sup> *Id.*

<sup>76</sup> *Id.*

<sup>77</sup> *Id.*

<sup>78</sup> *Id.* at 297.

<sup>79</sup> *Id.*

<sup>80</sup> *Id.*

<sup>81</sup> *Id.*

<sup>82</sup> *Id.* at 282.

<sup>83</sup> *Id.* at 282.

transcended nutrients and calories to become a central element in tribal and community solidarity and culture.

In summary, the traditional Native American diet was high-protein and low-sugar, often based on one or two primary food sources, and supplemented with a variety of plant and animal species. The traditions of food preparation promoted health and good nutrition in the way food was combined and cooked, and the daily life of a tribe was full of physical activity. Finally, food sources became a central element of many cultural traditions and rituals, which became a way of connecting food acquisition and consumption with community cohesiveness and spiritual observance.

### **III. NATIVE AMERICAN LIFESTYLES POST-EUROPEAN CONTACT: A CHANGING DIET AND CHANGING CULTURE**

The modern Native American diet tends to be radically different from that of traditional societies. Now, a typical Native American diet involves large portion sizes and a fat intake that comprises 31-47% of total calories consumed.<sup>84</sup> The typical diet is low in fiber, vegetables, fruits, and dairy, and high in simple starches and processed food.<sup>85</sup> Common current food choices include tortillas, fry bread (usually a type of unleavened dough fried on a griddle), fried potatoes, mutton, processed meats, fried eggs, white bread, dessert foods, canned fruits and vegetables, macaroni pasta, soda and juices, and coffee.<sup>86</sup> As for physical activity, although tribes do engage in some organized activity such as pow-wows, push dances, and school sports programs, modern tribal lifestyle tends to be largely sedentary.<sup>87</sup>

In this section, I will explore the history of Native American interaction with European

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<sup>84</sup> Gille, *supra* note 2.

<sup>85</sup> *Id.*

<sup>86</sup> *Id.*

<sup>87</sup> *Id.*

settlers, and the continuing interaction with the U.S. government, from the perspective of changing cultural norms of diet and exercise. Much of the reason for the modern obesity and health crisis in many tribes traces back to the history of U.S.-tribal involvement, with tribes being relocated to inhospitable areas and coerced into assimilation in Western culture. These policies resulted in a modern tribal lifestyle that tends to be severely impoverished, geographically isolated, reliant on the federal government for food, and heavily influenced by Western modes of diet and lifestyle. Therefore, the very recent trend of the obesity/diabetes epidemic in tribes implicates cultural interactions from centuries ago.

**A. Changes in Native American hunter-gatherer and agricultural practices, from European contact to the American Revolution (circa 1500-1780)**

The influence of Western-style diet and cultural practices of food acquisition and preparation on Native American tribes first began upon the arrival of the European settlers in North America. This European influence heralded the beginning of fundamental changes among tribal cultural, and launched a cycle of Western marginalization of tribal traditions, and replacement of tribal culture with Western culture—often as a result of direct or indirect coercion from Western powers.

The arrival of European settlers and their interactions with Native American tribes had profound effects on the Native American hunter-gatherer lifestyle in several ways: first, Western hunting aids such as guns and horses dramatically changed the modes of food acquisition among tribes; and second, the environmental modification by European settlers made much of Native Americans' traditional hunting and gathering practices untenable.

Trade with Europeans resulted in Native American tribes possessing, for the first time, guns, horses, and farming tools.<sup>88</sup> This radically changed the hunting and food cultivation

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<sup>88</sup> Barret & Markowitz, *supra* note 24, at 749.

culture of many tribes; for example, after the introduction of horses, many Plains tribes became equestrian buffalo hunters.<sup>89</sup> As a result, Plains tribes became largely nomadic, assembling as a tribe only during the summer months and spending the rest of the year dispersed to follow buffalo herds on horseback.<sup>90</sup> Therefore, the simple cultural exchange of knowledge and tools regarding food consumption had vast cultural implications for these tribes.

