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The Evolution of the Indigenous Diet

Taylor Garlow

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The Evolution of the Indigenous Diet

A Capstone Project Submitted in Partial Fulfillment of the
Requirements of the Renée Crown University Honors Program at
Syracuse University

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and Renée Crown University Honors
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Honors Capstone Project in Nutrition

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Abstract

At some point, we learn about Indigenous culture in history class. We learn about produce such as the Three Sisters, the hunting of protein sources, and the gathering of nuts and berries that create the staples of the traditional Indigenous diet. If their traditional diet was so fresh, wholesome, and nutritious, how come there are several health disparities compared to other ethnicities? Over time, the Native Americans have seen rates of health conditions such as obesity, diabetes, and heart disease increase to a greater extent than the general population.

Through research with academic and government resources and site-visits, this Capstone examines how European colonization influenced the Native American diet. Focusing on the Onondaga Nation, I analyzed how the Onondaga people's living conditions changed as their native land was taken from them and they were forced to live on the reservation. Factors such as the availability of food, physical activity level, education level and income all have significant influence on their current eating habits. Although there is evidence on the Onondaga's rates of obesity, diabetes, and heart disease are not available, generally the Native American population has experienced a higher incidence of these conditions related to the different way of life they now have. It has changed drastically from that of their ancestor's pre-contact, which I argue is causing these disparities.

Executive Summary

Indigenous people, also known as Native Americans, are notable for their diverse lifestyles, customs and beliefs. Lacrosse, feathered head-dress, drumming music and a shared relationship between the Earth and humans are significant parts of their culture. Traditional food is also a unique part. A mix of agriculture, hunting and gathering supplied the foods consumed in their traditional diet. Activities such as gathering nuts and berries, hunting for deer or turkey, fishing for fish, and planting produce such as the Three Sisters provided the essential nutrients needed to survive and live a healthy life. However, everything changed once the Europeans began to colonize on their native lands.

In the 1400's, the Doctrine of Discovery ignited various expeditions to discover new lands to add to the growing Christian Empire. As land was taken from the Native Americans, their culture was significantly impacted. Living on reservations today, the Native Americans experience a new way of life compared to that of their ancestor's pre-contact with the Europeans. With limited traditional foods from their culture, the Native American diet changed to include higher amounts of saturated fats, added sugars, sodium and consuming lower amounts of fruits, vegetables, fish, game, and other traditional foods. In comparison, the Recommended Dietary Allowances recommend 3-5 servings per day of vegetables, 2-4 servings per day of fruit, 6-11 per day servings of grains (at least half should be whole grains), 2 servings per day of dairy (low-fat and fat-free), and 2-3 servings per day of meat (lean sources). It is also well known that Native Americans have higher incidence of chronic diseases such as diabetes, obesity and cardiovascular disease. This Capstone examines the composition of their pre-contact diet versus their post-contact diet and its relationship to the health disparities among in Native Americans.

This Capstone is presented in four parts. Part one investigates the Native American lifestyle prior to any contact with European colonizers. To narrow the scope of research, only the Onondaga nation was reviewed to include the natural resources the land and lake provided them, their state of health, and the general way of life before any contact. Part one also provides the timeline of contact between the Onondaga and European colonizers. Part two investigates the Onondaga's lifestyle post-contact including resources available to them on the Onondaga reservation, especially food sources and their current lifestyle. Part three explains the statistics relevant to rates of diabetes, obesity and cardiovascular disease among the Native American population in general. Statistics for the Onondaga people specifically are not available, so this section is focused on the general Native American population in the United States. Part three also outlines several factors that influence their diet today such as limited access to grocery stores, low income, low physical activity, and level of education. In part four, I provide some suggestions on strategies to help mitigate the health disparities in the Native Americans compared to other groups of people.

I have used a majority of academic and government resources to ensure I was securing appropriate and relevant data. I also visited the Skä•Noñh -Great Law of Peace Center and the Onondaga Reservation for additional information. While on the Onondaga Reservation, I was able to get a first hand look at the available resources to them such as grocery stores and health care facilities. The above sources helped me gather information to examine what has happened to the Indigenous diet post-contact with European colonizers and how it has impacted their current state of health.

This Capstone holds a great deal of significance for several reasons. The Native Americans are experiencing high rates of chronic diseases that have a direct relationship with food and nutrition. Their traditional ways contributed to their long, healthy lives. Since European colonization, however, that has been compromised. This topic is not talked about nearly enough and there is very little research on it. The lack of research available gave me even more motivation to put together this examination in order to start this important conversation. Attention needs to be brought to the Native American population and their health so that we can be a healthier nation together.

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Introduction

In this Capstone, I will examine the ways in which the Indigenous people eat and the evolution of their dietary patterns since European contact. Indigenous cultures all over the country have experienced great change since first contact. Native land was taken by those who thought it was rightfully theirs, forcing the Native Americans to live in new environments such as on reservations. This contact impacted their way of life, including how and what they eat. Today, Indigenous people's health is at stake. Their population is commonly associated with higher rates of certain health conditions such as obesity, diabetes and heart disease that are strongly influenced by diet. Recognizing this link, my goal was to explore the evolution of their eating habits since contact with Western nations that might reflect a trend with these health disparities.

This topic is of great personal interest to me. I have Native American heritage on both sides of my family. On my father's side, I am Mohawk from French-Canadian territory and on my mother's side I am a bit of Cherokee. Especially on my dad's side, this played a big role in my identity growing up. My grandparents would tell me stories about our ancestors including how we got our last name. My great-grandfather struggled to find work with our original Native American last name of Garu, so through time and many adjustments, he changed it to "Garlow" and was then able to find a job.

When thinking of a Capstone topic, I explored many ideas that could relate to my Nutrition major. I wanted to combine my passion for food and nutrition as well as something more personal to me. While learning about the Mediterranean Diet, I had an epiphany when I realized that the diet of Indigenous people has never really been discussed in any of my curriculum the past four years. I had learned in history classes about the Three Sisters and how Indigenous

people grew and prepared their foods. I was intrigued to note such high rates of diseases like obesity, diabetes and heart disease despite this population's nutritionally sound traditional dietary practices. There is little research that examines this change, and this inspired me to study this topic.

I focused my research on the Onondaga Nation and explored how this population has been specifically impacted by contact. This exploration is presented in four parts; the Onondaga pre-contact, post-contact, the current state of health in Indigenous people and what needs to be done to address these health disparities.

