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DIET AND DISEASE:
SUBSISTENCE CHANGE AND TUBERCULOSIS AMONG THE PAWNEE, OMAHA AND WINNEBAGO IN THE NINETEENTH CENTURY

by

Owen J. O'Reilly

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DIET AND DISEASE:
SUBSISTENCE CHANGE AND TUBERCULOSIS AMONG THE PAWNEE, OMAHA AND WINNEBAGO IN THE NINETEENTH CENTURY

Owen J. O'Reilly, M.A.

University of Nebraska, 2011

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The mid- to late nineteenth century was the beginning of the reservation era for most Native Americans, ushering in a series of unprecedented changes that affected the cultural traditions and physical health of groups across the United States. For the Pawnee, Omaha and Winnebago in Nebraska, changes in subsistence patterns not only destroyed traditions but influenced the spread of disease and malnutrition. Government rations, consisting largely of wheat flour, beef, bacon, pork, sugar and coffee, were a drastic departure from the traditional diet of lean bison meat, corn, beans, squash and wild food and those who depended on these rations experienced high numbers of dysentery, diarrhea, scurvy and tuberculosis. Diet is an often-overlooked component of tuberculosis, but can seriously affect an individual's ability to fight off infection or recover from an illness. Along with the living conditions native people faced on reservations, the new diet introduced by the government contributed to epidemic rates of tuberculosis and other dietary-based diseases that plagued the tribes. This new diet of Western food set the stage for the common nutritional components of Native American diets today and is largely responsible for the epidemic rates of obesity, type II diabetes and depression among indigenous people.

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ONE: Introduction

On December 28, 1877, Charles H. Searing, agent for the Pawnee reservation in Indian Territory, received a letter from the agency's physician, Dr. J.L. Williams. In it, the doctor explains: "The man and his family that are at my office for medical treatment is [*sic*] actually suffering for the want of something to eat. Can you give them some 'Bacon' and flour?" (in Blaine 1997:22). Almost four decades later, it seemed little had changed. In 1915, a Sioux physician named Dr. Charles Eastman, working on a Dakota reservation, wrote about Indian health and malnutrition saying, "The Indian suffered from an indoor and sedentary life, too much…indigestible food—indigestible because he did not know how to prepare it, and in itself poor food for him. He was compelled often to eat diseased cattle, moldy flour, rancid bacon, with which he drank large quantities of strong coffee" (1915:49). These descriptions of Indian nutrition were fairly consistent through the late nineteenth- and early twentieth centuries and created the template for what is considered a normal diet today among American Indians living on reservations (Miewald 1995:98).

Native Americans of the Plains did not always eat so poorly. Until the mid-nineteenth century, most still engaged in their traditional means of subsistence. For the Pawnee and Omaha, whose traditional homes were in the central and northeastern state of Nebraska, respectively, this meant hunting bison, growing corn, beans and squash, and collecting wild roots, vegetables and fruits. Both tribes are traditionally referred to as "horticulturalists" because, although they relied on wild caught and gathered foods for a large portion of their diet, they also tended their own fields and stored food for lean

times. Bison hunts divided the year into quarters, with a summer hunt lasting from late June to early September and a winter hunt from January to late March. In between hunts, both groups tended to their crops: in spring, fields were planted and weeded and in the fall, crops were harvested, processed and stored.

The traditional crops—corns, beans and squash—were planted together in a single mound, called a polyculture, meaning that they were grown together and shared the same soil and nutrients. In this design, the plants worked together, sharing nutrients and, through biodiversity, reduced the likelihood of disease wiping out an entire harvest. Sowing and reaping of crops were done in villages, with extended families living in earth lodges (large circular homes constructed with wooden poles and covered with brush and sod). Villages were usually maintained for 10 to 15 years or until the soil had been exhausted and the walls of the earth lodges became too infested with insects and needed to be rebuilt. During the hunt, village members traveled together, living in hide tepees that were set up and taken down daily. Bison hunts and the growing of corn not only provided sustenance, but were also intricately intertwined in the spiritual life of the Pawnee and Omaha. Both groups performed rituals, sang songs and made sacrifices to the provider of the food and the food itself (Fletcher and LaFlesche 1972:230, 243, 614, 636; Weltfish 1977).

In the 1860s, as Euro-American homesteaders began to flood into the plains of Nebraska, the Pawnee and Omaha were faced with not only a scarcity of traditional wild bison meat, but also with a period of worsening drought and grasshopper infestations that destroyed their harvest of traditional crops. This double assault on their means of subsistence forced both tribes to rely, at times, on rations of flour, sugar, pork, beef and

coffee provided by the United States government instead of their traditional food staples. Since these five foods were ubiquitous among the Euro-American population and relatively cheap, they were provided compassionately by the Indian Agents to prevent starvation of the Pawnee and Omaha in times of great need. However, there was most likely a conscious choice by government officials to provide Indians with what was thought to be a superior version of food; wheat that was grown by monocultural means and cattle that were often finished on a diet of corn and whose lives ended in the stockyards (Barsh 1990:122).

In 1865, a northern section of the Omaha reservation was sold to the Winnebago, or Ho-Chunk, people, originally from Wisconsin and Illinois, who had been displaced from their homes due to encroaching white settlement. They had been driven across the Midwest; from Wisconsin to Iowa to Minnesota to South Dakota, finally ending up in northern Nebraska, tired and starving (Wishart 1994:159). Winnebago people are Siouan speakers and most likely distantly related to the Omaha, also Siouan speakers, who migrated from the Great Lakes region to eastern Nebraska between the seventeenth- and eighteenth century. The Pawnee are Caddoan speakers who are likely a mix of Upper Republican peoples who lived in central Nebraska and Kansas as early as 1100 AD, and immigrants who came in waves up from the southern Great Plains in the 1700 and 1800s (Wishart 1979). Due to the consolidation of the Omaha and Winnebago agencies in late 1879, information concerning the health of these two, very different tribes essentially became one, and thus the story of the Omaha in the late nineteenth century is incomplete without an examination of the Winnebago.

The Pawnee, who ended up moving to Indian Territory (which later became the state of Oklahoma) starting in 1874, drew upon government rations more often than the Omaha and Winnebago. Remaining in their traditional Nebraska homeland, the Omaha began experimenting with new agricultural crops like wheat and sorghum and raising cattle and pigs. For the Pawnee, Omaha and Winnebago, the decreased reliance on wild game and native plants, and the increased reliance on western imports, appears to have occurred in the same period that epidemics of tuberculosis, dysentery, diarrhea and other enteric and respiratory diseases became chronic among the three tribes. David Wishart writes this about the Nebraska Indians in the nineteenth century: "Less dramatic than smallpox, however, but perhaps equally damaging in the long run, was the steady erosion of the Indians' health by malnutrition as their traditional food base collapsed and was replaced by the starvation diet of government rations and annuities" (1994:24).

Epidemics of disease are nothing new to most American Indian populations: history shows that endemic illness has been a constant in Indian life since the arrival of Europeans. In the middle of the nineteenth century, the common disease among Indians shifted from communicable diseases, like smallpox, to chronic diseases, like tuberculosis and other respiratory illnesses (Barsh 1990:224). This new epidemic of tuberculosis was passed communicably, like smallpox before it, but was known as a "wasting" disease, meaning the fat and muscle of the victim broke down due to the relentless demands of the illness and the host's attempt to defend against its ravages. Another term for this condition is "acute malnutrition" because the likelihood of survival for the host becomes much slimmer if they do not have a strong constitution supported by a healthy diet. It is fair to say that since the middle of the nineteenth century up to the present, well-known

epidemics among American Indians have been those related directly or indirectly to nutrition; first due to wasting diseases like tuberculosis, then alcoholism, and now diabetes. In 2008, diabetes affected 16.3% of all American Indians and Alaska Natives, according to the Indian Health Service website (www.ihs.gov). With the exception of alcoholism, which is specific to liquor consumption, diabetes and tuberculosis are diseases that are both made worse by poor nutrition, stress and alcohol consumption and these illnesses seem to increase in prevalence and impact as diet deteriorates (Buikstra 1981:9; Caldwell 1988:34; Dormandy 2000:225).

With the removal of Indians from traditional lands to reservations, starting for most in the mid nineteenth century, diets shifted from wild game, native plants, and traditional crops to western staples like wheat, beef, pork and sugar. These were mostly doled out as rations when crops and hunts inevitably failed. The Indian's reliance on this unfamiliar and, often times, insufficient diet may have contributed to the spread of tuberculosis and other diseases by depriving many of them of the adequate sustenance needed to help fight bacterial infections. The goal of this paper is to establish a significant correlation between the change in diet of the Pawnee, Omaha and Winnebago and the corresponding number of cases of tuberculosis recorded for each group in the late nineteenth century. The study will focus on diet specifically with the understanding that nutrition is but one of the many factors that contributes to the spread of tuberculosis. However, diet will be emphasized because, as this paper will attempt to show, it is a key factor that has been drastically overlooked as an important contributor to the spread of tuberculosis. With the exception of a few, erudite observations that will be discussed, this is true of both the late nineteenth century and modern day literature.

Since the destruction and transformation of diet was such an enormous consequence of the removal of Native Americans to reservations, it is important to understand the qualitative changes each tribe went through. The Omaha and Pawnee shared a nearly identical traditional diet prior to their removal to reservations. The Winnebago had a similar traditional diet of corn, wild game, and wild-gathered tubers, vegetables and fruits even though, at the beginning of the nineteenth century, they were living hundreds of miles away in what is today Wisconsin and Illinois. The transformation of these traditional means of subsistence (not only of the food itself but the means by which it was procured and the ceremonial importance of this process) was a crucial cultural shift in the late nineteenth century.

Due to the similar traditional diet, tracking the change in the way each tribe ate and received their food during the reservation period is an important difference that will affect the prevalence of disease and malnourishment. Since the Pawnee relied on government rations more often than the Omaha and Winnebago, it should be possible to contrast the three tribes in order to determine how government rations are related to the cases of tuberculosis. However, since diet is just one of the factors contributing to the spread and development of tuberculosis, environmental factors specific to each groups, due to their location or particular history, will be explored in detail as well. Some of these factors include changes in lifestyle, new living and sanitary conditions, epidemics of illness and the effects of depression and alcohol consumption.

A Brief History of Tuberculosis

Mycobacterium tuberculosis humanis is the most common strain of tuberculosis that causes human infection. This bacterium, first isolated by Robert Koch in 1882, most often infects the body through the nasal passages in a droplet of airborne liquid or mote of dust. Once inside, it is aspirated into the lungs where it makes its home in the alveoli, the tiny air sacs in the lungs, and feeds on oxygen, making the lungs an ideal breeding ground (Caldwell 1988:6; Teller 1998:1). At first, the body often does not recognize the bacteria as an invader, but after 6 to 12 weeks, it becomes aware of the disease and begins defend itself. At the site of infection, typically in the lungs, the body's immune system cordons off the bacteria with a wall of tissue, called a tubercle, where the disease gets its name.

Tuberculin is a protein made by the bacilli, which the body now recognizes as harmful, and it reacts when the tuberculin is produced. At this point, the bacilli are confined effectively, and the host carries on unaware of the infection. However, the body's quarantine typically breaks down later in life when the subject's immune system is weakened by poor nutrition, aging or other stresses, essentially freeing the bacilli from its prison (Teller 1988:1-2). The bacilli multiply and the tubercles can rupture in the lung, becoming open sores, through which the infectious bacteria can spread both inside and outside the body of the host. Coughing, talking, sneezing and spitting all spread thousands of bacteria from the host into the air. Direct sunlight kills the bacteria within five minutes, but it can live in the dark for months, due to a waxy cell surface, so the

easiest way to spread the disease is indoors, especially in confined spaces (Harries et al. 2004:24).

Tuberculosis has gone by many names throughout history, including phthisis, from the Greek, meaning "wasting," but in the nineteenth century it was typically referred to as scrofula, consumption, dropsy or the white plague (Buikstra 1981:2; Dormandy 2000:2; Wilbur et al. 2008:963). Pulmonary tuberculosis, or consumption, is the most common type of infection, responsible for 90 percent of all tuberculosis morbidity and mortality throughout history (Teller 1988:2). When the lung is infected and the body's immune system weakened, symptoms generally include gradual weight loss, fatigue and cough containing blood. These symptoms occur once the disease is already in the advanced phase. Pulmonary tuberculosis is typically acquired in childhood from an infected adult, who themselves were likely exposed as a child and only began to suffer later in life as their immune system deteriorated. Unless tested before the onset of symptoms, it is difficult to know if a person has tuberculosis lying dormant in their system. Common risks to the health of an individual's immune system are other diseases, including HIV, alcoholism, and diabetes.

The tuberculosis bacteria can be spread to other parts of the body, besides the lungs, through the host's white blood cells, which carry it unknowingly through the bloodstream. Infections of other parts of the body by the tuberculosis bacilli are known as extrapulmonary tuberculosis (Caldwell 1988:6; Teller 1998:1). Lymphatic tuberculosis, also known as cervical lymphadenitis, or scrofula, comes from a strain of tuberculosis bacteria that infects cattle. Scrofula, from the Latin means, "breeding sow," a reference to its origins in the cow. *Mycobacterium tuberculosis bovis*, the cattle strain of the bacteria,

can be spread to humans and other warm-blooded mammals through the air, but more commonly through meat and unpasteurized milk. Drinking raw milk from diseased cows infects the tonsils, lymph nodes and can be spread to the intestinal tract. When infected, the lymph nodes swell and abscesses appear on the outside of the neck, which can rupture and form chronically draining sores. Fever, chills, malaise and weight loss also accompany the neck sores when the patient is infected with scrofula. Other types of extrapulmonary tuberculosis, like *tuberculous spondylitis*, or Pott's Disease, affect the intervertebral joints of the thoracic and lumbar vertebra and the joints at the ends of long bones, causing swelling and cavitary lesions.

Aleš Hrdlička (1909), a medical doctor working at the Smithsonian in the early twentieth century, concluded that there was little to no tuberculosis existing in the pre-Columbian Americas. He based his conclusion on the physical absence of lesions from Native American bones available at the time. He also used accounts of early explorers who reported no signs of the disease among indigenous peoples and ethnographic evidence that presented a lack of medicinal cures among traditional doctors of the Americas (Townsend 1938:483; Buikstra 1981:3-4). Although later evidence would prove that tuberculosis did exist in the pre-Columbian Americans (Allison, et al. 1981; Buikstra 1981; Palkovich 1981; Widmer and Perzigian 1981; Salo et al. 1994; Stead et al. 1995; Mackowiak et al. 2005; Wilbur et al. 2008), Dr. Hrdlička did make some erudite observations. In 1909, he wrote:

> "Nearly all the tribes that have long been in contact with the whites, and that have advanced more or less in civilization, are seriously affected [by tuberculosis]. On the other hand, most of the least affected tribes have been less in contact with the whites and live not only in a favorable climate, but also, to a large degree, in their native manner. Judging from the Pueblos, who are among the tribes most free from tuberculosis, the contact of the

> Mexicans was not as detrimental as was that of the whites from the east and north of the continent. The natives most free from tuberculosis—the Navajo—occupy an extensive and naturally healthy region, where they live under conditions more nearly aboriginal than those found in any other location north of Mexico" (6).

These observations seem to point to something within white, American culture that was facilitating the spread of tuberculosis among Indian peoples. This is in direct contrast to the popular ideas of Indian agents and doctors at that time: that Indian peoples were genetically predisposed to contract tuberculosis due to poor heredity and weak constitutions. This idea will be discussed in detail below.

The reason why Native American populations had seemingly no immunity to European diseases is thought to be based on the spread of agriculture and domestic stock throughout the Western hemisphere. The majority of European diseases that would go one to affected Native American peoples had zoonotic origins, meaning they were transferred from livestock to people. Inhabitants of the Old World contracted these illnesses starting with the advent of agriculture, around 10,000 years ago, and had thousands of years to build immunity to them. Due to the slower spread of agriculture in the Western hemisphere and the lack of large, domesticated animals, diseases of a zoonotic origin; like influenza, smallpox and measles, did not exist in the New World as they did in Europe, Asia and Africa (Diamond 1999).

However, as stated above, more current information proves that tuberculosis was indeed present in the Americas before the arrival of Europeans, spanning from the Mississippi Valley all the way to the highlands of Peru. The prevalence of pre-Columbian tuberculosis mirrors the environmental and cultural conditions of other, Old World populations: tuberculosis struck in densely settled, agriculturally based and socially

stratified societies. Anthropologists have discovered tubercular lesions on the long bones and vertebra of skeletal remains from Fort Ancient tradition along the Ohio River and preserved tuberculosis bacteria was found in the lung tissue of a seventeen hundred-year-old Chilean mummy (Allison, et al. 1981; Widmer and Perzigian 1981:111; Salo et al. 1994). Widmer and Perzigian (1981:111) argue that population density would have contributed more to the spread of tuberculosis than diet, but Wilber et al. (2008:974) argues that it was the shift in subsistence, brought on by agriculture, that precipitated the spread.