After European contact, many Indian tribes also switched from subsistence hunting (hunting for what was required to eat) to commercial hunting (hunting for hide, fur, and meat to trade).<sup>91</sup> This change was brought about largely by the European fur and hide trade, and it had devastating consequences for stability of the food sources and the environment generally. For example, the fur trade resulted in vast depletion of buffalo herds; in 1870, there were 14 million buffalo, but that number dropped to 1 million by 1875, and by 1895, only 800 buffalo were left.<sup>92</sup> Not all of this change was wrought by tribes; in fact, European hunters may have been largely responsible: European settlers also engaged in vast buffalo hunting for the hide trade, and Europeans also hunted buffalo for sport, often riding in trains and shooting at buffalo with rifles through the windows of the cars.<sup>93</sup> This was one way in which contact with Europeans dramatically changed tribal lifestyle and resulted in depletion of the traditional food supplies on which tribal cultural and sustainability depended.

There were also other ways in which European contact significantly changed the Native American hunter-gatherer lifestyle and culture generally. For example, the Columbian Exchange—a term for the vast exchanges of flora and fauna between the New World and the Old World—resulted in the introduction of new animal and plant species that dramatically altered the

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<sup>89</sup> *Id.* at 153.

<sup>90</sup> *Id.*

<sup>91</sup> *Id.* at 749.

<sup>92</sup> *Id.* at 154.

<sup>93</sup> *Id.*

landscape on which Native Americans depended for subsistence.<sup>94</sup> Invasive European species, such as dandelions and feral pigs, took over the North American ecology and decimated native species of plants and animals.<sup>95</sup> European alteration of the landscape to establish farms, and the European introduction of livestock, also significantly changed the ecology on which traditional tribal lifestyles depended. Finally, it is important to note the exchange that had the most devastating impact on tribal lifestyles and culture: the rapid spread of European diseases, such as smallpox, among tribes, resulting in epidemics that killed many thousands of Native people.<sup>96</sup>

Finally, European contact also dramatically altered the Native American use of agriculture, in two main ways: Europeans brought new crops and livestock, and the European influence turned some of the Native American agriculture into commercial agriculture.<sup>97</sup> The major crops introduced by European settlers included wheat, potatoes, tomatoes, cantaloupes, apricots, and apples.<sup>98</sup> European settlers also introduced agricultural tools, such as the plow, and concepts, such as the idea of growing orchards to cultivate tree fruit, and growing more than was needed for subsistence purposes in order to sell crops (commercial agriculture).<sup>99</sup>

European settlers also introduced domesticated livestock, which had a significant impact on Native American lifestyle—both directly and indirectly. The introduction of horses, mules, cattle, and goats had a direct effect on some Native American tribes, who used the animals for hunting or agricultural purposes; for example, the Plains tribes became equestrian buffalo hunters, and some Eastern tribes used oxen for plowing.<sup>100</sup> Additionally, the livestock changed Native American lifestyles in an indirect way, by fundamentally altering the ecology of the

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<sup>94</sup> See generally Alfred Crosby, *THE COLUMBIAN EXCHANGE: BIOLOGICAL AND CULTURAL CONSEQUENCES OF 1492*. Greenwood Press: Westport, CT (1972).

<sup>95</sup> See *id.* at 73.

<sup>96</sup> *Id.* at 37; see also Barrett & Markowitz, *supra* note 24, at 229.

<sup>97</sup> Barrett & Markowitz, *supra* note 24, at 8.

<sup>98</sup> *Id.* at 9.

<sup>99</sup> See *id.* at 9.

<sup>100</sup> See *id.* at 9.

landscape—the introduction of livestock also meant the introduction of European-style farms, fences that intruded on Native American hunting and gathering land, and destruction of native plant and animal species by the cattle, pigs, and other animals introduced by European settlers.

Overall, the first 250 or so years after first contact with the Europeans were characterized by significant change in the Native American diet and lifestyle, resulting in a substantial departure from traditional tribal diets and the adoption of European-style hunting and agricultural practices—practices that tended to be much more destructive and less sustainable than tribal traditions. This in turn led to the beginning of problems with Native American poverty and cultural clashes between tribes and European settlers; in the next section, I will discuss how these problems evolved from the establishment of the U.S. government to the present, with a focus on the dislocation and marginalization of traditional tribal culture, and a replacement of Native American diet and rituals with Western-style diet and rituals.