Part I: The Onondaga Pre-Contact and their Diet

The year 1142 is the earliest date believed to be the creation of the Haudenosaunee league. The Iroquois Confederacy was formed in the same year. Haudenosaunee is a general term that refers to the group of six nations instead of the term “Iroquois.” The five nations include the Mohawk, Seneca, Oneida, Cayuga, and the Onondaga. “Iroquois” is a French derivative meaning “Black Snakes,” so Haudenosaunee was used instead for its meaning of “People of the Longhouse.” This confederacy was originally made up of the Onondaga, Mohawk, Oneida, Cayuga, and Seneca tribes.¹ However, the Haudenosaunee believe their league was formed even earlier than 1142.² This group has shared values that have been passed down from generation to generation. These values include thinking for future generations, consensus in decision making, having a strong sense of self-worth without being egotistic, and equality for all despite age. Included in these values is the concept of food being a great gift from Mother Earth as well as there being a sacred bond between humans and food.² This value has contributed to the shaping of their culture and how food fits in their life.³ For the first few hundred years, the Haudenosaunee lived in peace and harmony with the Earth and the food she provided them.

Onondaga Lake supplied many sources of fresh food native to its shores. These included wild rice, bulrush, cattail, and arrowhead which grew in the wetlands that surrounded the great body of water. Its waters supplied salmon, whitefish, trout, and eel. The lands surrounding the lake provided options for hunting such as bears, wolves, buffaloes, and moose.³

The food Indigenous people consumed was based on their geographic location. Whatever resources were native to that land dictated their diet significantly. Onondaga Lake provided the Onondaga people different foods than the land of the Midwest provided tribes such as the Sioux. In the Midwest, tribes had access to native animals like Bison to hunt. With the foods supplied

by the area, the Onondaga also had three major staple crops in their diet; the well-known Three Sisters corn, beans, and squash. The Three Sisters got their name because of how they grow together. The stalk of the corn provides support for the beans, as it acts as the pole for them to climb up. The shade provided by the leaves of the corn also helps the squash as it grows under those leaves. The beans, while growing up the corn stalk, provide nitrogen to the soil for both the corn and squash to use. The leaves from the squash also provide shade to the beans and corn. The three crops benefit each other and the Onondaga, as it was the backbone of their diet for hundreds of years. The corn provides carbohydrates, B vitamins, vitamin C, magnesium, and fiber. Beans provide protein, fiber, folate, iron, potassium, phosphorous, and thiamin. Squash provides an abundance of vitamins and minerals including vitamins A, C, E, B6, and niacin. The minerals in squash include manganese, copper, magnesium, potassium, and calcium. Together, these crops are a nutritionally balanced trio.³ The Onondaga Nation harvested fifteen kinds of corn including blue, red, white and yellow as well as forty varieties of beans and several types of squash.⁴ The corn had many uses in their cuisine. It could be dried to then be made into soup, ground into flour, or boiled to be made into bread.⁵ They often put the Three Sisters in soups and stews as well.

Based on their food sources, one can assume that the Onondaga had a wholesome and balanced diet. The wild game they hunted and fish they caught provided high-quality protein and other essential vitamins and minerals like iron and vitamin D. The various fish also provided a source of essential fatty acids like omega-3. The wild rice and grasses available to them were rich sources of whole grains that were replete with fiber and complex carbohydrates. Given New York's terrain and temperatures, there are certain fruits and vegetables that grow native to the state that the Haundenosaunee likely had access to. These fruits include apples, blueberries,

raspberries, melons such as cantaloupe and watermelon, as well as peaches and apricots. These are just a few of the many fruits that thrive in the climatic conditions of New York. Methods of preparation used to make these foods consumable included baking, frying, boiling and roasting over an open fire.⁶ The Native diet was comprised of whole foods with no artificial ingredients that are prominent in a modern diet. Their diet was unprocessed, organic, locally grown, sustainable as well as low in refined carbohydrates and high protein.⁷

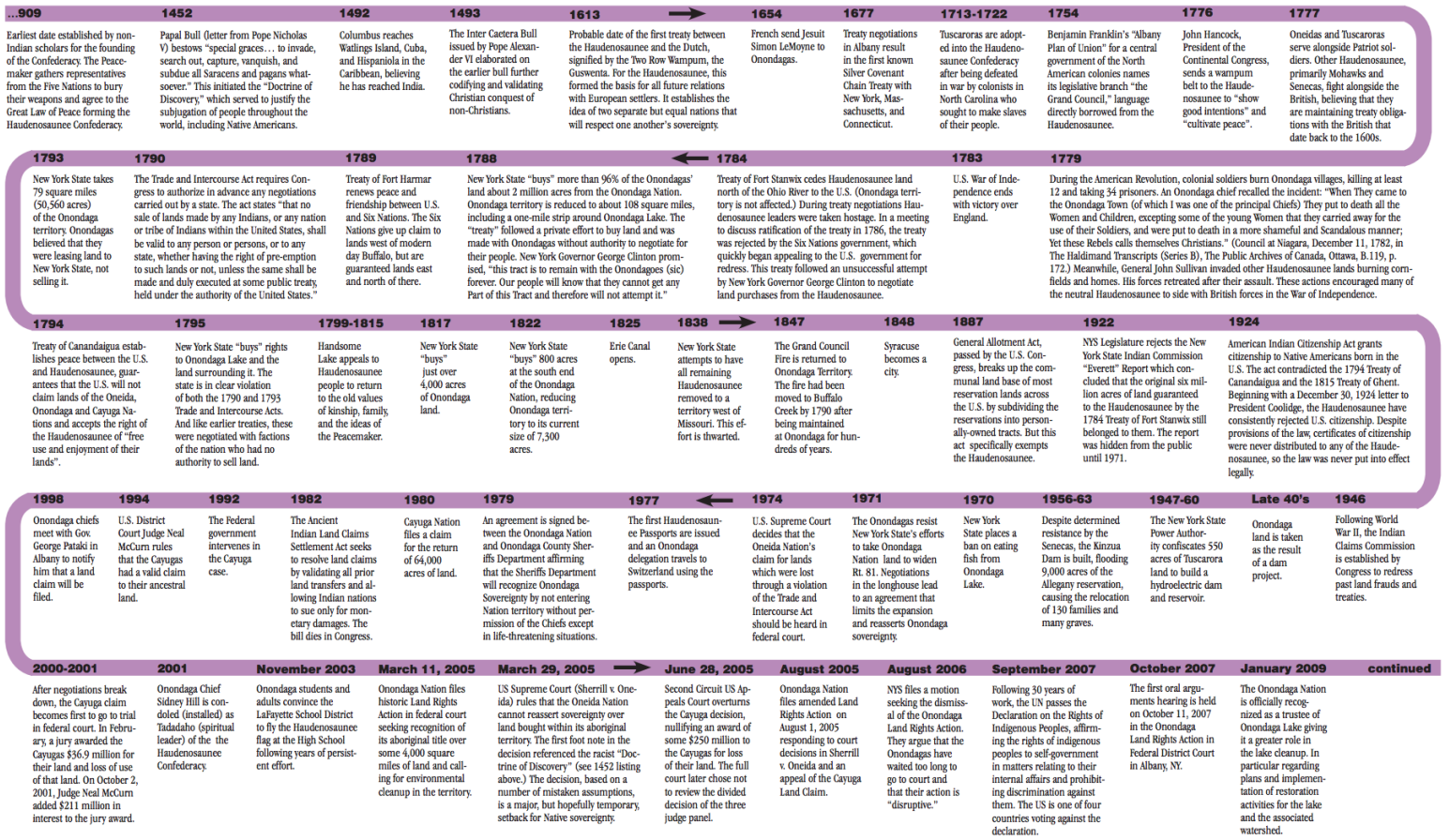
Given their resources, the Haudenosaunee had access to all the essential food groups and nutrients needed to maintain optimal health. Their traditional diet was low in saturated fat, sodium, added sugar, and cholesterol. Skeletal remains of Indigenous people in Vancouver showed virtually no tooth decay, arthritis or bone deformity present.⁸ Hunting and gathering was not only a source of physical activity but allowed them access to whole foods. Indigenous people generally were physically fit as well as healthy.