Whichever the case, there is irrefutable evidence that tuberculosis was present in populations throughout the Southeast of North America and Western South America (Mackowiak et al. 2005), though not in the devastatingly high rates seen in the post-Columbian, reservation era. Though it was originally hypothesized that human tuberculosis had a zoonotic origin, resulting from the mutation of the cattle strain of bacteria (Stead et al. 1995), more recent evidence suggests that the disease appeared in humans first and was then passed to cattle and other mammals (Borsch et al. 2002). Gutierrez et al. (in Wilber et al. 2008:976) estimates that the earliest forms of tuberculosis could have evolved in Africa 2.5 million years ago, meaning it could have potentially been brought to the Americas across Beringia or by other means of New World peopling. How the disease was sustained among small bands of foraging societies, and why it only became visible in human remains staring around 17,000 years ago, is entirely unknown (Wilber et al. 2008:977). Since the New World lacked large draft animals, originally thought to have spread the disease, the human origin of tuberculosis explains how it could have existed in the Americas before the arrival of Europeans.

A tuberculosis vaccine was not available until 1947. However, at this time throughout the world tuberculosis was already on the decline. The theory is that, among the general population, improvements in nutrition and public sanitation in the early twentieth century helped to drive down the prevalence of the disease (McKeown 1979). Modern reports have also highlighted the connection between diet and tuberculosis. During World War I, prevalence of tuberculosis rose in Europe as food became scarce. However, cases in Denmark suddenly dropped in 1917 when the consumption of meat and milk went up (in Dormandy 2000:225). Studies of adolescent girls in the 1950s showed low levels of protein and calcium in their diet contributed to prolonged disease and maintenance of tuberculosis in the host's body (in Wilber et al. 2008:966). However, since poor nutrition does not exist in a vacuum, factors like poor sanitary conditions and crowding into confined areas often coexist with lack of adequate food and contagious diseases (Dormandy 2000:225n; Wilber et al. 2008:974).

Currently, tuberculosis is classified as a resurgent disease because, despite its near eradication by the 1960s, multidrug-resistant strains have emerged and the disease persists among poor, urban populations around the world (Wiley and Allen 2009). This can partially be attributed to the HIV/AIDS epidemic that depresses the immune system of its victims and allows tuberculosis to thrive. Tuberculosis was responsible for approximately 1.7 million deaths in 2009 and there were 9.4 million new cases of tuberculosis in that year alone. Despite the major advances in the treatment of TB, it remains one of the three leading causes of death among women, aged 15-44, in the world (WHO 2010).

Tuberculosis has been called the perfect expression in an imperfect society (Anonymous in Dormandy 2000:377). It is a perfect example of a multifactorial disease (Johnston 1993:1059) because both the bacterial infection and environmental factors are equally important in its transmission and preservation. This why, despite its antiquity, tuberculosis proliferated significantly throughout the Western world during the Industrial Revolution of the nineteenth century, when living conditions and malnutrition provided a comfortable environment for the bacteria. It is also why it began to most seriously affect American Indian people during the Reservation Era in the last half of the nineteenth century, even though the disease had existed before the arrival of Europeans.

TWO: Methods and Materials

The utilization of both primary and secondary sources has been necessary for the study of Pawnee and Omaha health and diet. The most important information comes from the government documents *The Annual Report of the Commissioner of Indian Affairs to the Secretary of the Interior*, which are available in Love Library at the University of Nebraska-Lincoln from the year 1849 until 1969. These reports are a yearly compilation of all the information concerning Native Americans groups throughout the nation, often by an individual agent who is responsible for the task of "civilizing," or introduce white culture to, their assigned tribes. Even though the reports span more than a century, both the quantity and quality of the information that they contain is sporadic and unreliable. Concerning the Omaha, Winnebago and Pawnee, the most comprehensive coverage begins around 1860 and diminishes significantly after the 1890s. In each of these reports are letters containing the yearly "progress" of each Indian group living on a reservation, written by their specific agent. Many also contain reports written by the superintendant of agency schools, the agency physician and the agency farmer.

The second most important primary source are the unpublished letters received by the Commissioner of Indian Affairs from area superintendents and individual agents, located at the Nebraska State Historical Society in Lincoln, Nebraska and the Oklahoma State Historical Society in Oklahoma City, Oklahoma. The official correspondence between the commissioner, superintendents and agents provides first hand information not available in the *Annual Reports*. These sources, available both in the original, hand-written form and on microfilm, include official government letters and transcripts but

also accounts of settlers, military personnel, railroad company supervisors, and many other non-official subjects that were somehow involved in, or witness to, Indian affairs. These collections also include reservation censes, payment vouchers for food and goods and various other descriptions of daily life on the reservation. These documents are essential as supplementary information to provide a qualitative expansion of the available statistical information.

The secondary sources include mainly ethnographies and monographs of all three tribes so that an examination of the difference between pre-contact and post-contact diet can be made. The most helpful of these sources were George Will and George Hyde's *Corn Among the Indians of the Upper Missouri* (1964), David Wishart's *An Unspeakable Sadness: The Dispossession of the Nebraska Indians* (1994), Gene Welfish's *The Lost Universe: Pawnee Life and Culture*, and Alice Fletcher and Francis LaFlesche's *The Omaha Tribe* (1972). Valuable accounts of reservation life were also taken from secondary sources like *Some Things are Not Forgotten: A Pawnee Family Remembers* by Martha Blaine (1997) and *With Good Intentions: Quaker Work Among the Pawnees, Otos and Omahas in the 1870s* by Clyde Milner (1982).

All of the statistical information provided has been taken from the *Annual Reports*, either from the statistical tables, provided as appendices in the records, or from the firsthand accounts of the Pawnee, Omaha and Winnebago agents. Reports of agency physicians, who provide all the medical information, are compiled in tables at the end of each *Report* for every Indian agency in operation. These tables are available only for the years 1879 to 1894. Cases of tuberculosis are often referred to in the literature by their archaic names: "consumption" (pulmonary tuberculosis) and "scrofula" (lymphatic

tuberculosis). In the statistical tables, cases were occasionally recorded separately by these names, but were more often recorded simply as "tuberculosis", with no differentiation between the two types. Because of this fact, all cases in this analysis have been listed simply as tuberculosis, except where specifically noted otherwise.

The majority of the Winnebago people had made their new home in Nebraska by 1865, and by 1880 they officially shared an agency physician with the Omaha. For most of the years between 1879 and 1894, all incidence of disease for both tribes was recorded jointly, under the heading, "Omaha and Winnebago Agency." An attempt has been made to tease apart the cases, assigning an approximate number of cases to each tribe, based on statistics that are available for the 4 years when medical cases were recorded separately. It is also based on the literature that describes the virulence of disease among each tribe. Both the jointly recorded cases and the separate, approximated cases are enumerated below.

Figures for percentage of subsistence based on government rations are taken from tables provided in the *Annual Reports*. These numbers are available starting in 1875, continuing until 1894, which is also the last year cases of disease are reported in the *Annual Report*. The use of rations appears to end for all three tribes by 1892 at the latest. Specific rations provided are occasionally available in letters from Indian agents and superintendents to the Commissioner of Indian Affairs at the Nebraska State Historical Society and the Oklahoma State Historical Society. Specific rations for the Pawnee are also available in Tamara Levi's dissertation *Food, Control and Resistance: Rations and Indigenous Peoples in the American Great Plains and South Australia* (2006) which cites information provided in letters located at the National Archives in Washington, D.C.

THREE: Results

The results of this paper must be approached with the understanding that poor diet is not a cause of the spread of tuberculosis and this is not what is being suggested. The specific association that is to be highlighted between diet and tuberculosis is that malnutrition, which leads to a poor constitution, contributes to the spread and maintenance of tuberculosis within the host's body, and the community at large, by providing the bacteria with a number of potentially compromised targets. Without proper stores of fat and calories for energy, the body's immune system lacks the strength it needs to fight the bacteria when first exposed to it and to maintain containment of the bacteria once infected. A poor, inconsistent diet of low quality food would also facilitate the detrimental effects of tuberculosis by depriving the host of the recuperative strength needed to overpower the disease and recover. It will also be emphasized that diet is only one of the factors that contributed to the spread of this disease in the last half of the nineteenth century. Other factors, including poor living conditions, improper sanitation and changing lifestyle will be addressed in the Discussion chapter.

Figure 3.1 is a representation of the population figures for the Omaha, Winnebago and Pawnee from the year 1864 to 1894. Table 3.1 provides a full list of yearly population numbers, including births and deaths, when available. Although the Pawnee population exceeded that of both the Omaha and the Winnebago by 1,000 persons in 1864, by 1894 there were approximately 430 fewer Pawnee than the combined Omaha and Winnebago tribes. This incredible drop in population, compared with the Winnebago and Omaha, is discussed below.

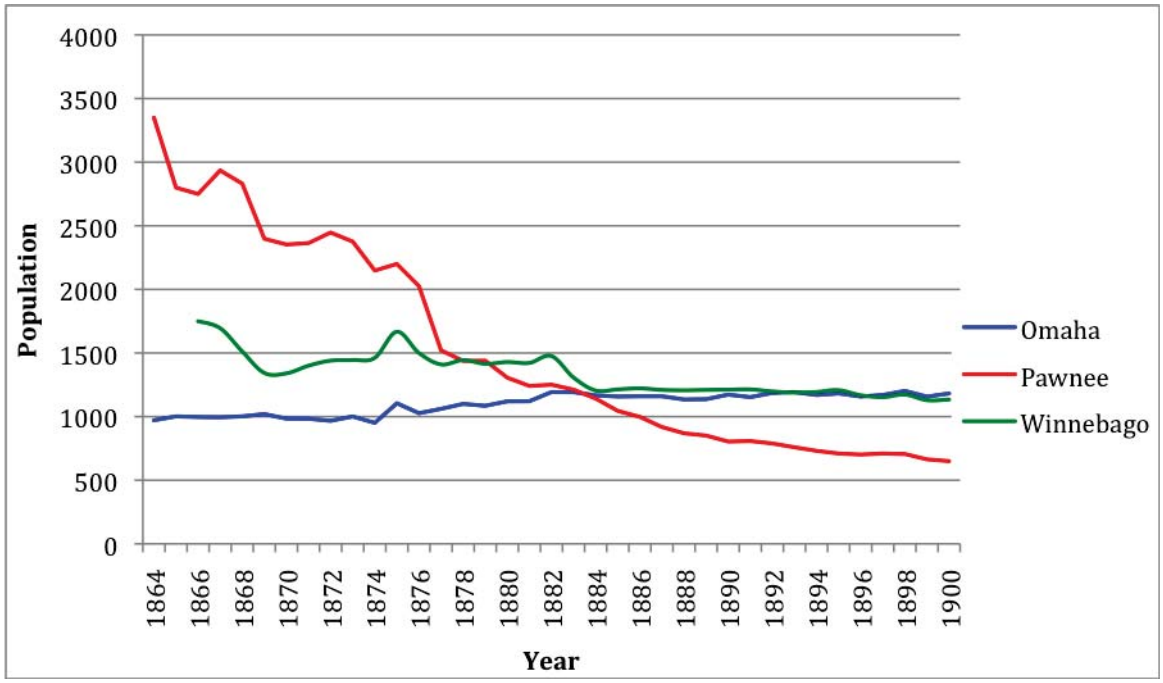

Figure 3.1 Omaha, Winnebago and Pawnee Populations, 1864 – 1900.
Winnebago population figures begin in 1865 when they first moved to Nebraska

Table 3.1 Total Population, Births, and Deaths for the Pawnee, Omaha and Winnebago, 1860-1894.

Year	Tribe	Population	Births	Deaths
1860	Omaha	931		
	Pawnee			
1861	Omaha	950		
	Pawnee	3414		
1862	Omaha	953		
	Pawnee	3414		
1863	Omaha	998		
	Pawnee			
1864	Omaha	971		
	Winnebago	1200		
	Pawnee	3350		
1865	Omaha	1002		
	Winnebago			
	Pawnee	2800		
1866	Omaha	997		
	Winnebago	1750		
	Pawnee	2750		
1867	Omaha	995		
	Winnebago	1695		
	Pawnee	2935		

Year	Tribe	Population	Births	Deaths
1868	Omaha	1002		
	Winnebago	1512		
	Pawnee	2831		
1869	Omaha	1020		
	Winnebago	1343		
	Pawnee	2398		
1870	Omaha	984		
	Winnebago			
	Pawnee	2352		
1871	Omaha	984		
	Winnebago	1400		
	Pawnee	2364		
1872	Omaha	969		15
	Winnebago	1440		
	Pawnee	2447	83	
1873	Omaha	1001		
	Winnebago	1445		
	Pawnee	2376		
1874	Omaha	951		76
	Winnebago	1462		
	Pawnee	2148		
1875	Omaha	1005	74	20
	Winnebago	1667	35	34
	Pawnee	2200		
1876	Omaha	1027	55	33
	Winnebago	1500	35	40
	Pawnee	2026	95	150
1877	Omaha	1061	68	38
	Winnebago	1410	36	22
	Pawnee	1521		
1878	Omaha	1100	68	34
	Winnebago	1444	50	33
	Pawnee	1438		
1879	Omaha	1085	43	25
	Winnebago	1415	68	66
	Pawnee	1440	33	160
1880	Omaha	1120	45	40
	Winnebago	1429	40	34
	Pawnee	1306	49	51
1881	Omaha	1121	33	40
	Winnebago	1422	39	41
	Pawnee	1241	19*	8*
1882	Omaha	1193	95	80
	Winnebago	1476	65	70

Year	Tribe	Population	Births	Deaths
	Pawnee	1251	27	25
1883	Omaha	1192	91	28
	Winnebago	1307	91	28
	Pawnee	1212	17	56
1884	Omaha	1167	61	12
	Winnebago	1205	73	18
	Pawnee	1142	58	72
1885	Omaha	1188	25	34
	Winnebago	1214	31	44
	Pawnee	1045	38	103
1886	Omaha	1160	28	36
	Winnebago	1222	51	57
	Pawnee	998	28	77
1887	Omaha	1160	23	36
	Winnebago	1210		
	Pawnee	918	45	125
1888	Omaha	1135	52	87
	Winnebago	1207	35	35
	Pawnee	869	101	123
1889	Omaha	1137		
	Winnebago	1210	42	36
	Pawnee	851	49	55
1890	Omaha	1173	50	35
	Winnebago	1212	45	61
	Pawnee	804	53	79
1891	Omaha	1153		
	Winnebago	1214	54	47
	Pawnee	808	32	35
1892	Omaha	1186	54	30
	Winnebago	1198	32	44
	Pawnee	789	42	57
1893	Omaha	1199	97	84
	Winnebago	1189	44	53
	Pawnee	759		
1894	Omaha	1170	41	71
	Winnebago	1194	31	28
	Pawnee	731	40	68
1895	Omaha	1182	67	55
	Winnebago	1208	29	25
	Pawnee	710	54	75
1896	Omaha	1158	37	64
	Winnebago	1168	27	48
	Pawnee	702	36	24
1897	Omaha	1170	62	50

Year	Tribe	Population	Births	Deaths
	Winnebago	1153	30	45
	Pawnee	710	44	37
1898	Omaha	1202	72	40
	Winnebago	1173	66	46
	Pawnee	706	44	49
1899	Omaha	1157	45	90
	Winnebago	1129	34	78
	Pawnee	664	31	73
1900	Omaha	1182	51	26
	Winnebago	1134	42	37
	Pawnee	650	32	46

* In hospital only
Blank rows imply no information available

In Figure 3.2, the yearly percentage of subsistence that came from government rations is provided for the Pawnee, Omaha and Winnebago for the years 1875 to 1894. This is the only period that this information is made available in the *Annual Reports*. A full list of the yearly subsistence percentages for each tribe is provided in Table 3.2. Agents were given the task of summing up yearly subsistence percentages under the rather vague headings: percentage of diet from civilized pursuits, percentage of diet from wild hunted or gathered foods and percentage of diet from rations. "Civilized pursuits" likely refers to those who grew their own food or perhaps purchased it using the money they earned from working.

The Pawnee, due to hostile raids by their intruding neighbors, the Lakota, and bad luck at farming, relied on government rations to make up a more significant part of their diet than the Omaha. Although it appears to be less so than the Pawnee, the true extent of the Winnebago reliance on rations is not accurately demonstrated by the information provided in the *Annual Reports*, and a review of the literature will demonstrate that this is likely true.