### **B. Changes in Native American diets and lifestyles as a result of U.S. policies and cultural pressures (circa 1780-present)**

Although the U.S. policy toward Native American tribes has changed dramatically since the inception of the U.S. government, the history of U.S.-Native American interactions illustrates a trend of sublimation of tribal traditions to Western culture. Even in modern times, when the U.S. has formally revoked its policy of assimilation of Native Americans and instead encourages Native American tribal self-determination and recognition of traditional culture, the reality is that Western culture continues to exert a substantial influence on Native American diets and lifestyles.

The U.S.-Native American relationship began with a policy of separation. After the federal government was organized, circa 1783, the government established policies of removal; specifically, the U.S. acquired huge tracts of land in the west and began forcibly moving Native

American tribes to those areas.<sup>101</sup> Simultaneous with this policy of removal, the U.S. exerted efforts to inculcate western values and ideals in Native American tribes. One of the predominant examples of this policy was the effort of the federal government to transform Native American tribes into farming communities.<sup>102</sup> Western-style agriculture was considered to be a “civilizing” influence on tribes, and the government provided tools and livestock in an attempt to instill the practices and ideals of Western-style small farmers in Native American communities.<sup>103</sup>

In 1887, the federal government introduced the Dawes Severalty Act, which aimed to create private property incentives on Native American reservations, and to further encourage the farming lifestyle among these communities.<sup>104</sup> Pursuant to this Act, reservation land was divided into several allotments, and a family was provided with 160 acres, or a single male with 80 acres.<sup>105</sup> The title to this land was held in trust by the federal government for 25 years, and then the full title was transferred to the Native American owner.<sup>106</sup>

The Dawes Act was problematic, and ultimately a failure, for several reasons. First, it constituted an imposition of private property values on individuals with no cultural concept of individual, private property.<sup>107</sup> Furthermore, the land assigned was too arid to grow crops needed for the Native American families to become subsistence farmers, and the aim of converting tribes into commercial farmers subverted the tribes’ cultural ideals of self-sufficiency.<sup>108</sup> In 1928, the government issued the Meriam Report regarding the failure of the Dawes Act, which made three recommendations regarding Native American agricultural initiatives: (1) abandon the goal of converting Native Americans to commercial farmers; (2)

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<sup>101</sup> *Id.* at 10.

<sup>102</sup> *Id.* at 10.

<sup>103</sup> *Id.*

<sup>104</sup> *Id.* at 11.

<sup>105</sup> *Id.*

<sup>106</sup> *Id.*

<sup>107</sup> *Id.*

<sup>108</sup> *Id.*



direct more programs toward encouraging women to engage in subsistence farming; and (3) shift the focus to livestock raising, toward which the arid land was more suited than crop-growing.<sup>109</sup> Finally, in 1934, the Indian Reorganization Act ended the allotment system and returned all originally designated tribal land to tribal ownership.<sup>110</sup>

Since that time, agriculture on Native American reservations has continued to decline, and now only 10% of reservations are agriculturally active.<sup>111</sup> Furthermore, the formal federal policy of imposing Western dietary and food production ideals on “uncivilized” tribes has been replaced with more subtle pressures of Western culture on Native American communities. For example, the forced dislocation of tribes onto reservations contributed to the current state of poverty that many Native American communities experience, for the transition to reservation life limited the entrance into the mainstream U.S. economy until the 1900s.<sup>112</sup> Additionally, many tribes are unable to access natural resources due to ecological change and are located far from grocery stores. These tribes rely on federal government food programs, such as commodity food programs and food stamps, which enforces the saturation of Native American diets with Western-style foods.<sup>113</sup> The result? In many tribes, the traditional diet and lifestyle has been replaced with fast food, Western-style processed food, and a largely sedentary lifestyle based around computer and TV screens.<sup>114</sup>

As noted above, the Native American contact with Europeans was marked by vast exchanges of infectious diseases with devastating impacts on tribal populations; now, the epidemic of infectious diseases among tribes has been replaced with an epidemic of obesity and

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<sup>109</sup> *Id.* at 12.

<sup>110</sup> *Id.*

<sup>111</sup> *Id.* at 12.

<sup>112</sup> *Id.* at 750.

<sup>113</sup> Gille, *supra* note 2.