There is a long history between the Haudenosaunee and Europeans. In 1452, “A Papal Bull”, a letter from Roman Pope Nicholas V, initiated the seizing of non-Christian lands, dominions, possessions, and goods to be used to benefit and increase the Christian empire.³ This initiated the Doctrine of Discovery in 1493 after Columbus’ voyage to the Americas. This Doctrine declared that if a Christian came upon land that wasn’t already inhabited by Christians, they could claim it and that land would then be transferred to the Christian nations. A relationship developed from the desire to trade between Christians and the Onondaga people as the foreigners were landing on Indigenous grounds. This relationship developed over the next few hundred years, resulting in a treaty established to maintain peace between them. This treaty was known as the Two Row Wampum. In 1613, this wampum established two separate but equal nations. It wasn’t until 1656 when the Onondaga people experienced another major encounter

with the foreigners. Jesuits from Quebec came to Onondaga and established the mission of Sainte Marie on the shores of Onondaga Lake. The Onondagas were fearful of these missionaries, as they brought new diseases, that killed millions, and their ideas and values conflicted with that of the Haudenosaunee. Two years later, the Jesuits were forced to abandon the mission at Sainte Marie causing the relationship between these two groups to deteriorate. Despite any treaties that already existed or any new ones that were formed, Europeans continued to take Haudenosaunee land. Major occurrences of this include the state of New York buying more than 96% of their land. Onondaga territory was then reduced to approximately 108 square miles which included a one-mile strip around the lake in 1789.⁸ Land continued to be lost in 1822 when the state bought another 800 acres at the south end of Onondaga Nation. This reduced their territory to a mere 7,300 acres. Between 1788 and 1822, the Onondaga Nation lost its possession of about 95% of its land through illegal “takings” by New York State.⁹ An agreement was signed in 1979 that declared the Onondaga Nation sovereign, meaning although they are within the United States boundaries, they are self-governed and separate from the governing system that was put in place around them.⁹ The Onondaga have attempted many times to go against the U.S government to take back their land, including in March of 2005 when they filed a land claim on their territories in Central New York. The Doctrine of Discovery continues to get cited when Indigenous peoples try to take back what was theirs.⁴ In the Supreme Court Case *City of Sherrill v. Oneida Indian Nation* of 2005, it was questioned whether land parcels once owned by the Oneida, before being sold in 1807 and then repurchased in the 1990s by their descendant tribe, were part of an Indian Reservation and thus exempt from local taxes. Justice Ruth Bader Ginsberg cited the Doctrine of Discovery in the majority decision against the Oneida Nation.¹² Below is a timeline put together by The Neighbors of the Onondaga Nation with help from

Robert W. Venables. It compiles all the history between the Onondaga and the United States beginning in the year 909.⁹

ONONDAGA HISTORICAL TIMELINE



Compiled by NOON with consultation by Robert W. Venables

Figure 1. Historical timeline of the Onondaga and U.S.

The land that supplied the Onondagas with a wide range of resources such as wild game, fresh fruits, vegetables, and grains was taken away from them over the past few generations. This significantly impacted their sources of food and way of life. Adapting to this new normal, the Onondaga were forced to re-establish themselves. Not only were they forced to adjust their daily

life, but their diet was also forced to change as well. These changes ultimately contributed to health conditions that are prevalent in their population today.

Part II: The Onondaga Post-Contact and their Diet

After contact with the Europeans, life as they knew it changed for the Onondaga. Once their land was taken, they were forced to live in their own community separate from the state of New York. Today, the Onondaga Nation is a 7,300- acre territory south of Syracuse. It remains sovereign and out of the NYS jurisdiction while maintaining its own laws, language, customs, and culture. The Nation operates a tax-free smoke shop which acts as a major source of revenue. They also have the Nation Arena to continue their tradition of lacrosse and Plantagon, which is a business founded in part by the Onondaga Nation that focuses on providing sustainable food by way of greenhouse technologies in order to prepare for an upcoming food crisis caused by the continuously growing population.¹¹ There is also the Firekeepers Restaurant located on the reservation. These businesses conduct programs like a water system, which was developed to provide clean and safe drinking water to people within the Nation's borders.¹¹

The Firekeepers Restaurant does not serve any traditional Haudenosaunee dishes. The menu reflects a diner style with items like breakfast foods, fried foods, burgers, pizza, and more. There are some lighter options like salads and veggie burgers. Located right off of I-81 in Nedrow, NY, this restaurant acts as a stop for travelers and locals. When I asked about where the ingredients came from, I wasn't able to get much information from any of the employees. Due to this and the items on the menu, I can assume it is a wholesale food vendor. The food was delicious, however, it wasn't anything replicating the traditional Indigenous diet. Not only was I eating an American-style meal, but it definitely wasn't prepared with ingredients harvested in the traditional way.