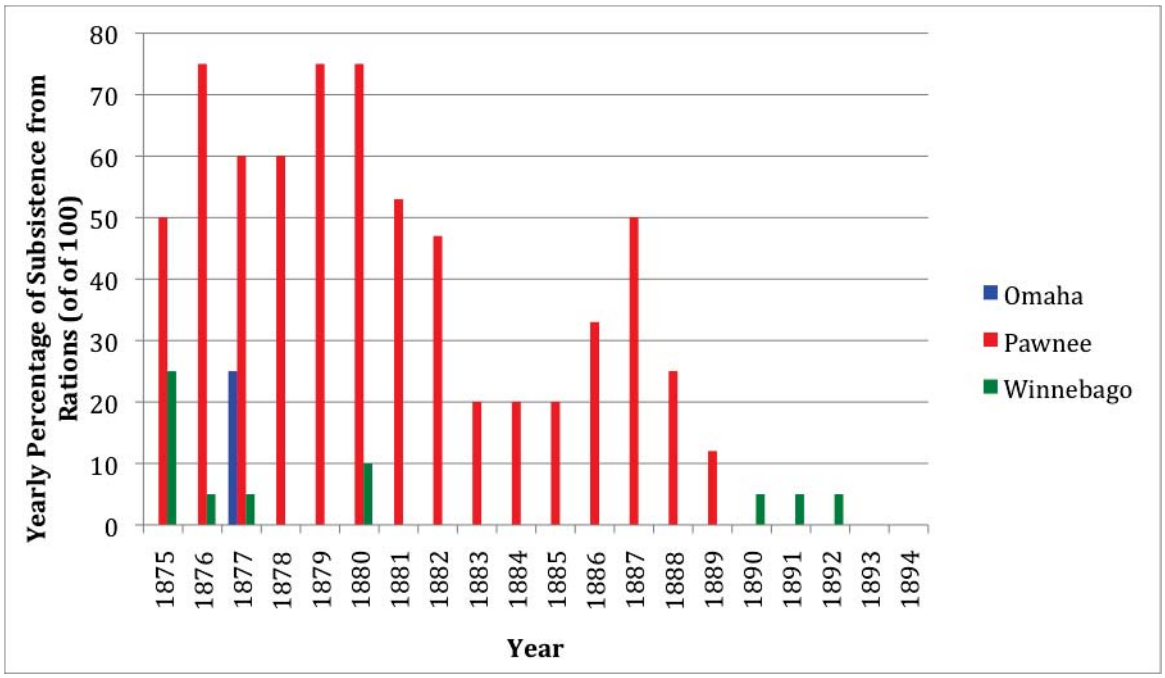

Figure 3.2 Yearly percentage of subsistence from government rations for the Pawnee, Omaha and Winnebago, 1875 – 1894.

The Omaha had far greater success at farming than the Pawnee, which allowed them as a group to draw on rations in much smaller quantities than the Pawnee. However, the Omaha, who had the highest annuity income, became increasingly in the habit of purchasing, not growing, their own food at the end of the nineteenth century, making their diet similar to that which was doled out by the government in the form of rations. Although made up of the same foods, the quality of food the Omaha purchased was likely much better than that provided to the Pawnee and Winnebago. This will be discussed in detail below. First, the correlation between diet and tuberculosis for the Pawnee will be examined, followed by that of the Omaha and Winnebago.

Table 3.2 Yearly Percent of Subsistence from Civilized Pursuits, Wild hunted or gathered foods and Government rations for the Omaha, Winnebago and Pawnee, 1875-1894.

Year	**Tribe**	**% Diet from Civilized Pursuits (out of 100)**	**% Diet from Wild hunted or gathered foods (out of 100)**	**% Diet from Government Rations (out of 100)**
1875	Omaha	90	10	-
	Winnebago	75	25	-
	Pawnee	50	-	50
1876	Omaha	90	10	-
	Winnebago	92	3	5
	Pawnee	25	-	75
1877	Omaha	75	25	-
	Winnebago	92	3	5
	Pawnee	30	10	60
1878	Omaha	95	5	-
	Winnebago	95	5	-
	Pawnee	30	10	60
1879	Omaha	100	-	-
	Winnebago	100	-	-
	Pawnee	20	5	75
1880	Omaha	100	-	-
	Winnebago	50	40	10
	Pawnee	25	-	75
1881	Omaha	100	-	-
	Winnebago	95	5	-
	Pawnee	45	2	53
1882	Omaha	90	10	-
	Winnebago	95	5	-
	Pawnee	50	3	47
1883	Omaha	95	5	-
	Winnebago	95	5	-
	Pawnee	75	5	20
1884	Omaha	95	5	-
	Winnebago	98	2	-
	Pawnee	75	5	20
1885	Omaha	90	10	-
	Winnebago	95	5	-
	Pawnee	80	-	20
1886	Omaha	95	5	-
	Winnebago	90	10	-
	Pawnee	67	-	33
1887	Omaha	95	5	-
	Winnebago	100	-	-

Year	Tribe	% Diet from Civilized Pursuits (out of 100)	% Diet from Wild hunted or gathered foods (out of 100)	% Diet from Government Rations (out of 100)
	Pawnee	50	-	50
1888	Omaha	100	-	-
	Winnebago	100	-	-
	Pawnee	75	-	25
1889	Omaha	100	-	-
	Winnebago	100	-	-
	Pawnee	88	-	12
1890	Omaha	100	-	-
	Winnebago	95	-	5
	Pawnee	50	50	-
1891	Omaha	100	-	-
	Winnebago	95	-	5
	Pawnee	95	5	-
1892	Omaha	50	50	-
	Winnebago	50	45	5
	Pawnee	100	-	-
1893	Omaha	100	-	-
	Winnebago	100	-	-
	Pawnee	100	-	-
1894	Omaha	100	-	-
	Winnebago	100	-	-
	Pawnee	100	-	-

Dash (-) indicates zero (0) percent of diet

The Pawnee

Figure 3.3 shows the correlation between Pawnee yearly percentage of subsistence based on government rations (x-axis) and recorded cases of tuberculosis (y-axis) for the years 1879 to 1894 (n = 16). It is clear from the scatter plot that the cases of tuberculosis are positively associated with rising percentage of subsistence from rations (r = 0.579), but statistically speaking, the correlation between the two is not strong (R^2 =

0.336). However, this model predicts that government rations will determine approximately 34 percent of the variation in future cases of tuberculosis. In this particular case, this is a fairly significant correlation, since diet is just one of the many environmental factors that affect tuberculosis. Furthermore, there is reason to believe, from the letters of Indian agents, that there were certain periods when cases of tuberculosis may not have been accurately recorded because the agency physician did not treat potential patients. The supplementation from the literature is provided below.

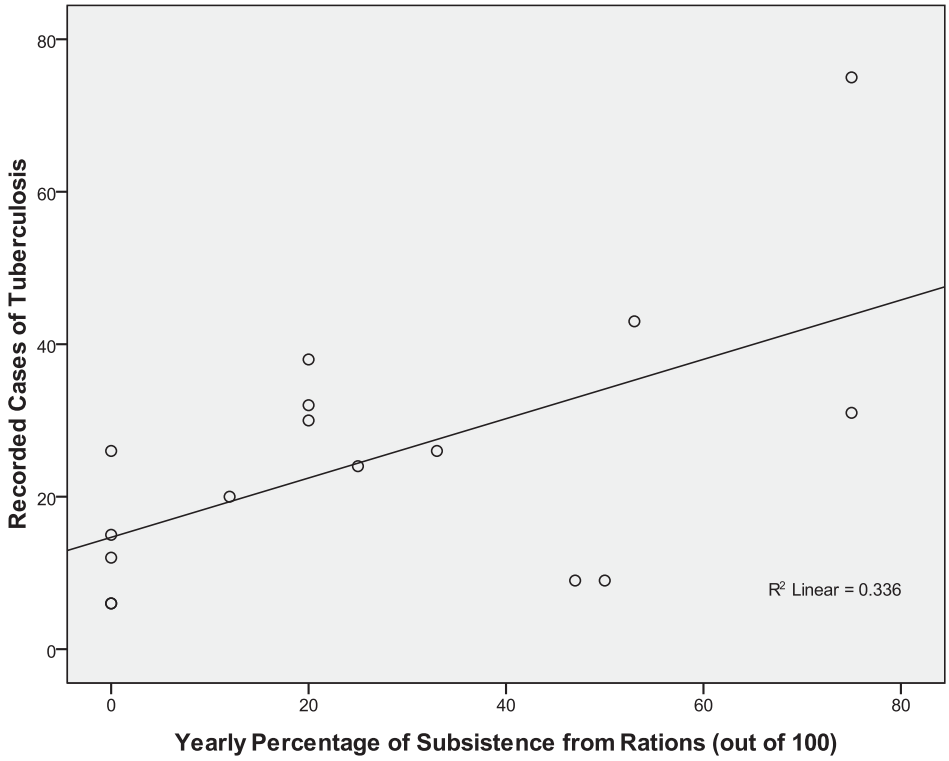

Figure 3.3 Scatter Plot for the correlation between Pawnee subsistence (x) and cases of tuberculosis (y) from 1879-1894. r = 0.579, R^2 = 0.336, n = 16.

The letters contained in the *Annual Reports*, written by Pawnee reservation agents, show that the tribe's reliance on rations started long before 1875 and that as much as 75 to 100 percent of the population's diet may have come exclusively from rations

during the statistically undocumented period in the late 1860s and early 1870s. As early as 1862, the Pawnee agent, Benjamin Lushbaugh, described them as being in a "half starved and nude state" (122) and in 1864, after a swarm of grasshopper left "not a green thing in the form of corn or vegetable," the Pawnee were entirely without food and "their only remaining resource [was] their annuity" (Lushbaugh 1864:382). When it came to rations, the most common types distributed were flour, beef, pork, sugar, cornmeal and coffee. All of these were usually of the poorest quality imaginable, as they either had to be procured in an emergency by the agents, who were often swindled by greedy traders, or incompetent distribution methods caused meat to spoil and flour to turn rancid (Campbell 1894:190; Milner 1982; Blaine 1999; Levi 2006). Martha Blaine, in the early twentieth century, recounts a story of Pawnee recipients of pork that was white in color and mostly fat and sometimes green with mold (1997:22).

The year 1869 provides one of the best examples of the interplay between government rations and disease, although no statistical records of either are available. Pawnee population dropped precipitously in the 1860s, from 3,350 in 1864 to 2,398 by 1869 (Figure 3.1, Table 3.1). The tribe was allowed to go on their summer bison hunt in 1869 with permission from their agent, Jacob Troth. He was obliged to allow this because of the starving condition of the Pawnee, as most of the tribe throughout July was living on 3 ½ pounds of flour and ¾ pounds of beef a day per individual (Janney to Parker 1869a). Their crops had been ravaged by grasshoppers and the only crops that showed any promise of lasting until harvest were those being grown on the agency farm—about 50 acres of wheat and 10 acres of potatoes (Janney to Parker 1869b).

The desperate times also caused Troth to buy any foodstuffs available to him, including 40 head of cattle that had drowned while crossing the Looking Glass and Shell Creeks near the reservation (Troth to Janney 1870a; Milner 1982:36). In his letter to the Commissioner of Indian Affairs that year, Troth writes that a "large number of Indians of all ages are now suffering from sickness and disease; numbers are dying for want of proper medical relief" (1969: 350). Indeed, the closest physician was in Columbus, Nebraska, 22 miles from the reservation. The number of sick prompted both Troth and Superintendent Samuel Janney to write letters to the Commissioner, begging him to let them hire an agency physician (Troth to Janney 1869; Janney to Parker 1869c).

The state of Pawnee children was no better. Those who attended the Manual Labor School were fed a diet of mostly beef, lard, sugar, coffee, molasses, rice and anything grown in the gardens of the school (Troth to Janney 1870b). However, the gardens, which supplied most of the vegetables, were unreliable. Elvira Platt, the principal of the school, writes how "harvesting no crops we could not obtain the corn they needed to eat…" and that she wished the school children "might have strengthening food to enable them to labor" (Platt to Janney 1869). The children, who were being fed a substandard diet and still being forced to labor futilely on the farm, not only "lacked clothing" and "at times proper food" (Platt to Janney 1869), but also suffered from outbreaks of measles. Poor sanitary conditions and lack of proper food had been a problem plaguing the Manual Labor School throughout the 1860s. Although no report of disease is listed, School Superintendent J.B. Maxfield, wrote in 1864 that after a bout of measles, there seemed "to be a lack of recuperative energy in many of the children; lung and bilious disease…followed close upon the exit of [measles]" (383). Measles was

notorious for weakening immune systems and essentially predisposing recuperating bodies for tuberculosis (Dormandy 2000:235), because if the children had already been exposed to the bacteria, the infection could take over while the body was weakened, busy fighting off another disease. It is possible that this is exactly what Maxfield was describing.

The 1870s proved to be the cruelest decade for the Pawnee, whom Janney describes at the opening of the new decade as "very much diseased" (Janney to Parker 1870a). In 1871, they received their own agency physician, and the Indians contributed 1,000 dollars of their own annuity money to stack the physician's shelf with medicine, which speaks to the state of virulent disease that plagued them (Janney to Parker 1871; Milner 1982:43). Subsistence records are not provided for the early 1870s, but evidence from letters suggests that the Pawnee were struggling. They sent a request to Superintendent Janney that 400 dollars of their annuity be given as supplemental payment to their interpreter, B. Bayhills, who taught them to farm and often fed them from his own pantry when they were in need (Janney to Parker 1870b). In 1872, the tribe even went so far as to try and sell off 50,000 acres of their reservation just to get money to buy cattle (Troth 1872). When their new agent, William Burgess, arrived in January of 1873, he wrote: "I found the Indians after I came in need of food…I represented to the Indians that it was not the finest quality flour and if I furnished it that they must not complain…" (Burgess 1873a).

On their winter bison hunt of that same year, the Pawnee were attacked by Ogallala and Brule Lakota warriors and 69 Pawnee were killed in an area of southwestern Nebraska that is today known as Massacre Canyon. The surviving party of around 600

men, women and children were forced to abandon their meat and bison robes in order to escape with their lives. Their agent, William Burgess, writes, "$3,000 was placed at my disposal to procure provisions, nearly all of which was expended in the purchase of flour, beef, and other necessities for their relief" (1873b:193). Again in 1874, after grasshoppers and drought left the Pawnee with no food, Burgess writes, "the sum of 9,000 dollars was placed at my disposal, to procure subsistence, with which I bought meat, cattle, flour, and other articles…" for distribution to roughly 2,000 individuals (207). Pawnee women were too afraid to work the fields for fear of Lakota raids, to which the government and Indian agents provided no protection. This dire state helped to prompt the Pawnee's exodus to Indian Territory, where they lived out the last half of the decade on rations of beef, bacon and flour. There are no specific medical records during this turbulent time, but Figure 3.1 demonstrates that the Pawnee's most precipitous drop in population was in the 1870s.

During 1879 and 1880, when the Pawnee relied on government rations for 75 percent of their total subsistence for two consecutive years, very little is mentioned by their agent of the rates of tuberculosis prevailing among them. This is despite the fact that 1880 saw the highest number of cases of tuberculosis in the 16 years that disease records are provided in the *Annual Reports* (Figure 3.4). The Pawnee agent, E.H. Bowman, wrote, in 1880, "…they had all the potatoes and vegetables they could eat. The people look well nourished, the children generally fat and healthy" (81). This seems to contradict the numbers that claim that only 25 percent of their food for the whole year came from farming, unless the rations being supplied were potatoes and vegetables, which was not the standard ration fare. It is possible that conditions may have been exaggerated to make

agents look good. In 1883, agent L.E. Woodin hailed the drop in reliance on rations to a mere 20 percent of the diet (Figure 3.2), but he adds, "Frequent deaths occurred during last winter and spring, mostly from pulmonary diseases." Indeed, 56 deaths had occurred since the 1882 (Table 3.1) along with 32 recorded cases of tuberculosis (Figure 3.4, Table 3.3). It seems as if agents were reluctant to report too much bad news, even though the corresponding spike in cases of tuberculosis and reliance on government rations in 1880 should not have gone unnoticed.