<sup>114</sup> See generally Rolf L. Wirsing, “The Health of Traditional Societies and the Effects of Acculturation,” *Current Anthropology* 26 (3) (June 1985).

diabetes, disorders that are not transmitted through viral or bacterial agents, but are instead products of extreme poverty and an adoption of the Western-style culture. In the next section of this paper, I will discuss theories on the specific biological and cultural mechanisms driving the obesity/diabetes epidemic in Native American tribes in the last half century or so.

#### **IV. BIOLOGICAL AND CULTURAL THEORIES FOR THE DISPROPORTIONATELY HIGH INCIDENCE OF OBESITY AND DIABETES IN MODERN NATIVE AMERICAN COMMUNITIES**

In this section, I will review three major theories for the specific mechanisms by which Western influence has contributed to the sharp increase in obesity and diabetes rates among Native Americans. First, the “thrifty gene” theory holds that Native Americans tend to share physiological adaptations that predispose them to metabolizing glucose and storing fat efficiently, which—when combined with a Western diet high in fat and simple carbohydrates—results in unusually high rates of diabetes and obesity. Second, the “ecocide” theory holds that deliberate and incidental environmental destruction by Western businesses and governments resulted in corresponding destruction of Native American health and culture. Third, the cultural trauma theory holds that the current obesity and diabetes epidemic is a manifestation of a continuing trend of Western invasion and usurpation of Native American culture. Each of these theories has merit, and together they reflect the racial, social, cultural, and health implications of the increasing rates of obesity and diabetes of Native Americans due to Western cultural influence.

##### **A. The “thrifty gene” theory: Native American physiological adaptations and biological responses to the rapid adoption of the Western diet and lifestyle**

The basis of the thrifty gene theory is that certain physiological adaptations, which are beneficial in times of scarcity and are well suited to a feast-or-famine, largely hunter-gatherer

lifestyle, also result in a predisposition to obesity.<sup>115</sup> In other words, these physiological adaptations ensure that optimal amounts of energy are available in a diet that is low on readily accessible energy from simple carbohydrates and sugars, and high in protein. When an individual who inherits these traits adopts a lifestyle, such as the Western diet, that is based on high-energy food sources such as fat, simple carbohydrates, and sugars, the hereditary adaptations predispose this individual to rapid fat storage, which may in turn lead to obesity.<sup>116</sup> Furthermore, these adaptations also predispose for increased glucose (sugar) sensitivity which, when combined with obesity, may result in diabetes.

Therefore, the theory holds, Native Americans migrating over the land bridge from Asia led hunter-gatherer lifestyles and experienced long periods of shortages; because of this, Native Americans may have evolved to possess the above-described traits in order to best thrive in their traditional lifestyles. Then, in a very short period of time since World War II, Native Americans began adopting a Western-style diet. Because the above traits may predispose an individual to obesity if consistently large amounts of easily metabolized foods are consumed, the adoption of the Western diet resulted in very high rates of obesity and diabetes among Native Americans.

The specific physiological adaptations that would have benefited Native Americans conducting traditional lifestyles are increased glucose sensitivity, easier fat storage, and glucose sparing.<sup>117</sup> In this section, I will briefly describe each of these adaptations and explain why they would be beneficial to a hunter-gatherer who must experience times of shortages, but would result in a predisposition to obesity and diabetes when combined with a Western diet and lifestyle.

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<sup>115</sup> See generally C. Ritenbaugh & C.S. Goodby, "Beyond the thrifty gene: metabolic implications of prehistoric migration into the New World." *Medical Anthropology* 11(3): 227-236 (1989).

<sup>116</sup> See *id.*

<sup>117</sup> See generally Eموke J.E. Szathmary, "Non-Insulin Dependent Diabetes Mellitus among Aboriginal North Americans." *Annual Review of Anthropology* 457 (1994).