Figure 2. Firekeepers Restaurant located off of I-81.

There is a school district on the nation called the Onondaga Nation school offering grades K-8. Exclusively for Onondaga Nation students, New York State curriculum is taught in the school as well as Onondaga language and culture. In 1954, the Lafayette School District joined in a contract with New York State to help Onondaga Nation students continue their education at Lafayette since the Onondaga Nation School only houses students until the 8th grade. However, in the Lafayette School District, the culture education the Onondaga Nation students used received through 8th grade ends as they continue with the New York State curriculum that Lafayette follows.¹³



Figure 3. Onondaga Nation School located on the Onondaga Reservation.



Figure 4. Onondaga Nation School board.

Breakfast and lunch are served at both the Onondaga Nation School and Lafayette. Their identical menus are available on the Lafayette Central School District website. At first glance, food items like Pancake Wrapped Sausage,” “Cinnamon Roll,” and “Dutch Waffle” are listed as breakfast options. Each breakfast is served with a choice of juice, fruit, and milk. Cereal, bagels, and muffins are also available. At lunch, students have several options. They can get the main meal of the day, with some options such as “Cheesy Dippers w/Tomato Sauces” served with green beans and carrots, “Deluxe Bacon Cheeseburger Whole Grain Bun” served with sweet potato fries and steamed broccoli, and “Personal Pan Pizza” served with a garden salad and mixed vegetables. Students also have sandwich options like peanut butter and jelly, turkey and cheese, or ham and cheese. All the lunches are served with fruit and the vegetable choices of the day.¹⁴ Prices for these meals include \$1.25 for breakfast, \$2.55 for lunch for students in pre-K through 6th grade, and \$2.65 for students in 7th grade-12th grade. Free and reduced price meals are an option if students or their parents meet the appropriate criteria. Factors include total income or participation in other food programs like SNAP.¹⁴

Since the district participates in these nationally mandated school breakfast and lunch programs, they need to meet certain criteria for the nutritional quality of the food. For example, the School Breakfast program requires a set meal pattern for students K-12th grade. According to the table below from the Government Publishing Office, amounts are listed for fruit (1 cup must be offered daily), grains (half of the grains offered weekly must be whole grain) and fluid milk (must be fat-free or low-fat), a minimum to maximum calorie amount per breakfast, amount of saturated fat, a sodium target amount, and a no trans fat rule.

	Breakfast meal pattern		
	Grades K-5	Grades 6-8	Grades 9-12
Food Components	Amount of Food ^a per Week		
	(minimum per day)		
Fruits (cups) ^{bc}	5 (1)	5 (1)	5 (1)
Vegetables (cups) ^{bc}	0	0	0
Dark green	0	0	0
Red/Orange	0	0	0
Beans and peas (legumes)	0	0	0
Starchy	0	0	0
Other	0	0	0
Grains (oz eq) ^d	7-10 (1)	8-10 (1)	9-10 (1)
Meats/Meat Alternates (oz eq) ^e	0	0	0
Fluid milk (cups) ^f	5 (1)	5 (1)	5 (1)
Other Specifications: Daily Amount Based on the Average for a 5-Day Week			
Min-max calories (kcal) ^{gh}	350-500	400-550	450-600
Saturated fat (% of total calories) ^h	<10	<10	<10
Sodium Target 2 (mg) ^{hi}	≤485	≤535	≤570
<i>Trans</i> fat ^{hj}	Nutrition label or manufacturer specifications must indicate zero grams of <i>trans</i> fat per serving.		

Figure 5. Table from the Government Publishing Office indicating what required food components and quantities a school must offer in the School Breakfast Program.

The School Lunch program also has certain requirements. Lunch meals require more food groups to be present than the School Breakfast Program including various colored vegetables and meats/meat alternatives. Lunches include fluid milk and half of the grains to be whole grains. Fresh, frozen, or canned vegetables and dry beans and peas (legumes) may be offered. Below is a table of the specific amounts for food groups in the School Lunch Program from the Government Publishing Office.

	Lunch meal pattern		
	Grades K-5	Grades 6-8	Grades 9-12
Food Components	Amount of Food ^a per Week		
	(minimum per day)		
Fruits (cups) ^b	2½ (½)	2½ (½)	5 (1) ½
Vegetables (cups) ^b	3¾ (¾)	3¾ (¾)	5 (1)
Dark green ^c	½	½	½
Red/Orange ^c	¾	¾	1¼
Beans and peas (legumes) ^c	½	½	½
Starchy ^c	½	½	½
Other ^{cd}	½	½	¾
Additional Vegetables to Reach Total ^e	1	1	1½
Grains (oz eq) ^f	8-9 (1)	8-10 (1)	10-12 (2)
Meats/Meat Alternates (oz eq)	8-10 (1)	9-10 (1)	10-12 (2)
Fluid milk (cups) ^g	5 (1)	5 (1)	5 (1)
Other Specifications: Daily Amount Based on the Average for a 5-Day Week			
Min-max calories (kcal) ^h	550-650	600-700	750-850
Saturated fat (% of total calories) ^h	<10	<10	<10
Sodium Target 2 (mg) ^{hi}	≤935	≤1,035	≤1,080
<i>Trans</i> fat ^{hi}	Nutrition label or manufacturer specifications must indicate zero grams of <i>trans</i> fat per serving.		

Figure 6. Table from the Government Publishing Office indicating what required food components and quantities a school must offer in the School Lunch Program.

School is a significant influence on a student's dietary choices. Having nationally mandated regulations for these programs helps provide some nutritional structure. There is always room for improvement, however, these regulations allow students access to a lot of crucial food groups like fruits, vegetables, and whole grains. Depending on whether the student takes all food groups these regulations offer, they have an opportunity to get nutritious foods during their day at school. Students who don't qualify for the reduced price or free meals, however, may not get the same opportunity. Their guardian may prepare meals that are not structured the way the school meals are and may lack certain food groups are consumed. Although this is the case for any population, these are factors to consider when we think about the diet of Indigenous people today.