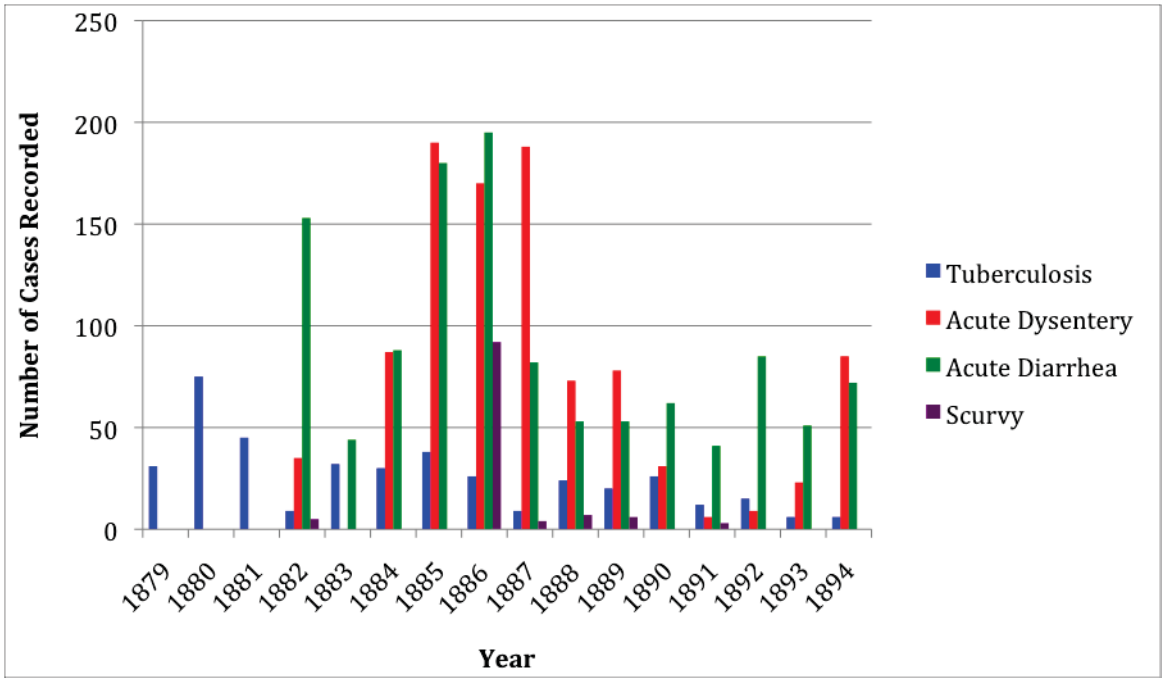

Figure 3.4 Cases of Recorded Illness, including tuberculosis, acute diarrhea, acute dysentery and scurvy, among the Pawnee, 1879 – 1894.
Cases of diarrhea, dysentery and scurvy are only available after 1882

Figure 3.4 provides a graph of the yearly-recorded cases of tuberculosis, scurvy and enteric or intestinal diseases, such as diarrhea and dysentery, for the Pawnee from 1879 to 1894. Table 3.3 provides the exact numbers of all the diseases. Figures for diarrhea, dysentery and scurvy are not available until 1882. The major spike in cases of scurvy, diarrhea, dysentery and tuberculosis all correspond to the increased reliance on

government rations during the years 1885 to 1889 (Figure 3.2), which is evidence of the poor quality of the provided rations.

Table 3.3 Cases of Recorded Illness, including tuberculosis, acute diarrhea, acute dysentery and scurvy, among the Pawnee, 1879 – 1894.

Year	**Tuberculosis**	**Acute diarrhea**	**Acute Dysentery**	**Scurvy**
1879	31			
1880	35			
1881	45			
1882	9	153	35	5
1883	32	44	-	-
1884	30	88	87	-
1885	38	180	190	-
1886	26	195	170	92
1887	9	82	188	4
1888	24	53	73	7
1889	20	53	78	6
1890	26	41	6	3
1891	12	41	6	3
1892	15	85	9	-
1893	6	51	23	-
1894	6	72	85	-

Cases of diarrhea, dysentery and scurvy are only available after 1882
Dash (-) indicates no cases recorded
Blank rows indicate no information available

The difference between diarrhea and dysentery is negligible: dysentery is a bacterial infection that causes inflammation of the intestine and colon and results in diarrhea. Diarrhea merely refers to the state of having several liquid-like bowel movements per day. Left untreated, dysentery, or other infections that cause diarrhea, can be fatal if proper hydration is not provided for the victims. It is possible that all cases recorded as “diarrhea” were a result of dysentery or another bacterial infection, like cholera, parasites or something completely benign. It is not clear why or how the doctors

differentiated between the two but since the *Annual Reports* list them separately in their charts, they have been listed separately in Figure 3.4 and Table 3.3

The middle of the 1880s was a transition period for the Pawnee when things went from relatively good to awful. Despite the failure of their corn crop in 1885, agent John W. Scott (1885:94) applauded the Pawnee for resisting the help of the government and not accepting a large number of rations, which remained at 20 percent of their total diet from 1883 to 1885 (Figure 3.2). However, where the extra food, to make up for this shortage, came from is not clear. Agent Scott describes the Pawnee as "reduced to distressing straits to procure their means of subsistence" (1885:94), but does not specify what they ate. It is possible that the Pawnee lived off what corn they did manage to save, along with wheat, potatoes, pumpkins and melons, but what is more probable is that the Pawnee used their annuity money, or goods, to buy or trade for food from white traders.

Scott also wrote in 1885 (95): "The acute disease incident to the locality and climate are *not* particularly frequent or severe. But many of the Indians are *tainted* with hereditary and constitutional complaints which weaken their powers of resistance, and they succumb to attacks of pneumonia or malarial fever which a healthy constitution would easily overcome [my emphasis added]." This same year, the Pawnee complained of 38 cases of tuberculosis (although the real number may have been much higher), 180 cases of diarrhea and 190 cases of dysentery (Table 3.3). These figures, and Scott's letter, suggests a serious problem with not only the quantity, but also the quality, of the food being consumed and it is hard to believe that farm-grown vegetables were causing such incredible numbers of enteric disease. Obviously poor quality food was being consumed, and this likely points to spoiled meat and flour, the standard ration fare.

The year 1886 saw the first increase in subsistence based on rations in 3 years, yet the cases of tuberculosis dropped to 26 from 38 the year before (Table 3.3). However, in his annual letter to the commissioner, agent John W. Scott (1886:137) wrote, "This decrease [in population from last year] does not result, I am sure, from any unhealthfulness in their location, but doubtless from an *inherent consumptive taint*, affecting, it seems, two-thirds of the tribe [my emphasis added]." There were 77 deaths that year among the Pawnee (Table 3.1) and with a population at 998, it seems that consumptive problems affecting "two-thirds of the tribe", as Scott wrote, would have resulted in more than 26 cases of tuberculosis that year. Food quality must have been a major issue as well because there were also 92 cases of scurvy, 195 cases of diarrhea and 170 cases of dysentery (Table 3.3). The following year, 1887, agent E.C. Osborne laments a drought that caused an increase in reliance on rations and writes, "This fearful decimation [of the population] is due alone to the existence of scrofula, syphilis, and consumption amongst [the Pawnee]. Their location is perfectly healthful, and pure water can be had anywhere upon the reservation" (1887: 918). Despite this obvious decimation (125 deaths in one year [Table 3.1]), only 9 cases of "scrofula" and "consumption" were reported, even though these were two of the three causes that Osborne points to as overwhelmingly responsible for the drop in Pawnee population.

It is possible that these letters were exaggerations on the part of Scott and Osborne, and certainly a number of only 35 cases of tuberculosis in two years suggests this. However, it is unlikely that the agents would have exaggerated the negative aspects of their job, unless they were likely to gain something from it. Consider the case, mentioned above, of E.H. Bowman (1880:81) who wrote that the Pawnee "...look[ed]

well nourished, the children generally fat and healthy" when they experienced a drought and the highest number of tuberculosis cases in their recorded history (Figure 3.4). The tendency to exaggerate, or outright lie, was beneficial to the agent only when it made them look good. It is unlikely that agents would have lied to make the Pawnee appear sicker than they really were, as this would reflect poorly on the agents themselves. This is also likely why Agent Scott (1885:95; 1886:137) constantly described the Pawnee as being inherently conditioned to contract tuberculosis, so that it would not reflect badly on the social and environmental conditions on the reservation.

It is also possible that many cases of tuberculosis were not reported to the commissioner because the victims did not go to see the agency physician. Despite their agent's recommendations, the Pawnee still relied heavily on their traditional doctors, "the incorrigible medicine man" as Osborne put it (1889:196), to treat their ailments (Phillips 1892:397; Driesbach 1893:262; Driesbach 1894:250). In 1882, agent L.E. Woodin reported, "there is a falling off in the business of native medicine men. There is still much room for improvement in this respect…" (78). The Pawnee still had great faith in their traditional healers and probably even turned to them more often than American doctors in times of great need and despair. The two-year high in Pawnee reliance on rations (1886 and 1887) and overall deaths in this period correspond to a clear desperation in their agent's writing about the presence of tuberculosis, despite a low number of cases reported. In this instance, the recorded cases of tuberculosis are probably unreliably low; however, there is no way to know the real number.

The reported cases of tuberculosis and the reliance on rations begin to decrease again after 1889. However, that year Osborne continued to write about the "yearly

decimation, and now they number only 851, being a loss of 1,375 in thirteen years. This fearful loss is largely due to the existence of constitutional diseases…" (1889:196). The Pawnee population continued to fluctuate throughout the end of the nineteenth century and beginning of the twentieth century (Figure 3.1). Letters from agents continue to report on cases of tuberculosis among the Pawnee (Goodman 1895:264; Driesbach 1897:243). In 1923 there were 49 cases of tuberculosis among the Pawnee, and their agent reported that most of the 14 deaths that year were due to the disease (Hart 1923). Despite their freedom from government rations, the Pawnee seemed to despise farming, refusing to grow food for sale or subsistence, choosing instead to purchase the majority of it. From 1898 to 1900 the Pawnee purchased 80 percent of their food with money from cash annuities and income earned from leasing allotments and in 1902 the figure rose to 96 percent (Sharp 1898, Jensen 1899, 1900; Harvey 1902). Their refusal to integrate as American farmers left them only with the choice to purchase American foods.

By 1922, the allotment program among the Pawnee had finished after 24 years. In the end, 318 families lived on their own farms, mostly in frame houses with wooden floors (Hart 1923) and 83 percent of their original reservation had been carved up into farms and sold. For the most part, the Pawnee had abandoned the camps they had lived in, centered around each other on the reservation (Webb to Woolsey 1895), and were spread widely throughout the area in modern homes with white neighbors (Hart to Burke 1922). This most likely had the effect of constraining tuberculosis infection to close family who were nourished with wheat, beef and pork bought from local stores and traders. Generations born during times of high rations and allotments would have been raised on these foods and probably grown accustomed to and fond of the taste, setting the

stage for their modern diet. The Pawnee were clearly affected to a great degree by their meager diet throughout the end of the nineteenth- and beginning of the twentieth century.

The Omaha and Winnebago

Figure 3.5 provides the correlation between Omaha and Winnebago yearly percentage of subsistence based on government rations (x-axis) and recorded cases of tuberculosis (y-axis) for the years 1879, 1881 to 1889 and 1893 to 1894 (n = 12). Due to the differing percentages of subsistence from rations between the two groups in the years 1880 and 1890 to 1892 (Table 3.2), these 4 years, when the Winnebago received government rations as a small percentage of their diet (10 percent in 1890, and 5 percent from 1890 to 1892; Table 3.2) have been excluded from Figure 3.5.

Since the Omaha and Winnebago derived 0 percent of their subsistence from rations for the selected years, this is not a significant factor in explaining increases in tuberculosis. This scatter plot is somewhat vague because the majority of the tuberculosis figures are recorded jointly. The Omaha and Winnebago were, and are currently, two very different tribes with very different histories. In 1884, George Wilkinson, the agent of the combined Omaha and Winnebago tribes remarked: “The Winnebago are in many respects as different from the Omahas as a Gypsy from a German” (118). It would be more beneficial for the understanding of the relationship between diet and disease if the records of these two different groups had been kept separately. Even though percentage of subsistence from rations is still not a significant factor, both groups had differing environmental circumstances that affected their separate rates of tuberculosis.

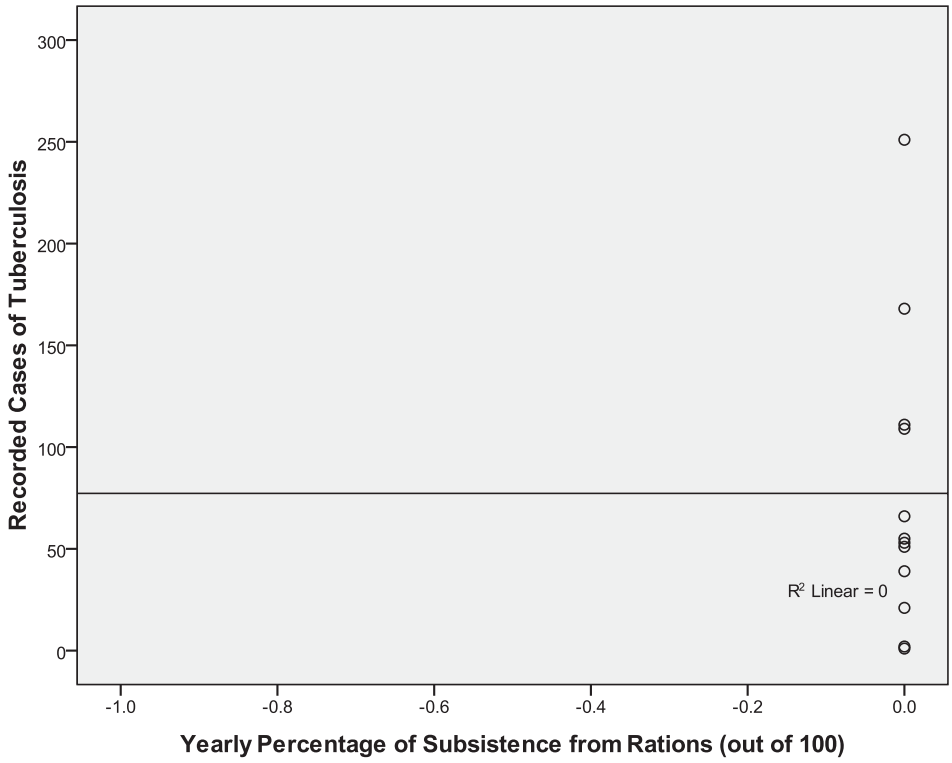

Figure 3.5 Scatter Plot for the correlation between Omaha and Winnebago subsistence (x) and cases of tuberculosis (y) from 1879-1894. r = 0.0, r^2 = 0.0, n = 12.

The *Annual Reports* list cases of tuberculosis for the Omaha and Winnebago separately for only four different years: 1879, 1892, 1893 and 1894. These numbers are represented in Figure 3.6. Before 1879, the agencies were two separate entities and thus information was recorded separately. When the agencies were consolidated in late 1879, statistics were recorded jointly thereafter, but began to be recorded separately again in 1892, for reasons which will be described below. The figures for these four years were added together when calculating the statistics for Figure 3.5, since the majority of Omaha and Winnebago tuberculosis cases are listed together. However, it is clear from Figure 3.6 that in all four years of separately recorded medical statistics, the Winnebago accounted for more than 60 percent of all reported cases of tuberculosis. The cases for these four years were added together in order to understand how they relate to each other.