Increased glucose sensitivity refers to more rapid production of insulin when glucose enters the bloodstream.<sup>118</sup> Insulin is a hormone secreted by the pancreas that helps regulate the conversion of excess energy, such as glucose in the bloodstream, to fat tissue. Glucose sensitivity helps to prevent energy loss by rapidly storing excess glucose as adipose (fat) tissue.<sup>119</sup> This would be beneficial for the hunter-gatherer ancestors of Native Americans, because it would ensure that, in times of plenty, the most energy possible would be stored from the excess glucose available in “feast” times.<sup>120</sup> That energy could then be released (i.e., the stored fat would be “burned”) when it was needed in times of fasting, such as the winter months, in which excess glucose was almost impossible to come by.<sup>121</sup>

However, increased glucose sensitivity, although it would be highly beneficial for hunter-gatherers, also seems to result in a propensity for obesity if an individual with this adaptation is constantly in a “feast” mode—i.e., is consistently eating plenty of glucose-heavy foods such as simple carbohydrates and sugars. The reason for this is that when an individual is metabolically predisposed to rapidly convert excess glucose into fat, constantly consuming excess amounts of glucose will result in constant fat storage.

Increased glucose sensitivity also predisposes the individual to diabetes, for two reasons: first, the higher rates of obesity may contribute to diabetes risk; and second, rapid insulin reactions to glucose in the bloodstream may eventually result in insulin exhaustion—which may in turn cause Type II diabetes. Specifically, when high amounts of insulin are circulating in an individual’s bloodstream as a result of excess glucose levels, the cells that react with insulin to

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<sup>118</sup> *See id.* at 464.

<sup>119</sup> *Id.*

<sup>120</sup> *See id.*

<sup>121</sup> *See id.*

store the glucose as fat may become insulin resistant.<sup>122</sup> In other words, the cells begin “ignoring” the insulin signals and stop storing glucose in the bloodstream as fat. This results in high amounts of glucose circulating in the bloodstream, which may result in diabetes-related complications.

The next physiological adaptation that would be beneficial to hunter-gatherers, but may result in obesity and diabetes when combined with a Western diet, is easier fat storage. This adaptation is related to increased glucose sensitivity: as described above, higher sensitivity to glucose in the bloodstream results in increased insulin production and higher amounts of fat storage. Some studies also indicate that other physiological mechanisms promote increased fat storage in Native Americans; for example, one study of the Pima Indians noted that in individuals in that population, peripheral tissues, such as muscle tissue, were more resistant to glucose entry than were lipid (fat) tissues.<sup>123</sup> In other words, glucose in the bloodstream may be channeled into various tissues throughout the body; it may be stored as glycogen in muscles or converted to lipids in fat cells. The Pima Indian study seems to indicate that Native Americans may be predisposed to storing glucose as fat, as opposed to metabolizing it in other ways.<sup>124</sup> Increased fat storage would have been particularly beneficial for nursing and pregnant women.<sup>125</sup>

Like increased glucose sensitivity, metabolic processes that more readily produce fat tissue would be beneficial for hunter-gatherers experiencing frequent periods of scarcity, but would result in a predisposition to obesity, and likely diabetes as well, when the dominant food source is a high-glucose Western diet.

Finally, a physiological adaptation called glucose sparing would have been beneficial in

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<sup>122</sup> *Id.*

<sup>123</sup> *See id.*

<sup>124</sup> *Id.*

<sup>125</sup> *Id.*

northern hunter-gatherer tribes by maximizing the amount of glucose circulating in the body, but it would predispose the individual to obesity and diabetes in a modern Western society. Glucose sparing is a metabolic adaptation that essentially blocks the formation of glycogen (a molecule that cells use to store glucose) and instead uses a byproduct of glucose metabolism to promote increased circulation of glucose in the blood.<sup>126</sup> Therefore, the net effect of this biochemical process is to optimize the amount of glucose in the bloodstream that is available for utilization by the brain. When combined with increased glucose sensitivity, as described above, these two adaptations would result in the following situation where an individual consumes high-glucose food: the body would first ensure that there was sufficient glucose circulating in the bloodstream for use by the brain, and would then rapidly store the rest as fat.

This adaptation would have been very beneficial in hunter-gatherer tribes needing to make the best use of what little glucose they were able to come by. However, for individuals with this adaptation eating a modern Western-style diet, glucose sparing would promote diabetes by increasing the amount of sugar circulating throughout the individual's bloodstream.

Therefore, three physiological adaptations—increased glucose sensitivity, easier fat storage, and glucose sparing—may contribute to a predisposition to obesity and diabetes of Native Americans.