There are no grocery stores located directly on the Onondaga reservations. The closest grocery stores are located in Nedrow, NY about five miles away. One of these stores includes Green Hills Farms, one of Syracuse's independent grocers. Starting as a family farm stand during the Great Depression, this grocery store has several departments including a bakery, deli, produce, prepared foods, meat, seafood, grocery, and a garden center. It is open seven days a week from 6 am to 10 pm, which gives shoppers on any kind of schedule time to shop for what they need.¹⁵

Green Hills also supports local products. They sell fresh, seasonal produce harvested by local farmers all year round. With an abundance of options, including fresh, local products, Green Hills Farms is a great resource for the Onondaga to purchase groceries. However, the prices tend to be higher than those at other grocery stores in Syracuse, like Wegmans, since it is an independent grocer. I visited Green Hills Farms and compared prices for some of their products to Wegmans as well as grocery items. At Green Hills, the prices appeared higher

overall. However, they put out weekly ads with new deals for just about every department within the store.

Another grocery store located in Nedrow is ALDI. ALDI is a chain grocery store known for its low prices in comparison to competing chains. More than 90% of the products they carry are brands exclusive to ALDI which allows such low prices because they can avoid all the hidden costs associated with national brands. ALDI also carries produce, meats, and fish as well. They have weekly deals as well with even more deals on products like produce and groceries.¹⁶ I also visited ALDI to get a first-hand look at their prices.

I have compiled a table to compare the prices for certain staple food items from Wegmans, Green Hills Farms and ALDI. These food items include apples, bananas, carrots, tomatoes, wheat bread, 2% milk, eggs, chicken breast, and olive oil. These foods include the main food groups: fruits, vegetable, grains, dairy, protein, and oils.

Food Item	Weans	Green Hills Farms	ALDI
Red Delicious Apple	\$1.99/lb.	\$1.29/lb.	\$0.99/lb.
Banana	\$0.49/lb.	\$0.49/lb.	\$0.44/lb.
Carrots	\$0.99/16 oz.	\$1.79/16 oz.	\$0.99/16 oz.
Tomatoes	\$2.99/lb.	\$1.99/lb.	\$1.29/lb.
Wheat Bread	\$1.99/loaf	\$1.50/loaf	\$1.79/loaf
2 % Milk	\$1.93/gallon	\$2.39/gallon	\$1.77/gallon
1 dozen Large Eggs Grade AA	\$1.19/dozen	\$1.99/dozen	\$0.88/dozen
Chicken Breast	\$1.69/lb.	\$2.29/lb.	\$1.89/lb.
Olive Oil	\$7.99/16.9 fluid oz.	\$8.29/16.9 fluid oz.	\$2.99/16.9 oz.

Overall, ALDI had the lowest prices for the produce items, milk, eggs and olive oil. The chicken breast was higher at \$1.89 per pound compared to Wegmans at \$1.69 per pound, but less than Green Hills Farms at \$2.29 per pound. Green Farms Hills, as anticipated, did have higher prices mainly in non-produce items like milk, chicken, olive oil, and eggs. Their carrots were

also higher at \$1.79 for a 16-ounce bag compared to \$0.99 at both ALDI and Wegmans. It appears that it is less expensive to get certain items at each store over the others. A majority of the food items selected for this price comparison are less expensive at ALDI.

On the same road Green Hills Farms and ALDI are located, there are a few other options for food. You can find a McDonald's, an ice cream shop named Bailey's Dairy Treat, a diner called Sweet Grass Diner, and a pizza restaurant called Original Italian Pizza. Overall, there are several options for grocery stores and dining out meals. However, these resources are several miles from the reservation. Without transportation, it's a long walk and not one that is convenient to do while carrying groceries. This might act as a barrier to purchasing fresh produce and groceries for those living on the Onondaga Reservation. Also, the higher, independent grocer, prices of Green Hills Farms may be a financial factor influencing what kind of food the Onondaga purchase on a grocery run, furthermore influencing their dietary intake.

The Onondaga Nation School provides breakfast and lunch for purchase that are required to have certain amounts of food groups. However, if students aren't buying those meals, they are likely eating whatever their guardian prepares for them, which may not include those required amounts in the school's meals. The Firekeepers Restaurant doesn't provide traditional Haudenosaunee meals. Although there are some healthier options, a majority of the food offered is American-style diner food that is likely high in sodium, saturated fat, and calories. The Onondaga Nation is a produce desert, the nearest source of it being miles away in Nedrow. Without adequate income or reliable transportation, getting to ALDI or Green Hills Farms is not an option, and will significantly impact your intake of essential nutrients found in those foods. The other foods available from the diner, ice cream stand and pizza shop also aren't going to provide the essential nutrients they need and are laden with saturated fat, refined carbohydrates,

and sodium. I believe these factors are contributing to the poor nutritional health of the Onondaga, furthermore influencing their prevalence of certain health conditions that are linked to nutrition.

Part III: The Current State of Health

Obtaining health data specific to the Onondaga people is very difficult. There is little existing data that target this population and the statistics relative to their state of health. For the purpose of this research paper, I have included Onondaga County and American Indian/Alaska Native of the U.S. data.

As of January 2019, Onondaga County has a population of 464,140. The American Indian/Alaskan Native population is 3,880, which is 0.84% of Onondaga County's total population.¹⁷ The Indian Health Service (IHS) lies within the Department of Health and is responsible for providing federal health services to American Indians and Alaska Natives. The Onondaga Nation is a traditional nation, which means the state of New York is responsible for their health care in accordance with the Treaty of Fort Stanwick in 1784. Although a federally recognized nation, the Onondaga don't access the Indian Health Service funding to finance their health center on the nation. They utilize the IHS to fund inpatient hospital care services only. The clinic is operated on a sliding scale model, meaning fees are variable based on the service and the ability of the client to pay. Reduced or free services may be offered if the client has no insurance or low income. Services offered include medical care, including prenatal care, pediatrics, dental care, foot care, diabetes education, mental health counseling, and enrollment services for Child Health Plus(CHP), Family Health Plus(FHP), Women, Infants, Children(WIC).¹⁸ The clinic on the Onondaga Reservation is the only resource for those services. If they are in need of a service not provided by the clinic, travel would be required to another location such as a hospital in Syracuse.

Generally, the American Indian/Alaska Native population have a higher incidence of chronic disease compared to other Americans. Conditions such as diabetes, obesity, and heart

disease are prevalent in their community. I have compiled AI/AN statistics on these three health conditions in the next section.