Of the known, separately recorded cases of tuberculosis among the Omaha and Winnebago, on average the Winnebago accounted 66.2 percent of all cases, as demonstrated below:

Known Winnebago Tuberculosis:
1879 – 68 out of 111 cases, 61.3% of the cases
1892 – 37 out of 60 cases, 61.7% of the cases
1893 – 38 out of 66 cases, 57.6% of the cases
1894 – 43 out of 51 cases, 84.3% of the cases

61.3 + 61.7 + 57.6 + 84.3 = 264.9/4 = 66.225

Average: 66.2% of all cases

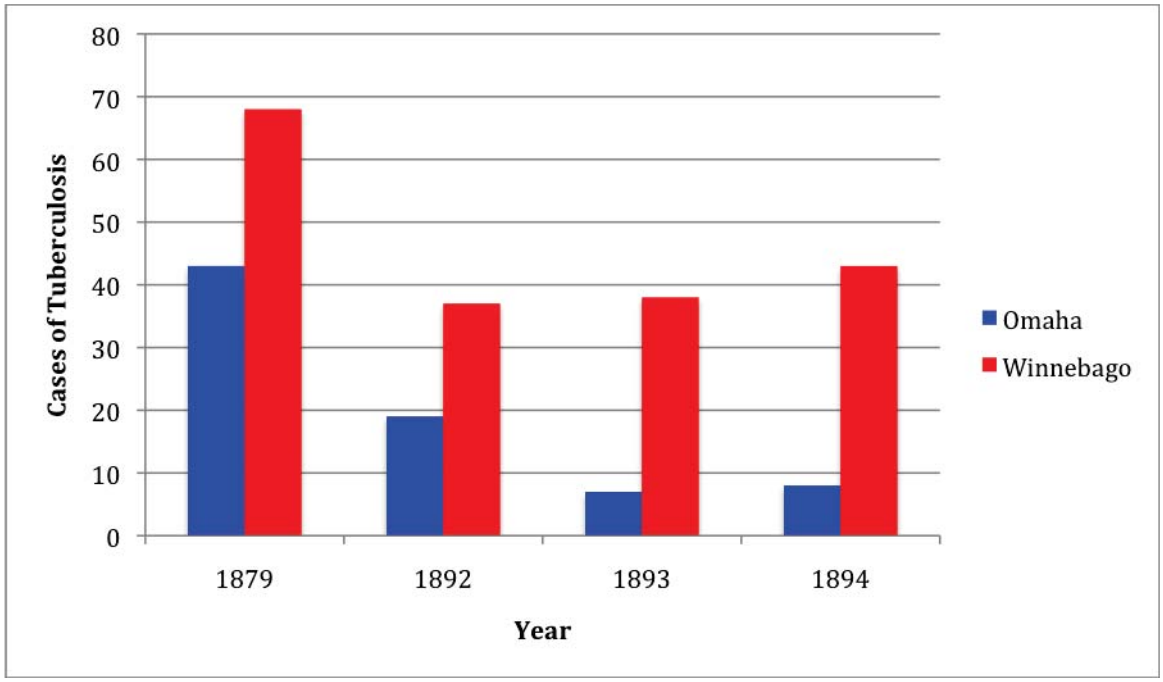

Figure 3.6 Relationship between known, separately recorded cases of tuberculosis among the Omaha and Winnebago for the years 1879, 1892, 1893 and 1894.

In order to understand potentially how the cases of tuberculosis differed for the Omaha and Winnebago from 1879 to 1894, this average of 66.2 percent has been applied to the combined cases of tuberculosis for each year, assuming that, on average, the

Winnebago suffered from more cases of tuberculosis than the Omaha. The subsistence figures from Table 3.2 were then applied to each respective tribe in order to create a separate, more accurate scatter plot for the Omaha and Winnebago to find the relationship between subsistence and tuberculosis. Table 3.4 lists the new, assumed cases of tuberculosis for the Omaha and Winnebago and their respective, corresponding yearly percentage of subsistence from rations figures. The information in Table 3.4 was used to create separate scatter plots, Figure 3.7 and 3.8.

Table 3.4 Combined Yearly Recorded Cases of Tuberculosis for the Omaha and Winnebago and the separate, assumed cases for each, 1879-1894.

Year	**Combined Cases of Tuberculosis**	**Assumed Cases of Omaha Tuberculosis**	**Percent of Diet from Government Rations**	**Assumed Cases of Winnebago Tuberculosis**	**Percent of Diet from Government Rations**
1879	111	43	-	68	-
1880	161	54	-	107	10
1881	168	57	-	111	-
1882	21	7	-	14	-
1883	1	0	-	1	-
1884	2	0	-	2	-
1885	53	18	-	35	-
1886	39	13	-	26	-
1887	55	19	-	36	-
1888	109	37	-	72	-
1889	251	85	-	166	-
1890	85	29	-	56	5
1891	45	15	-	30	5
1892	60	23	-	37	5
1893	66	28	-	38	-
1894	51	8	-	43	-

For the Omaha, the relationship between tuberculosis and percentage of subsistence from rations remains the same in Figure 3.7 as it does the original scatter plot, Figure 3.5. From 1879 to 1894, the Omaha received no documented rations, so this would clearly not affect rates of tuberculosis. However, the assumed cases of tuberculosis

among the Omaha show that if the cases had been recorded separately from that of the Winnebago, they likely would have been much lower than Figure 3.5 suggests. Figure 3.7 is set to the same scale as Figure 3.5 (0 to 300 on the y-axis) and demonstrates more accurately instances of Omaha tuberculosis from 1879 to 1894. The regression line's point on the y-axis, representing the mean of the cases, is much lower in Figure 3.7 (25) than in Figure 3.5 (75). All this points to what, in actuality, was a much lower incidence of tuberculosis than represented in the *Annual Reports*.

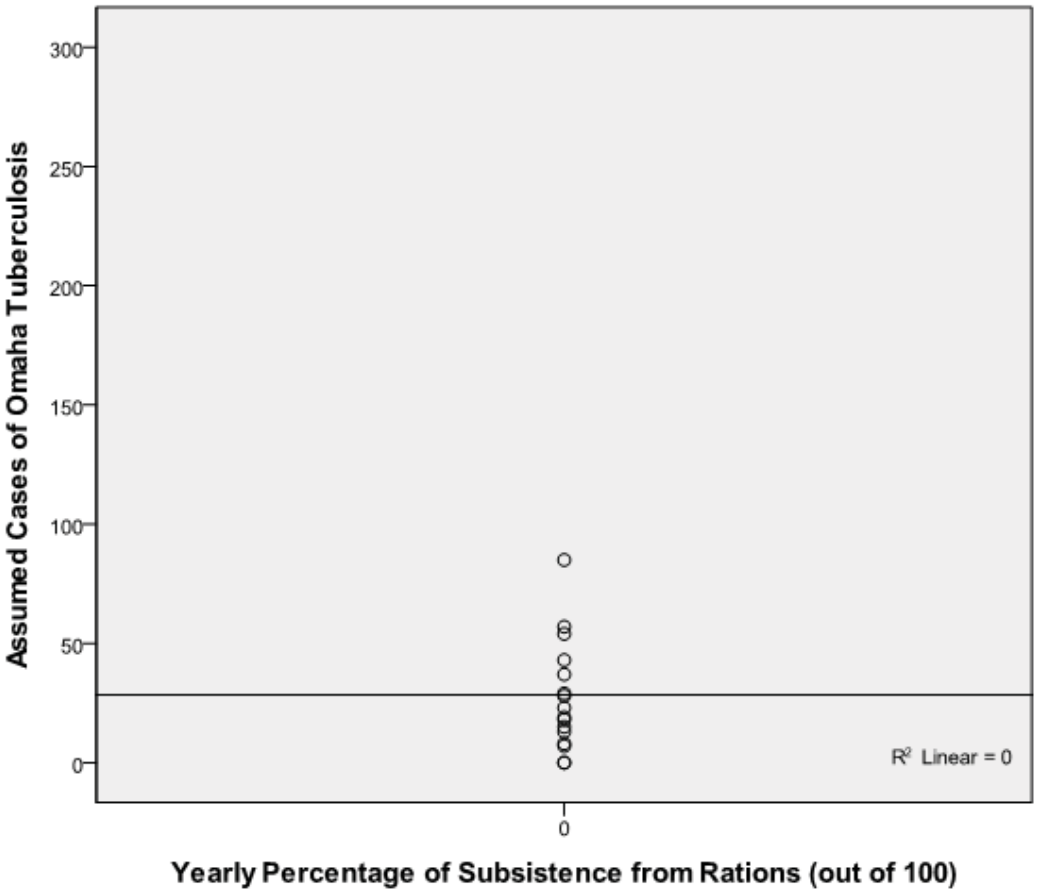

Figure 3.7 Scatter Plot for the correlation between Omaha subsistence (x) and assumed cases of tuberculosis (y) from 1879-1894. $r = 0.0$, $r^2 = 0.0$, $n = 16$.

Although the Omaha received no rations during the period when medical cases were recorded, levels of tuberculosis among the tribe are still high. This means that, for

the most part, diet was not a factor associated with tuberculosis among the Omaha. There were other environmental factors that affected Omaha tuberculosis, and these factors will be discussed below. The Omaha did experience a changing diet in the mid nineteenth century, including the introduction of dairy products, which may have contributed to cases of scrofula among the tribe, especially amongst children.

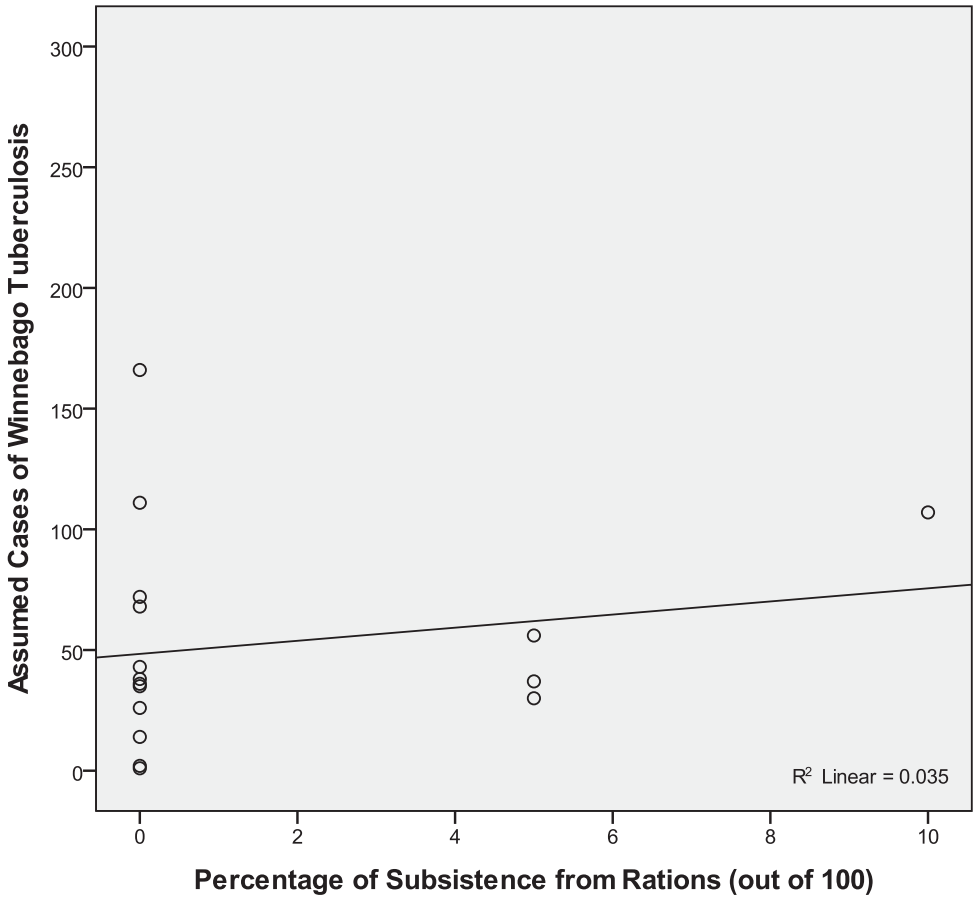

Figure 3.8 Scatter Plot for the correlation between Winnebago subsistence (x) and assumed cases of tuberculosis (y) from 1879-1894. r = 0.187, r^2 = 0.035, n = 16.

For the Winnebago, the assumed cases are much higher, based on the calculation above (Table 3.4). In Figure 3.8, one can see that the number of recorded cases is much higher on average than that of the Omaha. The correlation is not significant (r = 0.187, R^2

= 0.035, n = 16), however the relationship between subsistence based on government rations and cases of tuberculosis is positively associated. Like the original scatter plot of combined cases (Figure 3.5), Figure 3.8 uses the same scale to show how more closely related the assumed cases of Winnebago tuberculosis are to the combined cases. For the years when the numbers cannot be accurately teased apart, the Winnebago likely suffered the majority of cases of tuberculosis. An attempt to prove this is provided below, with explanations from the literature for why this is likely true. It is also the case that some correlation does exist between diet and the high rates of tuberculosis with regard to the Omaha and Winnebago, even in the absence of government rations. Again, written information will be employed to substantiate this claim.

During the 1860s, the Omaha remained fairly self-sufficient and, with smaller population sizes compared with the Pawnee, had a well-established agricultural system that allowed them to rely on good harvests year after year. In fact, they produced such a surplus some years that they were able to share corn and other food with the Winnebago, who began the trip to their new Nebraska home in 1864 and survived on the food provided to them by the Omaha. Although their agricultural pursuits were a success, the Omaha were facing many changes in their traditional diet, like the introduction of wheat as the main dietary staple, planted alone in straight rows, or a monoculture, and the replacement of bison with beef as the herds of this important food source continued to dwindle into extinction. This sudden change, forced upon them by their agents, removed food diversity, largely cut wild fruits and vegetables out their diet, and forced them to begin relying on the US economy for their prosperity (Doughty 1979; White 1983). Despite agricultural success of the tribe, relative to the Pawnee and Winnebago, most

Omaha were still poor, living in earth lodges, located in three villages spaced along a 10 to 15 mile area near Missouri.

The state of the Winnebago in 1865 was dire and Northern Superintendent E.B. Taylor remarked that year in his annual report that there was a "…loss of several hundred of their tribe by starving or freezing…" (410). Until the end of the decade, the Winnebago were kept alive on food kindly provided by the Omaha but the majority of their subsistence was the weekly rations of beef, flour and bacon provided by the government (Denman 1867:262; Janney 1869:332; White 1869:347). Their suffering during this period is apparent from the literature and it is clear that the hardships resulting from constant moves took its toll on the Winnebago people. In 1867, Agent Matthewson wrote: "We now have a physician, who is doing what he can to raise the feeble to health and strength; the few cases now on hand are mostly scrofula of long standing…as they are situated there is little hope of their recovering" (286). Two years later, health problems persisted, summed up by Superintendent Janney: "…the physical and moral condition of [the Winnebago] was far from satisfactory. Diseases of a scrofulous nature are very prevalent among them, arising probably from their uncleanly mode of living in ill-ventilated lodges…it is still deemed necessary to continue the weekly issue of beef and flour" (1869:332).

The difficult journey of the Winnebago had sapped their physical strength, compromising their ability to fight off infection. From 1865 to 1870 they subsisted off surplus Omaha corn (for the first year) and emergency, government rations as they prepared farmland on their new agency to grow crops. In this dismal state, tuberculosis flourished and was probably spread not only among other Winnebago but also their

Omaha neighbors. Meanwhile, the Omaha continued a "growing interest in agriculture," although this was largely based on a "[s]carcity of game, and consequent almost entire failure of their hunts" (Graff 1860:91). In 1869, US military campaigns against the Sioux prevented the Omaha from going on their summer hunts and forced them to use annuity money to purchase cattle for protein. That same year their agent, Edward Painter, wrote, "...there is little disease among the Indians, except scrofula, which prevails to an alarming extent. This is owing…partly to their meager and irregular diet…It is gratifying to find that, with the exception of scrofula, loathsome diseases are scarcely, if at all, found to exist among them" (1869:345). The irregular diet that Painter wrote about was due to the forced sedentism, the increasing eradication of the bison and the limiting of the diversity of the food source. Even though no proper medical records are provided, it clear that the Omaha were suffering from disease due to under- and malnutrition in the 1860s.

Compared to the Pawnee, for the Omaha the 1870s were relatively uneventful. Despite a bought of measles that killed 67 children in 1874 (Gillingham 1874:203), their population continued to rise steadily (Figure 3.1). The Winnebago were improving as well, according to their agent, Howard White, who reported that deaths from consumption were continuing to decrease (1871:449). The Winnebago population fluctuated heavily during the 1870s, but this was probably do to the constant influx and subsequent exodus of Wisconsin Winnebago to and from Nebraska. In 1874, more land was purchased from the Omaha to create a permanent home for the incoming Wisconsin Winnebago, providing the Omaha with more money and the Winnebago with a more crowded reservation. Disease was most likely carried and passed by the incoming Winnebago and it was necessary for the government to provide them with food, which

continued yearly until 1877 (White 1877), although the statistical records do not reflect this (Table 3.2).

The Wisconsin Winnebago were blamed for "retarding civilization" (Bradley 1874:211) and the relationship between the Omaha and Winnebago deteriorated as Winnebago constantly stole Omaha ponies in Nebraska and rode them back to Wisconsin (White 1879:108). Meanwhile, the Omaha were using the income from their sale of land to the Wisconsin Winnebago, along with their annuity money, to improve their farms, schools, agency and most likely, to supplement their diet (White 1874:200). When the bison hunts ended for good in 1878, in order to hold their sacred rituals involved with the hunt, cattle were purchased for the Omaha by the government and slaughtered to take the place of bison. However, this practice was soon ended, as the Omaha's agent saw it as a waste of annuity money (Fletcher and LaFlesche 1972:244). Along with beef, the Omaha increasingly incorporated sugar, flour and coffee, called "black medicine," into their diet. Alice Fletcher and Francis LaFlesche wrote, "unused to depend solely on a diet of grain and not accustomed to the taste of beef, they suffered from the change" (1972:635).