Furthermore, some studies indicate that certain genes and genetic markers shared by Pima Indians are correlated with insulin resistance (the result of increased glucose sensitivity leading to diabetes), which supports the theory of a genetic basis for Native American propensity toward the traits that promote energy efficiency in hunter-gatherer lifestyles, and may predispose toward obesity and diabetes in modern Western lifestyles.<sup>127</sup> Specifically, one study found that

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<sup>126</sup> *Id.*

<sup>127</sup> *See, e.g.,* Narayan, *supra* note 6, at 174.

diabetes in the Pima population was associated with genetic markers on chromosomes 4 and 7, which are genes that are known to be correlated with insulin resistance.<sup>128</sup>

The underlying genetic correlations and physiological adaptations described above provide plausible support for this theory, and several studies have shown additional evidence in support of this theory, by determining high statistical correlations between the adoption of Western dietary and exercise habits and obesity/diabetes occurrence in Native American communities.<sup>129</sup> For example, a study of the Pima Indian community showed a correlation between amount of carbohydrate intake and overall calorie intake, which rose sharply after the community transitioned to Western norms of eating, and diabetes occurrence, which also rose sharply after World War II.<sup>130</sup> Another study of the Pima Indians also showed an inverse correlation between exercise level and incidence of diabetes; those individuals with the highest rates of leisure physical exercise had the lowest rates of diabetes.<sup>131</sup> Finally, a study of the Zuni tribe noted that the epidemic of diabetes in the tribe since 1940 was correlated with a lifestyle that was much more sedentary than it had previously been, and with a diet that consisted of high proportions of fat and simple carbohydrates (the original Zuni diet was comprised of high-fiber foods such as corn and beans, with supplemental meat and vegetables).<sup>132</sup>

In summary, the “thrifty gene” theory suggests that the spike in obesity and diabetes levels among Native American tribes since World War II is due to the adoption of a Western-style diet and lifestyle. The foods and lack of exercise in the Western lifestyle, when combined with the physiological adaptations possessed by many Native Americans to metabolize food and

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<sup>128</sup> *See id.*

<sup>129</sup> *See, e.g.,* Narayan, *supra* note 6; B. Leonard et al., “Zuni Diabetes Project,” *Public Health Reports* 101(3): 282-288 (1986); Dorothy Gohdes, M.D., DIABETES IN NORTH AMERICAN INDIANS AND ALASKA NATIVES, ch. 34, at <http://diabetes.niddk.nih.gov/dm/pubs/america/pdf/chapter34.pdf>.

<sup>130</sup> Gohdes, *supra* note 129, at 6.

<sup>131</sup> Narayan, *supra* note 6, at 176-77.

<sup>132</sup> Leonard, *supra* note 129, at 283.

store fat efficiently, resulted in a disproportionately high rate of obesity and diabetes among Native Americans.

**B. The “ecocide” theory: effects of environmental destruction on Native American communities**

The ecocide theory holds that the deliberate and incidental environmental destruction caused by European settlers and, later, the U.S. government disproportionately affected Native American tribes who had an intricate relationship with their surroundings—many tribes relied on the environment for sustenance, incorporated it into their religions, and based aspects of their culture on the plants, animals, and geography of their region.<sup>133</sup> According to this theory, the rise of obesity and diabetes among Native Americans would be a direct result of the destruction of the environment and, therefore, of the traditional society and lifestyle of Native Americans.

The story of the Yamasee tribe in Florida is an example of the importance of the environment to Native American health and culture. In the Yamasee tradition, the “family” includes the environment and the ecosystem, and cultural ceremonies intricately involved the environment.<sup>134</sup> The destruction of the environment constituted a destruction of a core set of tribal relationships comprising a central aspect of Yamasee culture.<sup>135</sup> Furthermore, the destruction of Florida wetlands and coastal ecology fundamentally altered the diet of the Yamasee, which had previously relied on sea turtle, coquina shell, eggs, cabbage, molluscs, fish, and alligators.<sup>136</sup> With the traditional diet no longer possible, many Yamasee individuals turned to Western-style foods, which were often the only sustenance available.