Figure 7. Onondaga Nation Health Center located State Route 11.

Diabetes

Diabetes is a group of diseases that cause high blood glucose, or sugar. Type 1 Diabetes is when the body doesn't produce insulin, and Type 2 Diabetes is when the body does not produce or utilize insulin efficiently. Both are influenced by genetic and environmental factors. Diet and lifestyle have a significant impact on the onset of Type 2 Diabetes. Being overweight or obese is directly related to the prevalence of Type 2 Diabetes. Long-term complications of Diabetes include heart disease, kidney disease, and high blood pressure. There is no cure for Diabetes, but it is manageable with dietary modification, physical activity, and medication.

The Indian Health Service reported the American Indian/Alaska Native rate of Diabetes from 2009-2011 compared to the 2010 U.S all races rate was drastically different. On an age-adjusted mortality rate per 100,000 populations, the AI/AN rate was 66.0 to the U.S rate of 20.8. This is a 3 to 2 ratio.¹⁹ In 2017, the AI/AN population had the highest prevalence of diagnosed diabetes for men, at 14.9%, and women at 15.3%.²⁰

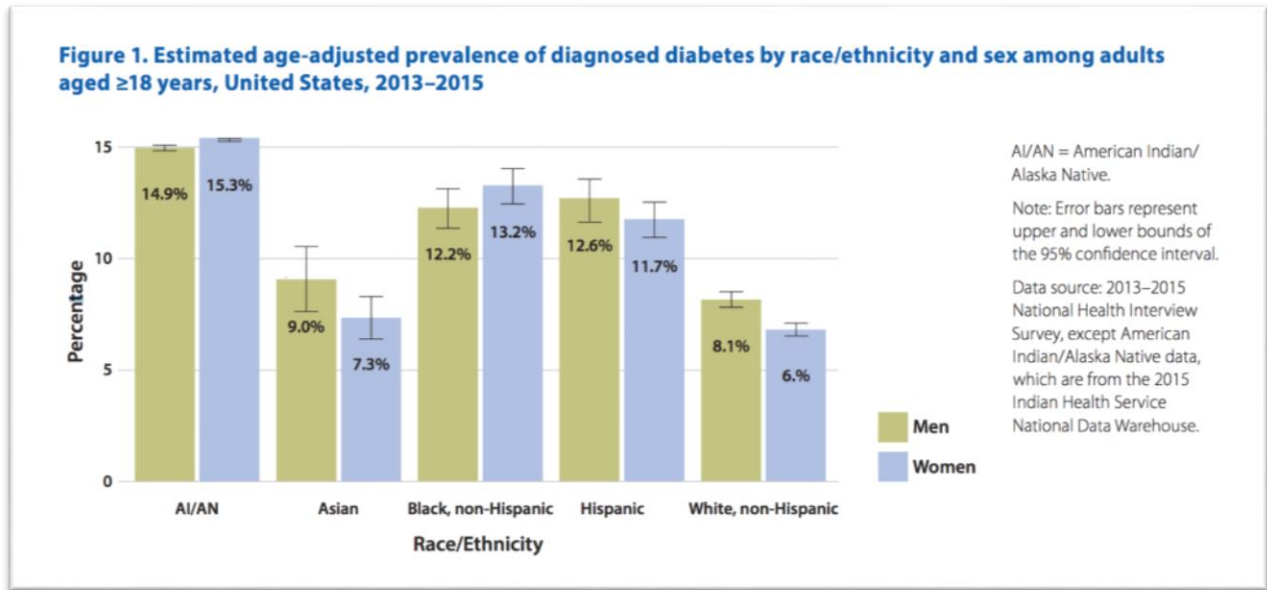


Figure 8. Estimated age-adjusted prevalence of diagnosed diabetes by race/ethnicity and sex among adults aged ≥18 years in the United States from 2013–2015

Obesity

Obesity is classified as having a body mass index, or BMI, of greater than or equal to 30. BMI is correlated with conditions such as cardiovascular disease and Type 2 Diabetes. Risk factors for obesity include being a member of certain racial/ethnic groups like Native Americans, lower education levels, and lower socioeconomic status. There is limited data available for rates of obesity among the Native American population.²¹ In 2015, 43.7% of the U.S population who

identify as American Indian/Alaska Natives over the age of 18 were obese. 15.9% of high school students were obese compared to the 12.4% of whites obese in 2015.²² In 2017, all states in the U.S. had more than 20% of the state's adults obese. That year, 25% of New York State adults were self-reported as obese.²³ In Arizona that same year, the Arizona Department of Health Services (ADHS) and CDC analyzed data from the 2017 BRFSS survey. Compared with whites, AI/AN had higher rates of being overweight or obese prevalence of 76.7% versus 63.2%.²⁴

Heart Disease

Heart disease, or cardiovascular disease, refers to conditions that involve narrowed or blocked blood vessels and also impact the heart muscles or rhythm. Several conditions put people at risk for heart disease including diabetes, obesity, poor diet, and physical inactivity.²⁵ In 2012, 8.1% of the AI/AN population over 18 years of age had coronary heart disease compared to the 6.2% of non-Hispanic white population.²⁶ This disease is the leading cause of death in American Indians and Alaska Natives. Heart disease caused 3,288 deaths among the AI/AN population in 2014.²⁷ From 2014-2016, 431.6 per 100,000 American Indian and Alaska Native over the age of 35 died from cardiovascular disease.²⁸

Heart disease is the number one cause of death in the United States and as of 2018, 16.5 million Americans 20 years of age and older are living with coronary heart disease.²⁹ Heart disease is predicted to remain a serious health issue in the future. It is projected by the American Heart Association that by 2035, 45.1% of the U.S. population will have some form of heart disease.³⁰

Physical Activity

Physical activity plays a role in preventing health conditions such as heart disease, diabetes, and obesity. Being active increases “good” cholesterol, or high-density lipoprotein

(HDL) and decreases unhealthy triglycerides. This aids in smooth blood flow, which decreases the risk of heart disease. It improves insulin's function and reduces blood sugar levels, cutting risks for Type 2 Diabetes. It plays a role in weight management by burning excess calories consumed and increases metabolic rate by increasing muscle mass, helping to decrease the risk of obesity.³¹ Lack of physical activity is a common problem in the United States but is especially a problem in minority populations. In fact, AI/AN adults are less likely than white adults to engage in physical activity. In 2015, 46.4% of American Indian adults over the age of 18 didn't meet the federal physical activity guidelines, which includes at least 150 minutes to 300 minutes a week of moderate-intensity, or 75 minutes to 150 minutes a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity.²² In 2016, 55.2% of the AI/AN population did not meet aerobic or muscle-strengthening guidelines in the federal 2008 Physical Activity Guidelines for Americans.³²