Figure 3.9 is a graph of the recorded yearly number of cases of diseases, including combined cases of tuberculosis, for the Omaha and Winnebago from 1879 to 1894. Figures for diarrhea and dysentery are not available until 1882. Table 3.5 provides a complete list of the yearly-recorded cases of disease. Unlike the Pawnee, who had more significant numbers of diarrhea and dysentery, the Omaha and Winnebago suffered from higher numbers of tuberculosis than enteric diseases (except for the large spike in diarrhea in 1882, for which there is no explanation in the literature). The fewer cases of diarrhea and dysentery among the Omaha and Winnebago likely have to do with the fact

that they were growing and purchasing their own food. Unlike the Pawnee, who were receiving a large percentage of their food from emergency rations (Figure 3.2), the Omaha and Winnebago were less exposed to the poor quality of rations, and therefore exempt from the intestinal problems that went along with consuming them.

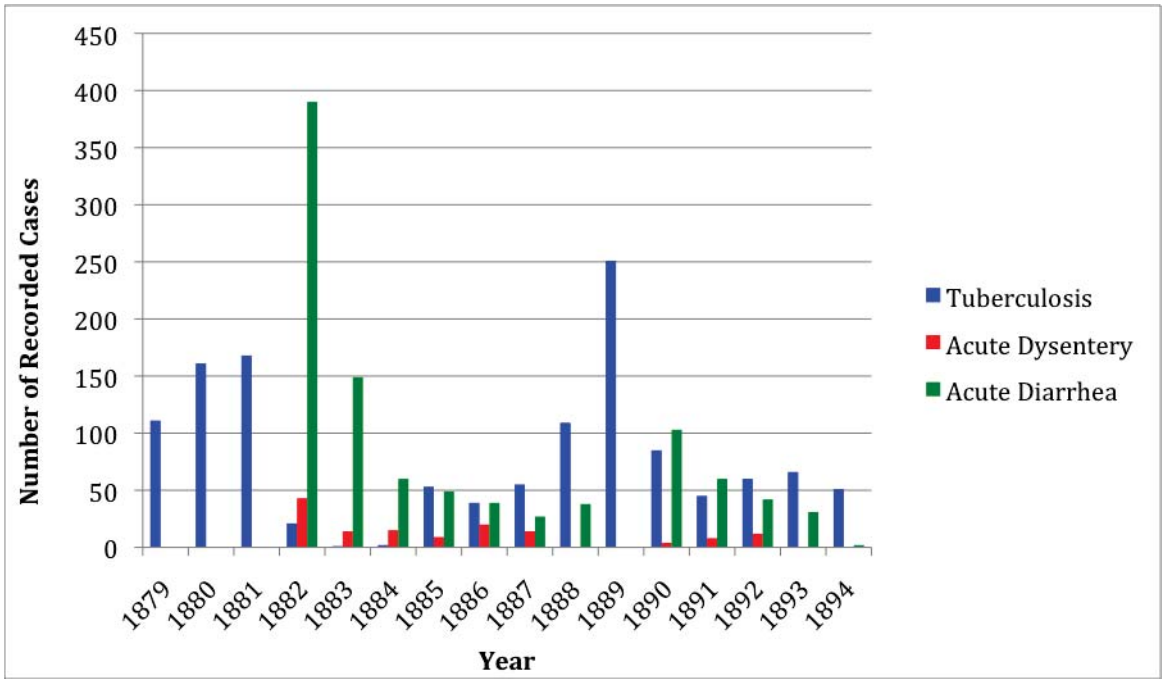

Figure 3.9 Cases of Recorded Illness, including tuberculosis, acute diarrhea, acute dysentery and scurvy, among the Omaha and Winnebago, 1879-1894.
Cases of diarrhea, dysentery and scurvy are only available after 1882

Cases of tuberculosis from 1879 to 1881 are some of the highest in this recorded period, but drop off suddenly in 1882 (Figure 3.9). This is probably due in large part to the allotment of Omaha land, completed in 1882, which moved families into wooden houses on separate parcels of land. These would have been more sanitary, relatively speaking, than earth lodges, which had an interior that received little sunlight, compared to a modern, American frame house and thus would have facilitated the long life of external tuberculosis bacilli. Members of each tribes would also have been spaced farther

apart, since their homes would have been placed on farms and not in villages, cutting down on the ability to spread disease. Cases of tuberculosis rise again dramatically during the years 1888 to 1890. This is most likely due to an epidemic of measles in 1888 among the Omaha, which alone caused the majority of the 87 deaths that year (Warner 1888:168; Liberty 1975:28). The infection started among children in the mission schools and, despite an attempt at quarantine, spread quickly throughout the tribe at large (Warner 1888:168).

Table 3.5 Combined Yearly Recorded Cases of Tuberculosis, Acute Diarrhea, Acute Dysentery and Scurvy for the Omaha and Winnebago, 1879-1894.

Year	**Tuberculosis**	**Acute diarrhea**	**Acute Dysentery**	**Scurvy**
1879	111			
1880	161			
1881	168			
1882	21	390	43	-
1883	1	149	14	-
1884	2	60	15	-
1885	53	49	9	-
1886	39	39	20	-
1887	55	27	14	1
1888	109	38	-	-
1889	251	-	-	-
1890	85	103	4	-
1891	45	60	8	-
1892	60	42	12	-
1893	66	31	-	3
1894	51	2	-	-

Cases of diarrhea, dysentery and scurvy are only available after 1882
Dash (-) indicates no cases recorded
Blank rows indicate no information available

It is unclear whether the Winnebago ere subject to the measles outbreak as well, but due to the sharing of one agency, it is entirely possible the disease was passed across the reservation borders. As mentioned above, tuberculosis is an opportunistic disease and

often appears as a sequel to other epidemics (Dormandy 1999:385). Those who survived the measles epidemic would have come out in a severely immuno-suppressed state. If the survivors had been previously infected with tuberculosis, the disease could take the opportunity of a weakened immune system to attack. This is probably the main reason for the spike in tuberculosis cases in both 1888 and 1889, as symptoms probably lingered for some time while patients recovered.

During this period following allotments, the Omaha and Winnebago were increasing their habit of purchasing food for a majority of their subsistence needs, not growing it. Oral history suggests that Omaha people still kept small gardens of food, but after 1882, both tribes began leasing or selling their allotment lands and houses to white farmers. The agents strongly disapproved of the methods of renting land to whites (Warner 1887:153; Ashley 1891:290), but it was a way for both tribes to make money. As early as 1890, entire farms, including the frame houses, were being leased to white tenants. Agent Robert H. Ashley writes of the Omaha: "The cultivated acreage on the Omaha Reservation has been increased…but this land has almost all been broken by white men under some kind of lease" (1890:139). That same year, in August, the Omaha received 35,000 dollars in annuity payments, bringing the total amount paid out to them since March of 1889 to 70,000 dollars. As for the Winnebago, Ashley states: "The small cash annuity paid to the Winnebago…is wasted or worse. If it is to be paid to them at all it should be during the latter part of the winter, when their other means of subsistence is exhausted" (1890:139). It is unclear what kinds of food the Omaha and Winnebago were purchasing; however, it is likely that it consisted mainly of the readily available flour, beef, pork, coffee, and sugar.

Annuity funds and income from leased land continued to be a huge source of income for the Omaha in 1891. Ashley writes, "During the past fiscal year the Omahas have received from the Government $116,000…they have depended too much upon it. Many have badly neglected their crops…" (290). The Winnebago, who had considerably less money coming in than the Omaha, leased their lands throughout the year and instead lived outdoors in tepees (Stephenson 1891:291; 1892:308; 1893:198; 1897:179). The Winnebago physician, W.J. Stephenson, blames this outdoor lifestyle for the high number of cases of tuberculosis, stating: "I can see a marked difference in the sanitary conditions in favor of those who are located on their allotments, and who have suitable houses" (1891:291), and "…I find the percentage of sickness among those who live on their allotments in a good house much less than those who are not so situated" (1892:308). Increased alcohol consumption by both the Omaha and Winnebago (Ashley 1892:306; Beck 1893:195; Beck 1895:200) would have deprived both groups of money to buy food and served to weaken their immune systems, giving those already infected with tuberculosis a greater risk of developing complications from the disease.

As for the children attending the Omaha Agency School, their diet was not much better. Superintendent of schools, Fred C. Campbell, wrote in 1894: "[The meat] never arrived at the school as early as it should have, and during the warm days of early spring and late fall would frequently be spoiled or tainted when it did arrive…we were seldom able to secure good meat, as the best of meat was furnished the trade and the school was furnished an inferior grade" (190). That same year, at the Winnebago Agency school, their superintendent wrote: "…a majority of the pupils have inherited scrofula and upon becoming well fed the disease shows itself…" (Atkinson 1894:192). It is possible that the

low-grade meat, described by Campbell above, possibly caused these cases of scrofula if the cattle were diseased. The consumption of milk, which was common among children in Indian schools (Campbell 1893:196; Daddario 1992), could also be responsible, if the milk cows had bovine tuberculosis.

Another explanation of the high rate of tuberculosis during the 1890s is offered by Dr. Stephenson in 1892 (308):

> "In studying the mortality in the different classes of Indians I find the death rate very high with returned students from Eastern Schools. A great number of them returned affected with…pulmonary tuberculosis… In view of the fact that so many have died I fear it will be a difficult matter to induce many of the Indians to send their children off to school…I think the hope of the Winnebagoes is in their own industrial school at the agency."

Indeed, both the Omaha and Winnebago had students at the Carlisle School in Carlisle, Pennsylvania and the Hampton Institute in Hampton, Virginia. When these children returned for their summer or intermittent breaks, they would have brought tuberculosis back with them and spread it to their brothers and sisters and parents. The crowded nature of east coast cities and schools would have facilitated the increased exposure and spread of pulmonary tuberculosis among the children, and they would have been vectors for its transport back to Nebraska.

Susan LaFlesche, daughter of Omaha chief Joseph LaFlesche, was the country's first female Native American physician. By 1883 she had returned from the Hampton Institute to the Omaha reservation to teach at the day school there. In August of 1889, Susan began acting as the Omaha agency doctor, making house calls on foot despite her fragile health. Dr. W.J. Stephenson, who was officially the physician for both the Omaha and Winnebago tribes, had an office located on the Winnebago agency, most likely

making it difficult for a large number of sick Omaha people to visit him. Exactly when he began practicing there is unknown, but his reports begin appearing in the *Annual Reports* in 1891 and there is mention of an "agency doctor" on the Winnebago reservation in 1890 (Ashley 1890:140).

In Dr. Stephenson's reports, he refers only to the Winnebago and it is possible that none of the cases of tuberculosis recorded in 1889, 1890 and 1891 include those of the Omaha. Dr LaFlesche writes in 1893 (197), "The Omahas have no Government physician and have called upon me to attend to them during the *last four years* while I worked at the school [my emphasis added]." Medical information for the Omaha began to be recorded separately from that of the Winnebago in 1892, but before this date, with the only doctor located on the Winnebago agency (and Dr. Stephenson's reference to the Winnebago only in his writing), it is unclear whether the statistics from 1889, 1890 and 1891 accurately represent Omaha illness. Eighteen ninety-two is the year that Dr. LaFlesche likely took over as official physician (based on the fact that information began to be recorded separately in 1892), signifying that Dr. LaFlesche's treatment of Omaha patients may not have been included in the official statistics before this date.

LaFlesche possessed an intimate understanding of the Omaha people and their struggles and seemed to understand the deadly combination of poor diet and tuberculosis. She wrote in 1893 (197):

> "…simple food excellently cooked, regular meals and regular hours for retiring, all contribute to and are the main factors in maintaining a good physical condition for our school children…Scrofulous cases receive long and patient treatment...together with all the factors before mentioned will help to ameliorate, if not eradicate entirely from this and future generations, these scrofulous complaints to which our Indians are so subject…Tuberculosis of the lungs seems to be on the increase in our tribe. In the place of wild game, diseased meat, in many cases, and pork…There have been more deaths among adults,

than there have been for many years, most of them being from consumption and three from dissipation."

That same year, 1893, W.J. Stephenson (198), reported that over 37 percent of all Winnebago deaths were due to tuberculosis. Again, he blamed the habit of families abandoning their allotted homes in the winter to live communally in tents in the timbered areas of the reservation. "Two or three families generally occupy one house and often one or more of the inmates has pulmonary tuberculosis…" (Stephenson 1893:198).

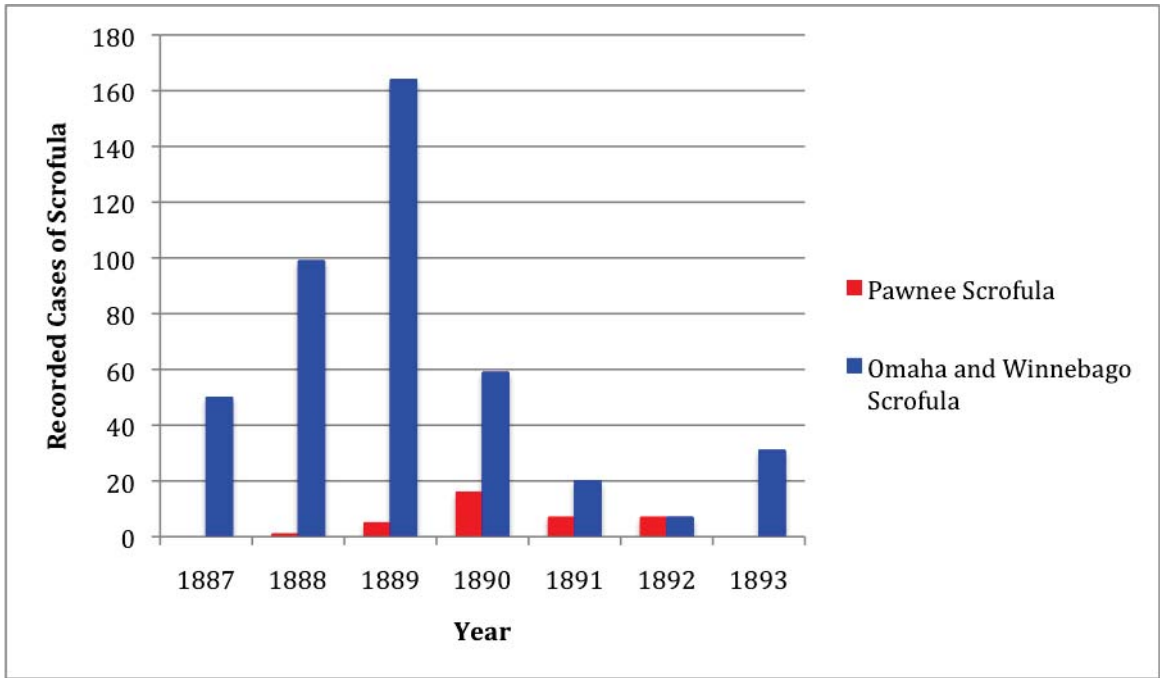

Figure 3.10 Cases of scrofula reported among the Pawnee and the Omaha and Winnebago, 1888-1893.

Another answer to the question of why cases of tuberculosis were so high among the Omaha and Winnebago may be the *type* of tuberculosis they were routinely suffering from. Typically the *Annual Reports* list all cases of tuberculosis as "tuberculosis", whether they are pulmonary or other, but from 1887 to 1893, cases were recorded

separately as “consumption” (pulmonary tuberculosis) and “scrofula” (lymphatic tuberculosis). Figure 3.10 and Table 3.6 enumerate the cases of scrofula from 1888 to 1893, which were recorded jointly for the Omaha and Winnebago (except for 1892 and 1893). Cases of scrofula for the Pawnee are also presented to demonstrate that the prevalence of scrofula was much higher among the Omaha and Winnebago.

Table 3.6 Separately Recorded Cases of Scrofula and Consumption among the Pawnee and the Omaha and Winnebago, 1888-1893.