One commentator noted that ecocide, or deliberate environmental destruction, may be a

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<sup>133</sup> See Donald E. Grinde & Bruce E. Johansen, “Environmental Destruction of Indian Lands and Peoples,” in *ECOCIDE OF NATIVE AMERICA*. San Diego: Clear Light Publishers, 1995.

<sup>134</sup> *Id.*, at 88.

<sup>135</sup> *Id.* at 80.

<sup>136</sup> *Id.* at 85-88.



tactic used by traders, government officials, and missionaries, who encourage Native Americans to give up their way of life in order to facilitate the invasion of Western culture.<sup>137</sup> For example, industrial and government representatives may want Native Americans to open their land to lumber companies, agro- and mining businesses, and the growing of cash crops.<sup>138</sup> All of these activities cause environmental destruction and make it impossible for Native Americans who permit this environmental destruction—or who are coerced into “permitting” it—to continue their previous way of life.

One result of this environmental destruction is a serious, and negative, impact on the traditional diet and health of Native Americans. Therefore, this theory links the historical ecocide of Native American culture with the correlated invasion of the Western diet in Native American homes as dual agents of harm against Native American culture and health.

### **C. The theory of cultural trauma: Native American poverty and reliance on the federal government**

The theory of cultural trauma posits the obesity and diabetes crisis in Native American tribes as the most recent manifestation of a larger disorder: the systematic replacement of Native American cultures, traditions, and ideals with Western-style norms, and the resultant physical and psychological trauma of Native Americans.<sup>139</sup>

Therefore, the current eating and exercise patterns of Native Americans are related to the loss of traditional culture, to the historical trauma from genocide, to the forced removal of children to boarding schools, to punishment from the U.S. government for conducting traditional practices and speaking traditional languages, to the loss of homelands and forced dislocation to reservations; all of which contributed to the current state of poverty, low education levels,

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<sup>137</sup> See Wirsing, *supra* note 114, at 303.

<sup>138</sup> *Id.*

<sup>139</sup> See generally C. Eaton, “Diabetes, culture change, and acculturation: A biocultural analysis.” *Medical Anthropology* 1(2): 41-63 (1977).

alienation from traditional culture, and dependence on government food programs.<sup>140</sup>

One commentator emphasized the cultural trauma occurring in the Inuit tribes of Alaska as an explanation for the tribes' increasing adoption of unhealthy Western diets and lifestyle.<sup>141</sup> The Inuits traditionally led a very active lifestyle of almost constant hunting to obtain enough energy and nutrition to survive the very harsh Arctic conditions; now, however, much of Inuit life is led in front of a computer or TV screen.<sup>142</sup> The traditional diet of caribou, Arctic char, whale, and seal has been replaced with fast food and processed food.<sup>143</sup>

What explains the rapid acculturation of this tribe to a Western lifestyle? The commentator points to the isolation of the community and its reliance on government food programs, along with the extreme poverty of the tribe and how much more expensive fresh food is, on a calorie-by-calorie basis, than processed food.<sup>144</sup> The theory holds that the poverty and the reliance on government programs are a result of persistent and systematic pressure—from the U.S. government, from neighboring cities, and from traders—to convert to a Western culture.

In summary, the three theories discussed here—the thrifty gene theory, the ecocide theory, and the cultural trauma theory—illustrate a spectrum of the social, cultural, racial, and health implications of the influence of Western society on increasing Native American obesity and diabetes rates.

## **V. CONCLUSION**

In conclusion, the recent obesity and diabetes epidemic in Native American tribes has its roots in the history of Native American hunter-gatherer origins and the subsequent interactions

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<sup>140</sup> See Gille, *supra* note 2.

<sup>141</sup> “How Western Diets are Making the World Sick,” NPR, at <http://www.npr.org/2011/03/24/132745785/how-western-diets-are-making-the-world-sick>.

<sup>142</sup> *Id.*

<sup>143</sup> *Id.*

<sup>144</sup> *Id.*

with Western culture. Specifically, the adoption of a Western diet and the replacement of elements of traditional culture with Western culture are forces driving the rising obesity/diabetes problem in Native American communities. In moving forward to frame solutions to this problem, it is important that policymakers and health practitioners work to incorporate the priorities and traditions of the tribes in health care and prevention efforts targeted toward the obesity and diabetes epidemic.