What could be causing these disparities? There are many contributing factors such as lower levels of education, disproportionate poverty, discrimination in accessing health services as well as differences in their cultural beliefs and practices compared to others.¹⁸ Other influences include lack of transportation and limited access to grocery stores. The convenience stores in small reservation communities usually have a large inventory of items like soda, energy drinks, chips and other kinds of snack foods. High-quality produce is not available, neither is fresh fish or other low-fat protein sources.³³ On the Onondaga nation, there is no source of fresh produce. Residents of the Onondaga Nation must travel the five miles to Ned row to find the closest grocery store. Green Hills Farms is some expensive but supports local farmers. ALDI offers lower prices, however, the items aren't typically brand name. If they want food quickly, the convenience food options include fast-food that typically contain high amounts of sodium,

saturated fat, and calories. The Onondaga Nation Health Center provides services like diabetes education, pediatrics, and dental care but services are limited. These services can be very beneficial for members of the Onondaga community who experience the health disparities. However, more needs to be done in order to start bridging this disparity gap.

Part IV: What Can Be Done?

Diminishing these health disparities among the Native American population cannot be done overnight or with one solution. Several factors have led to the creation of these disparities and it is going to take even more solutions to begin bridging the gap. In putting together this Capstone, I have discovered several factors involved in the problem. With that, I propose a few ideas that would theoretically help move Native Americans closer to where they used to be; like their ancestors.

Food Insecurity

As examined earlier, the Onondaga Reservation is a produce desert. Food insecurity is defined as having limited access to sufficient amounts of affordable and nutritious foods. It has been found that food insecurity is linked to higher rates of conditions like obesity and diabetes.³⁴ In 2016, 12.5% of Onondaga County experienced food insecurity.³⁵ With no grocery stores located directly on the Onondaga Nation, they experience a level of food insecurity. Grade I evidence, which means there is good/strong evidence supporting it, from the Academy of Nutrition and Dietetics Evidence Analysis Library identifies several effective intervention strategies identified to help food insecure people meet their nutritional needs. These strategies include nutrition education interventions focused on increasing home meal preparation, including time-saving meal preparation, shopping, and cooking techniques.³⁶ This could be executed as a community program and could take place at the Onondaga Nation Health Center or in the Onondaga Nation School. This program would help educate members of the Onondaga Nation on how to shop for healthier foods with the resources they have as well as how to prepare those foods in a nutritious way. There could be specific lessons such as shopping on a budget or shopping and cooking for a specific disease state like Diabetes and heart disease.

Another intervention strategy is to have advocacy for efforts to improve access to healthful foods. This includes community initiatives to bring supermarkets to low-income areas.³⁶ If the Onondaga had a grocery store located directly on the Reservation, intake of fresh produce like fruits and vegetables would likely increase. This store could be operated similar to the other businesses they have on the reservation, where revenue can be made or conduct local programs like the water system mentioned previously. There are many other factors that play a role in this broad concept of building a grocery store. Finances would likely drastically affect the items sold in the store, where it would be built or if it could even be built. However, I strongly believe that it should be considered a priority in the Onondaga community. Once they have better access to items like fruits, vegetables, whole grains, lean protein, then healthier decisions can be made that will have an impact on their state of health.

If a grocery store on the Onondaga reservation isn't possible, then what grocery store in Nedrow should they shop for their food? Based on the price comparison at three stores, ALDI is the most budget-friendly option. They have produce, whole grains, dairy, oils, and lean meats all available at reasonable prices. However, the distance is a significant factor in whether the Onondaga can get to ALDI in order to shop. I would suggest carpooling with others who have a vehicle when going on grocery trips. This provides social benefits as well as saves greenhouse gas emissions into our atmosphere.

Community or home gardens could be another intervention that might improve food insecurity on the Onondaga Nation. A community-based participatory research project was conducted in 2009 in Oregon with the purpose of describing the impact of a community gardening project on vegetable intake, food insecurity, and family relationships. Hispanic worker families were given project materials like seeds at community meetings to learn about choosing

plants, composting, organic approaches for pest control, and maintaining the garden and harvesting vegetables. A questionnaire was given to the participant's before and after the garden was complete. The families reported that the frequency of adults in the household eating vegetables "several times a day" increased from 18.2% to 84.8% after the garden. For children, it increased from 24.0% to 64.0%. In a question about the frequency in the past month that the family worried food would run out before money was available to buy more, the answer for "never" increased from 68.8% pre-garden to 96.9% post-garden.³⁷

In 2014, "Yeego Gardening!" began as a community gardening intervention to increase gardening behavior, increase access to low-cost fruit and vegetables, and increase consumption in Navajo communities in New Mexico. Gardens were constructed in two community sites along with monthly workshops to build confidence and skills in gardening and healthy eating behaviors. So far, they have found that community input is important in the process of planning the community garden. The results of this intervention in terms of accomplishing their goals are still pending.³⁸ There are several community gardens in Onondaga County and the city of Syracuse, but none directly on the Onondaga Nation. It appears that whether in the community or at home, a garden has the potential to increase access to fresh produce and increase intake of those items.

Nutrition Education

Research shows that 35-50 hours per year of behaviorally focused nutrition education is ideal to provide students with the motivation and skills needed to make healthy choices. A study in 2006 found that American students receive only a median of 3.4 hours in elementary schools, 4.2 hours in middle schools, and 5.9 hours in high schools. Not only has school-based nutrition education been shown to produce significant decreases in BMI, overweight status, and increases

in fruit and vegetable consumption, some studies have also shown a positive impact on academic outcomes.³⁹ Grade II evidence, which is considered fair evidence, from the Evidence Analysis Library indicated using nutrition education to change food eaten, food preferences, or eating patterns as part of a school-based intervention may be associated with changes in weight status/adiposity.⁴⁰ Since the Onondaga Nation School has the attention of their Onondaga children at least until 8th grade, nutrition education as part of their curriculum has the potential to impact the decisions these children make early on in their life. According to the district plan for physical education in 2012, nutrition education was included in the curriculum for Lafayette Central School District. As part of the Lafayette Central School District Wellness Policy, one of the goals included was to “model healthful eating and provide opportunities for physical activity so that all students will have nutritious food in school, develop the habit of making nutritious food choices, and engage in regular physical activity now and for a lifetime.”⁴¹ Providing education on various nutrition topics at different grade levels, it seems as though the district includes nutrition education as part of their curriculum and incorporates it well into the classroom. Continuing nutrition education is crucial to helping students learn to make healthy choices.