Year	**Tribe**	**Scrofula**	**Consumption**	**Scrofula (School)**	**Consumption (School)**
1887	Pawnee	-	9		
	Omaha Winnebago	50	5		
1888	Pawnee	1	23		
	Omaha Winnebago	99	10		
1889	Pawnee	5	15		
	Omaha Winnebago	164	87		
1890	Pawnee	16	9	7	-
	Omaha Winnebago	59	14	7	2
1891	Pawnee	7	5	1	-
	Omaha Winnebago	20	5	19	1
1892	Pawnee	7	7	3	2
	Omaha	7	12	16	-
	Winnebago	22	15	5	1
1893	Pawnee	-	3	-	3
	Omaha	3	4	11	1
	Winnebago	28	10	2	2

Blank rows indicate no information available
Dashes (-) indicated zero (0) recorded case

Table 3.6 presents cases of both scrofula and consumption from 1888 to 1893, indicating that a majority of the available data suggests that Omaha and Winnebago had higher rates of scrofula and the Pawnee had higher rates of consumption. Cases of

scrofula and consumption from each tribe's agency school are also included to demonstrate that, as mentioned above, children were more exposed to unpasteurized milk and dairy products, and therefore more likely to contract scrofula. The tuberculosis bacilli has a high tolerance for heat and therefore dairy, or other products, have to be heated at high temperatures in order to destroy the bacteria. The introduction of High Temperature/Short Time (HTST) or Flash pasteurization in the 1960s and '70s, which heat liquids to 72 degrees Celsius (or 161 degrees Fahrenheit), successfully kills the tuberculosis bacilli in 15 seconds (BAMN 2010). However, these methods were unavailable at the time, and therefore infected milk was likely to spread the disease.

One explanation for the higher numbers of scrofula among the Omaha is that they had a longer and more intense exposure to cattle compared to the Pawnee. From the year 1865 to 1899, the Omaha had an average of 280 on their reservation at all times, while the Pawnee had an average of 173 and the Winnebago, an average of only 128 cattle. Table 3.7 provides a complete list of cattle owned by the Pawnee, Omaha and Winnebago during this period, according to the *Annual Reports*.

Table 3.7 Cattle owned by the Pawnee, Omaha and Winnebago, 1865-1899.

Year	**Pawnee**	**Omaha**	**Winnebago**
1865	0	200	0
1866	0	175	25
1867	6	90	134
1869	5	200	8
1871	0	200	8
1872	4	200	80
1874	8	175	59
1875	10	75	48
1876	15	75	4
1877	10	80	62
1878	4	34	85
1879	100	158	70
1880	120	166	100

Year	Pawnee	Omaha	Winnebago
1881	0	300	200
1882	200	450	100
1883	200	600	100
1884	250	700	100
1885	300	225	100
1886	380	40	26
1887	575	40	125
1888	550	400	175
1889	600	400	200
1890	418	638	462
1891	300	640	500
1892	275	250	300
1893	350	300	100
1894	400	300	100
1895	50	100	350
1897	69	375	150
1898	81	500	150
1899	97	600	100

Mycobacterium bovis, or the cattle form of tuberculosis, is associated with the inflammation of lymph nodes and typically does not spread to other organs of the body (Stead et al. 1995:1268). The exception is if bovine tuberculosis is transmitted through the cow's milk or meat, which could allow it to spread to the intestines. Since the Omaha had closer proximity to more cattle in this 35-year period, they not only would have been more susceptible to airborne bovine tuberculosis, but would have been more likely to have consumed tainted meat or, more likely, dairy products such as milk, cheese or butter. It is clear from the data and the literature (Matthewson 1867:286; Janney 1869:332; Painter 1869:345; Stephenson 1891:291; LaFlesche 1893:197; Atkinson 1894:192; Campbell 1895:202) that the Omaha and Winnebago suffered more from scrofula than consumption and this most likely had to do with their proximity to cattle and their particular diet.

As with the Pawnee, after 1894, all statistical information concerning the health of the Omaha and Winnebago disappears from the *Annual Reports*. Leasing of land continued, as evidenced by Agent Beck in 1895, who stated: "Nearly all the Omahas have leased their lands…" and instead of farming "…they find it easier to obtain money by leasing their lands…" (199-200). Of the Winnebago, Dr. Stephenson writes: "The system now in vogue of leasing an Indian's entire allotment, including in many cases his comfortable house…[to] live in tepees or huts" (1897:179). Tuberculosis among the Winnebago continues to be discussed in the literature, whereas mention of it among the Omaha drops off, with the exception of a remark about scrofula among Omaha children by Superintendent Campbell in 1895 (202). In 1897, Dr. Stephenson's tone became considerably dark and disturbing when discussing the Winnebago: "The prevailing disease is tuberculosis, which is slowly but surely solving the Indian problem… (179)."

In 1899, Agent Charles P. Matthewson wrote: "The number of [Winnebago] deaths is quite large…The prevailing disease is tuberculosis, which is a great scourge of the people." Another measles outbreak among the Omaha that year contributed 50 of the 90 total fatalities (Liberty 1975:228). This is the highest, single-year death rate up until this time in the recorded history of the Omaha (Table 3.1). The Winnebago also suffered 78 deaths in 1899, as evidenced by Agent Matthewson's remarks above. It is probable that tuberculosis rates were high in both 1899 and 1900 due to the measles outbreak; however, statistical information concerning these numbers is unavailable.

A study in the early twentieth century by Margaret Koenig (1921) showed that from 1909 to 1919 the Winnebago mortality rate from tuberculosis was 11.7 deaths per 1,000 population. The rate during this ten-year period for the US as a whole was 1.4

deaths from tuberculosis per 1,000 population. Six years later, in 1925, the combined mortality rate from tuberculosis for both the Omaha and Winnebago was 6.9 deaths per 1,000 population, while for the country as a whole it was 0.3 per 1,000 population (Meriam 1928:202). Whether this decrease in mortality in six years was due to better conditions among the Winnebago, or to lower rates of tuberculosis mortality among the Omaha being factored in, is unknown. It was most likely a combination of these two factors; however, the country was still 22 years away from an effective tuberculosis vaccine and it would have been remarkable if sanitary conditions and nutrition improved so drastically among the Winnebago in such a short amount of time.

While the Omaha clearly suffered from high number of tuberculosis, the majority of the cases likely belonged to the Winnebago, who had a hard existence, probably on par with that of the Pawnee, in the late nineteenth century. The high number of cases that existed among the Omaha alone were due in part to measles epidemics that severely weakened immune systems, children contracting consumption in Eastern schools and bringing it back to Nebraska, exposure to potentially infected cattle and milk products, demonstrated by high numbers of scrofula, and the shift in diet from traditional foods to increasing store-bought items that make up the current Omaha diet (Miewald 1995).

FOUR: Discussion

As important as the *Annual Report of the Commissioner of Indian Affairs to the Secretary of the Interior* is to this research, as a primary document, it presents some problems. Neither the statistics provided nor the yearly reports alone are adequate to describe the condition of the Pawnee, Omaha and Winnebago in the last half of the nineteenth century. The numbers and the written accounts often provide contradictory information, as in the case of the Pawnee, where the 26 cases of tuberculosis recorded in 1886 conflicts with their agent's statement that two-thirds of a tribe of 998 people were afflicted with tuberculosis (Scott 1886:137). Though it is possible that the written accounts were exaggerated, the numbers have the potential of being skewed one way or the other. Since records of agency physicians are provided only from 1879 through 1894, it is hard to get a concrete idea of long-term disease dispersal from a mere 16-year snapshot. The constant turnover of agents also lead to a disconnect of conditions from one year to the next, often with agents denying any responsibility for the state of the people they were working with.

The voices of Native Americans themselves—the average Pawnee, Omaha or Winnebago man, woman or child—are scarcely, if ever, included in the annual reports or primary documents elsewhere. This is, of course, a casualty of historical circumstances and one enters the field of Native American study knowing that there is no such thing as a written, pre-Columbian record and that the best information available often is European, or early American, in origin. It is, therefore, difficult to try and build a Native American narrative through the accounts of government employees, who often had

antagonistic relationships with the people they were meant to work with. It is through this modern understanding, or perhaps bias, that these historical accounts are viewed as skeptically as possible and is why both the literature and figures have been provided to try and provide the most accurate, detail available.

In an attempt to calculate death rates from tuberculosis for Native American people as a whole in the late nineteenth- and early twentieth century, a number of inconsistencies were discovered. Table 4.1 presents the number of deaths from tuberculosis per 1,000 population for Whites, Native Americans and the United States as a whole for the years 1880, 1890 and 1900. These figures have been calculated from information provided in the Tenth, Eleventh and Twelfth US Censes, specifically, the Mortality and Vital Statistics volumes produced in each of those years. These statistics; including total population, deaths, and deaths from tuberculosis for each group, were calculated using only the figures provided in these volumes, in their respective years, because separate censes from the same year and subsequent volumes from later decades provide conflicting numbers. For instance, the Twelfth Census from 1900 provided new numbers for Native American populations in 1890 that were not included in the 1890 Census. Therefore, only the information provided during the same year has been used in these calculations.

Table 4.1 Number of deaths from tuberculosis per 1,000 population for Native Americans, Whites and the US as a whole for the years 1880, 1890 and 1900.

Year	**US**	**White**	**Native American**
1880	1.92	2.39	8.21
1890	1.7	1.58	7.40
1900	1.44	1.31	5.06

The *Annual Reports* also provide similar statistics; total Indian deaths from tuberculosis as compared to the total population for the years 1888 to 1894 (excluding 1892). Table 4.2 provides the death rate per 1,000 population for the six-year period, provided by the yearly statistical charts at the end of each *Annual Report*. These figures are clearly different from those provided by the US Census in Table 4.1, but which of these provides a more accurate representation is problematic. Not only does each provide drastically different population numbers, but also overall death from tuberculosis numbers are different. Part of the problem may lie in each document's definition of the term "Native American." The *Annual Reports* exclude Alaska Natives; however, their overall population statistics for Native Americans is much higher. On the other hand, the US Census often has categories that only include "Civilized Indians," which is clearly a subjective, ethnocentric description, subject to differing interpretation. Similarly, death records in the Census are from hospitals throughout the country whereas those provided in the *Annual Reports* are most likely from agency physicians only.

Table 4.2 Total Native American population, total deaths from tuberculosis and annual deaths from tuberculosis per 1,000 population, 1888-1894.

Year	**Total Native American Population (Excluding Alaska Natives)**	**Total Deaths from Tuberculosis**	**Deaths per 1,000 population**
1888	246,036	623	2.53
1889	250,483	680	2.71
1890	243,534	558	2.29
1891	246,834	487	1.97
1892	248,340		
1893	249,366	483	1.94
1894	251,901	551	2.19

Total deaths from tuberculosis data not available for 1894

Native American deaths per 1,000 population, as provided by the *Annual Reports*, appear closer to the death rate per 1,000 for white Americans, provided by the census data in Table 4.1. Particularly disconcerting is the difference between Table 4.1 and Table 4.2 in deaths from tuberculosis per 1,000 population in 1890. Each document provides starkly different numbers: the *Annual Reports* suggest that deaths from tuberculosis were fairly low (Table 4.2), whereas census data suggests that tuberculosis was much more prevalent (Table 4.1). Since the same government produced both sets of data, although from different departments, the accuracy of each is impossible to determine. This is one of the serious problems of relying on historical data, even if it is the best information available. The purpose of providing both statistical accounts of tuberculosis and the literature of the time was to try to weed out inaccuracies and find the balancing point between the numbers and the words.

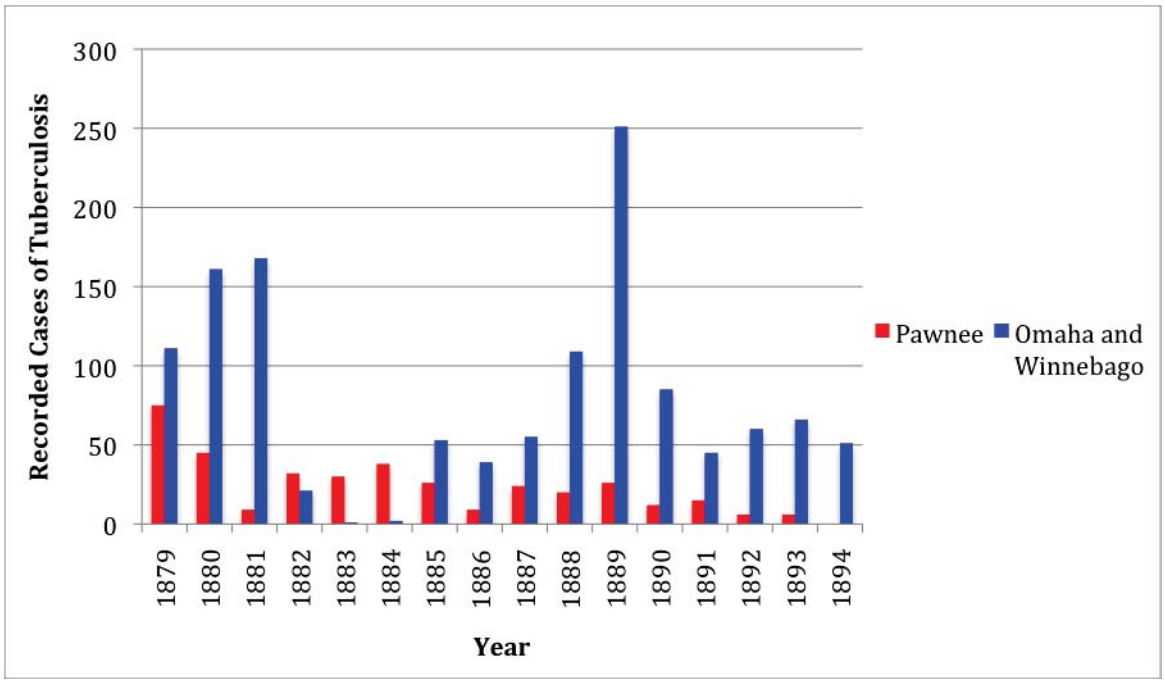

Figure 4.1 Graph comparing the reported cases of tuberculosis of the Pawnee and the Omaha and Winnebago, 1879-1894.

As important as diet and nutrition are in the history of tuberculosis among Native Americans, it is not the only factor. Figure 4.1 compares the incidence of cases of tuberculosis among the Pawnee, and the Omaha and Winnebago. The consistently higher number of cases for the Omaha and Winnebago is less attributable to diet; however, as explained above, the literature provides evidence that diet was involved more than the data suggests. The variable consumption of dairy products, the purchasing of food from white traders, and other factors, such as measles epidemics all had some influence on the greater number of cases of Omaha and Winnebago tuberculosis. By the 1880s, the combined population of the Omaha and Winnebago was more than twice that of the Pawnee (Table 3.1). This greater number of people also suggests more crowded conditions on reservations.

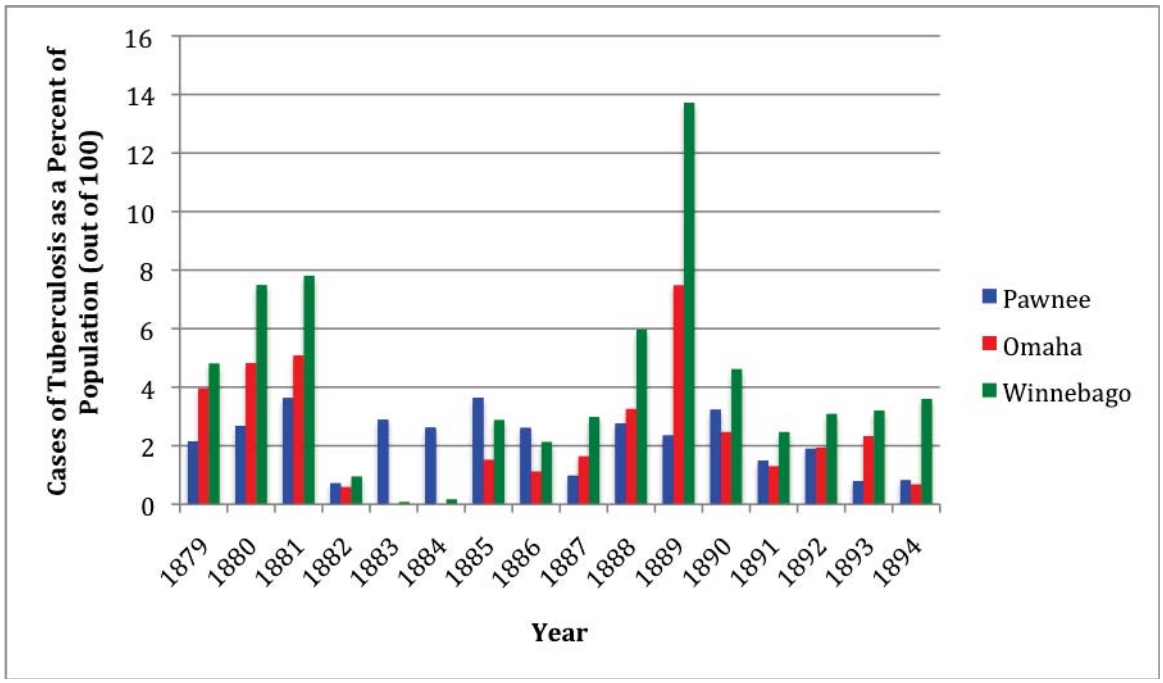

Figure 4.2 Graph comparing the reported cases of tuberculosis of the Pawnee, Omaha and Winnebago as percentages of their respective populations, 1879-1894.