Grade II evidence from the Evidence Analysis Library indicated that a multi-component school-based intervention, which might include physical activity and nutrition, may be associated with changes in weight status/adiposity.⁴⁰ This kind of intervention could take place in the form of an afterschool program so it doesn't take away time from the standard curriculum taught during the school day. The program could involve team sports, like intramurals, so students can play with their friends as well as include a nutrition component. This nutrition part

could include an incentive to participate in the program like complimentary healthy snacks they might make as part of a lesson.

Overall, making nutrition education a priority will be beneficial to the Onondaga. The students can bring home what they learned and relay that information to their guardian. It has the potential to have a domino effect, where the guardian will then start applying that education to their lives and spread that knowledge to others as well.

Not only is nutrition education important, but also continuing the students of the Onondaga Nation's education is important. Obesity has an inverse relationship with a person's level of education. It was found in 2017 that adults without a high school degree or equivalent had the highest self-reported obesity (35.6%), followed by high school graduates (32.9%), adults with some college (31.9%) and then college graduates (22.7%).²³ Encouraging students in the Onondaga Nation School to continue their education at Lafayette has the potential to help these disparities. This could give them the chance to receive more nutrition education throughout their high school career through the curriculum at Lafayette. Also, continuing on through high school will provide them with the opportunity to go to college, which has a lower percentage of people with self-reported obesity.

Physical Activity

A general increase in physical activity is needed in the Native American population to help reduce the health disparities distinguishing them from other groups. School can provide more opportunities for students to partake in physical activity. Whether through P.E. class or access to a university gym, continuing a student's education provides that opportunity in many ways. As indicated in the section above, a multi-component program in a school-based

intervention with topics like physical activity and nutrition may be associated with changes in weight status/adiposity. This makes another good reason why students should be encouraged to remain in school. Grade I evidence also indicates for people with type 2 diabetes, 90 - 150 minutes of weekly physical activity (both aerobic exercise and resistance/strength training) for at least three months combined with Medical Nutrition Therapy reduces A1C, glycated hemoglobin, which reflects an individual's blood glucose levels, improves insulin sensitivity, and reduces relative risk for all-cause mortality.⁴² Grade II evidence also has indicated that observational studies have shown physical activity reduces the risk of cardiovascular disease.⁴³ Physical activity has been proven to help the disparities this population has seen so finding ways to increase it in the community is just as important as making nutritional changes.

An intervention could be physical activity classes in community settings like in the Nation Arena or in the Onondaga Nation school. Zumba, spin classes, aerobics classes and other types of activity all could help encourage members of the Onondaga Nation to participate in more exercise. A community-wide campaign to initiate an increase in physical activity is also a possible intervention. This campaign would be designed to deliver any specific physical activity message using media like TV, radio, newspaper columns, and more. The Task Force on Community Preventive Services' *Guide to Community Preventive Services (the Community Guide)* rates the evidence for community-wide campaigns as strong, based on a review of 10 studies that suggest that these campaigns result in a median increase of about 4% in the percentage of people engaging in physical activity and a 16% increase in energy expenditure. Not only is there potential to increase physical activity, but also the community and social network aspect are likely to bring about more change to this population. An example of a community-wide campaign would be to increase the amount of walking a member of the

Onondaga Nation does in a way. With a catchy tagline like “Walk Onondaga” and support from the community, a member could aim to walk for at least 30 minutes a day with this campaign.⁴⁴

There are so many other factors that go into these suggestions I have made. However, having this conversation is the beginning and crucial to helping the Onondaga, and Native American population, decrease their rates of diabetes, obesity, and heart disease.

Conclusion

Prior to contact with European settlers, Indigenous people prospered on their native lands. Utilizing resources natural to the specific area of habitat, their state of health was relatively good compared to populations today. The Onondaga tribe had fresh resources that Onondaga Lake could supply such as fish, wild rice, and cattail. The land around the lake provided a source for wild game as well. Certain produce that is native to New York State like apples, blueberries, and raspberries were also available food sources. Given their resources, the Onondaga were able to consume essential food groups and nutrients needed to maintain good health. Their traditional diet was low in saturated fat, sodium, added sugar, and cholesterol. Not only was their diet overall nutritious, but they were physically active from hunting and gathering and playing lacrosse. This diet was unprocessed, organic, locally grown, and sustainable.

Indigenous cultures all over the country have experienced great change since first contact with European settlers. Not only were they experiencing change in their living conditions, but their sources of food were affected as well. Factors including available food resources, physical activity level, and education level all have a significant influence on what they consume in today's world. On the reservation, there is no grocery store to access fresh produce and other nutritious food items. The nearest grocery stores are at least five miles away so, without transportation, access to nutritious foods is limited. There are some inexpensive options at ALDI, and more local, fresh, but pricier options at Green Hills. The food available on the reservation at the Firekeepers Restaurant doesn't offer traditional Haudenosaunee foods which would mimic that of their traditional diet. While in school, children on the reservation have the opportunity to have a nutritious lunch if they purchase through the school, whose meals must meet certain requirements for the composition. However, those meals aren't guaranteed if the student isn't

purchasing the school lunches and potentially receiving not as nutritious lunches from other sources.

Currently, the Onondaga Nation and Native American population, in general, are experiencing higher rates of diabetes, obesity, and heart disease compared to other ethnicities. I believe these disparities are significantly influenced by their current living situation on the Reservations. Having their resources minimized by the taking of their native land causes less access to nutritious foods. Without access to these foods, adequate level of education, or physical activity, this population is at risk for these health conditions to continue. It has been made clear through this process that more research needs to be done not only for the general Native American population but specifically for the Onondaga to really target where improvements can be made. Overall, there needs to be closer access to these foods, encouragement to have students continue on in education and to participate in physical activity. These health disparities can't be changed overnight, and we can't go back in time to change history, however, we can begin the conversation in order to bring change for this population.

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