Analyzing the data generated when attempting to tease apart the number of assumed cases of tuberculosis grouped between the Omaha and Winnebago, it becomes clear that tuberculosis among the Winnebago account for the majority of the cases. Figure 4.2 presents yearly cases of tuberculosis as percentages of Pawnee, Omaha and Winnebago populations. For each year, cases were assumed to represent one person in each, individual population. Using the population numbers provided in Table 3.1 and the cases of tuberculosis for each, separate tribe (the assumed number of cases, from Table 3.4, are used for the Omaha and Winnebago), a yearly percentage of each population's tuberculosis rate was generated. Among the three tribes, a majority of the time (80 percent), the Winnebago had the highest percentage of population with cases of tuberculosis. Among the Omaha and Pawnee, the numbers are generally lower and the cases are split evenly between them.

The drop in population of Pawnee people in the late nineteenth century (Figure 3.1) suggests that tuberculosis was a serious problem among the tribe. Their most precipitous drop, from 1864 to 1876, was a result of failed crops, Lakota attacks and their journey to Indian Territory. However, after 1876 their population continued to decline steadily, dropping from 1521 people in 1877 to 650 people in 1900. The Omaha population gradually, but steadily, rose from 1864 to 1900 and the Winnebago, despite high fluctuations in the twenty years after their move to Nebraska, eventually evened out starting in 1884 and lasting until the end of the century (Figure 3.1). Despite the high numbers of tuberculosis among the Omaha and Winnebago, tuberculosis likely contributed to more deaths among the Pawnee. As discussed above, some of the recorded cases of Pawnee tuberculosis were likely higher than what was recorded and the literature

and population decline suggests that there is truth to this claim. Whether the Pawnee went to the doctor less, or whether they had worse conditions on their Oklahoma reservation in which to recover, is unknown. However, the staggering death rate of the Pawnee, as compared to the Omaha and Winnebago, is an indication that there were factors that the numbers alone cannot provide answers to.

Crowding in densely packed earth lodge villages on reservations was probably the most important contributing environmental factor to the spread of tuberculosis. Since it is a communicable, respiratory disease passed through the air, around 1,000 people per tribe living in a relatively small space would have exacerbated any infectious disease. Instead of villages spread out widely across the plains, like in the pre-reservation days, the Pawnee, Omaha and Winnebago were clustered together and strongly encouraged not to leave the reservation. The biannual hunts, which saw constant movement and dissembling of living quarters daily, provided fluidity in terms of the establishment of microbes and bacteria in certain areas. Since tuberculosis is often spread in dark, confined areas (Harries et al. 2004:24) regular movement probably helped to cut down on the communicability of disease.

Indian agents and physicians often cited poor sanitation and the particular social habits of Indians, like living in close-knit villages, as the main cause of disease (Guthrie 1929: 947; Barsh 1990: 222, 244). The traditional earth lodge received much opprobrium for allowing the incubation of disease, and the agents and physicians must have really stressed this among the Pawnee, because in order to keep “sickness” out, women would constantly sweep the earthen floor to drive out any germs that might be present (Blaine 1929:19). At the manual labor schools, children often slept together in one confined area,

with no quarantine space for sick children, making the spread of disease inevitable (Valentine 1908:3; Burke 1925:8; Lewis 1928:192). These living conditions were similar to poor, white Americans living in crowded cities. Since many people lived in close quarters in houses compared to the outdoors, and since tuberculosis bacteria can live longer in places hidden from direct sunlight, homes, especially earth lodges, or other confined areas would be the best place for the disease to spread. Earth lodges would probably have also spread disease in pre-Columbian times, but due to the absence of virulent tuberculosis and other epidemic diseases, they would not have been such a fertile source for the spread of deadly illness.

For the Omaha, cases of tuberculosis begin to decline after 1882 when the allotment process was completed (Figure 4.2). The exception is 1888 when a measles epidemics swept through the tribe, as mentioned above, killing 87 people in one year. For those who survived the epidemic and were recovering in 1889, tuberculosis most likely took the opportunity to spread, which is why the cases of tuberculosis are high in 1889 and then decline in 1890 and after. The leasing of land, practiced by the Omaha and Winnebago, meant that most did not stay isolated on their lots, in their frame houses, but probably spent a lot of time in tents and tepees with two or more families in a community-style arrangement. This would have allowed tuberculosis to spread from family to family instead of keeping it quarantined in individual houses. Another reason for the large number of cases of tuberculosis reported among the Omaha and Winnebago could have been due to their increasing reliance on agency physicians instead of traditional doctors. In 1882, Omaha and Winnebago Agent George Wilkinson wrote, "The physician is kept very busy, but that is more because of an increasing faith in the

white man's medicine and mode of treatment than increase in disease. When the Indian learns to eat healthy food in proper quantities he will be more healthy, for most of his diseases are from insufficient nourishment" (113).

Unfortunately, medical evidence only exists after 1879 and before 1894, but the literature continues to convey how tuberculosis was a scourge among the Pawnee, Omaha and Winnebago (Goodman 1895:264; Driesbach 1897:243; Stephenson 1897:79; Matthewson 1899:232) and for Native Americans in general (Leupp 1908:24; Valentine 1909:2; Burke 1923:5; Burke 1924:1; Meriam 1928:193; Nichols 1949:356). Along with crowded conditions, the lack of indoor, running water; overall poor sanitary conditions could have also contributed to the spread of disease. Although their new home in Indian Territory was often lauded for being an excellent environment (Scott 1885:95; Scott 1886:137; Osborne 1887:918), for the Pawnee, a sudden shift to a new and more crowded environment could have taken a toll on their health. They were introduced to new diseases, like malaria (Scott 1885:95) and the warmer, more humid environment could have also facilitated the incubation of disease. Unsuitable drinking water was also blamed in the case of the Pawnee as a "fertile source of sickness" (Phillips 1890:197) and the sharing of resources, like drinking cups, first brought up by Omaha physician Dr. Susan LaFlesche in 1893 (197), was blamed for the spreading of diseases (Barsh 1990:244).

Lifestyle is another big piece of the puzzle. Following the breakdown of traditional patterns of life, Native Americans on reservations fell into dependent poverty and became reliant on the government for life's very essentials (Anders 1980:691). Evert Hagen (in Anders 1980:688) refers to Native Americans on reservations in a position of "hostile dependence," which refers to a state of psychological emergency stemming from

a destruction of ethnic religion and traditions. Resulting increased alcohol consumption among members of all three tribes (Ashley 1892:306; Beck 1893:195; Beck 1895: 200; Woolsey 1895:262; Sharp 1898:245-6; Jensen 1899:300) could have contributed to the deterioration of the immune system, allowing the tuberculosis bacteria, if already in a person's body, to spread rapidly. Changes in household economics (Ashley 1890:139; Ashley 1891:290; Beck 1893:195; Mercer 1897:179) and a reorganization of the sexual division of labor (Warner 1887:153; Fletcher and LaFlesche 1972:244, 627) on reservations forced men to do traditionally women's work, like farming, and forced women to stay indoors to do all the cooking, cleaning and other domestic chores.

The overall destruction of traditional ways of everyday life (Warner 1887:153; Campbell 1895:201; Beck 1895:190; Webb 1898:247; Fletcher and LaFlesche 1972:309, 614, 636) could also have contributed to the spread of disease. Depression, anxiety and stress can affect the body's resistance to disease, lowering the immune system's response to foreign bacteria (Adler and Cohen 1975; Cohen and Williamson 1994). The agents' attempts to end rituals and traditional ways of life on Omaha, Winnebago and Pawnee reservations (Scott 1884:85; Wood 1891:359; Wood 1892:396; Campbell 1895:201) had serious, emotionally damaging effects, allowing infection to take hold in weakened bodies. Agents recorded at least one Pawnee suicide each year from 1891 to 1893, although the exact details behind these deaths are unavailable. Omaha agent, Jesse F. Warner, wrote in 1887, "It is true that some of the old fellows weep over the olden times of agents, rations, annuities, and buffalo, etc., while some cranks roam about the country with tales of woe for willing ears. If these complainers would return to their weed-grown

farms and set an example of thrift to others, they might be of benefit to some who, like themselves, are too lazy to work" (153).

This feeling of helplessness and overwhelming sadness should not have been taken as lightly as Agent Warner suggests, but rather viewed as a serious obstacle in the battle against disease and alcohol use that was prolific on reservations at the time. As stated in the Introduction, the body quickly and efficiently maintains most cases of pulmonary tuberculosis while the infection is still localized in the lung, preventing its spread to other organs of the body. However, as the body grows older and immunity weakens because of disease, depression, poor diet or simply as a result of aging, the bacteria spread. All these factors at work on the old, and young, of the Pawnee, Omaha and Winnebago tribes could have weakened their natural resistance to fighting off an infection that they had been exposed to years earlier when they were healthy, but was only being expressed in light of other, external factors.

In the twentieth century, the *Annual Reports* suffer from a dearth of information and are merely quick summaries of all American Indians groups, making sweeping generalizations about health and diet. Therefore, there is very little in them about the problem of diabetes, which is acknowledged as becoming a problem only after World War II. What is clear from the later editions of the *Annual Reports* (1894; 1898; 1899; 1909) is that a diet of flour, beef, pork, sugar and coffee continued among the Pawnee, Omaha, Winnebago and Native Americans in general, and it seems that by the twentieth century, most American Indians had already become accustomed to eating a Western diet and had a particular taste for it (Meriam 1928:221; Miewald 1995:98). Proper nutrition amongst Native American children continued to be addressed as a serious problem in the

early twentieth century (Goodman 1895:264; Valentine 1908:3; Burke 1925:8; Meriam 1928; Rhoads 1930:4; Rhoads 1932:10) and it is possible that this dependence on Western food began to lay the foundation for diabetes among Native Americans. The case of diabetes differs from tuberculosis in that it has only become known among Indians since World War II and was not considered of epidemic proportions until the 1960s and 1970s (Brosseau 1994:46). Many believe that American Indians are genetically prone to develop diabetes; that they have a diabetic pre-condition that is aggravated by the Western diet (Miewald 1995:78; Ferreira 2006:77).

The shift from traditional, lean bison meat to grain-fed beef and pork in the nineteenth century could be a major contributor to modern Native American health issues. After 1875, commercial cattle were typically finished on Midwestern corn, leading the grain-fed stock to be higher in saturated fat and sugar content than lean, grass-fed bison (Barsh 1990:109, 112). The caloric difference between the two meat sources is also staggering: bison meat is estimated at around 120-30 calories per 100 grams, whereas grain-fed cattle are estimated at 230 calories per 100 grams (Barsh 1990:106). Also, the collection of wild foods and tubers by the Omaha, Winnebago and Pawnee; like Indian potatoes, groundnuts, sand cherries, wild rice and gooseberries were much harder to come by when land was allotted and life became sedentary (Fletcher and LaFlesche 1972:314; Wishart 1994:24; Miewald 1999:83). These natural wild foods were increasingly replaced with white potatoes, spring wheat and sugar from sorghum, all which have different carbohydrate properties than wild, gathered foods (Miewald 1999:79). Although traditional foods were still high in carbohydrates, they were complex carbohydrates and therefore slowly digested (Thorburn 1987:96-7; Hug 1994:293).

Children in schools were forced to eat whatever was given to them, allowing them to develop a taste at an early age for the new, sweeter, fatter Western diet (Meriam 1928:327).

For the Omaha today, Non-Insulin Dependent Diabetes Mellitus (NIDDM), or type II diabetes, affects about 35% of their population and among all Indigenous Americans and Alaskan Natives, the numbers from 2008 of those diagnosed with either type I or type II diabetes is 16.3%. Specific studies of diabetes among the Pawnee and Winnebago have not been done; however, the official newsletter of the Pawnee Nation, *Chaticks Si Chaticks* (2011), runs several articles about diabetes prevention and information about the disease, suggesting that it probably exists to a fair extent among the tribe. Rapid introduction of Western food among the three tribes, and indigenous groups worldwide, mostly provided during emergency food shortages, may not have given native biology enough time to catch up to the digestion of the new, refined foods (Hug 1994:293). Socio-cultural stress and environmental change have been linked with rising rates of diabetes among the Omaha and studies have found that individuals who show strong connections with culture and respect for their ancestral past have maintained more significant control of their diabetes (Penn-Kennedy and Barber 1995:67, 73).

Theoretically, this is highlighted by the discordance hypothesis in evolutionary medicine. The discordance hypothesis looks at contemporary illness in society as a result of incompatibilities, or discordances, between the environment in which humans evolved and the one that they currently occupy (Trevathan, Smith and McKenna 2008). In other words, cultural evolution is much faster than biological evolution, and the catch-up is too intense for our genes (Cheyney 2011). While some scholars of American Indian history

and culture conclude that the presence of a genetic predisposition to diabetes exists (Ferreira 2006:77; Miewald 1995:78; Schultz et al. 2008:1870), they also agree that diet and lifestyle change are major contributing factors. The concept of the "thrifty genotype," presented by geneticist James V. Neel (1962), emphasized the body's inability to handle recent changes in diet, due to the absence of refined carbohydrates, sugar, salt and saturated fat from the diet of our human ancestors. This would be an excellent example of genetic responsibility for diabetes, but the author has since revised the theory, basing it more on environmental, than genetic, factors (Neel 1989).

A more recent theory, proposed by Barker (2004), called the "thrifty phenotype," points to nutrient deficiencies during the fetal stages of development, which can orient a body towards metabolic thriftiness in what it assumes will be a micronutrient-deprived environment. However, when the child is born into an environment full of high calorie foods, the chance of developing cardiovascular disease, obesity and diabetes increases. A study by Yajnik and Desmukh (2008) among babies in India who had stark nutritional differences in their intrauterine environment and their post-natal environment developed a much greater risk for what the authors call a "biphasic nutritional insult." Smaller babies in the study were at greater risk for obesity and diabetes as young adults, because their skinniness at birth meant the mother had inadvertently created an environment inside the uterus that informed the fetus that food was hard to come by. This threw proper levels of blood sugar, serotonin (which regulates hunger) and insulin production out of whack when introduced into an environment with plenty of calorie-rich foods. Both the genotype and phenotype theories emphasize a sudden change in diet, especially from a

traditional to a Western diet, and the problems that occur when scarce food items are suddenly made readily available.

The work of Caroline Smith-Morris (2004) and Schultz et al. (2006) among the Pima people of the American southwest shows that they have the highest rate of type II diabetes among all Native Americans, with 38 percent of all adults suffering from the disease. Both authors admit that genetic predetermination might be the proximate cause, but the ultimate causes are the Pima reliance on a Western diet and a highly sedentary lifestyle. Of the Pima people living across the border in Mexico, who retained their dietary and farming traditions, only 7 percent of adults are afflicted with type II diabetes. This enormous difference in health between two political divisions of the same population seems to clearly point to external, environmental factors as the major contributor to prevalence of diabetes. Just as Dr. Hrdlička pointed out in 1909 (6), rates of tuberculosis among Indian groups in Mexico and the Unites States were likewise dramatically different, with Mexican Indians showing less infection than those Indians surrounded by white Americans. Almost one hundred years later, it seems the same situation is occurring, only now the disease in question is diabetes and again, the answer is being sought in genetics, rather than obvious cultural and dietary differences.

Interestingly, one can find similar remarks about genetic determinism among the Indian agents writing in the *Annual Reports* about the supposedly inherited traits that caused the Pawnee, Omaha and Winnebago to suffer from tuberculosis. The agents write about the Pawnee's "consumptive taint" (Scott 1886:137) and "hereditary and constitutional complaints which weaken their powers of resistance" (Scott 1885:95). Even the agency physicians believed heredity was to blame. The Pawnee physician, C.W.

Driesbach writes that the Pawnee were a "people possessing, as they do, constitutions of low vitality" (1894:249) and the Winnebago physician, J.W. Stephenson, believed that the high number of deaths from tuberculosis in 1893 (up to 37 percent) were due to, "Heredity, bad food…and very imperfect ventilation" (198). Heredity, of course, was emphasized over the other, more likely explanations.

Tuberculosis became so common that its presence was often glossed over in letters to the Commissioner, as when Dr. Driesbach wrote in 1893, "With the exception of the usual number of scrofulous and tubercular trouble…there are now no prevailing diseases worthy of note" (262). The lack of understanding amongst agents and doctors alike helped solidify the popular notion that Indians merely had a hereditary "taint" that explained their poor health conditions. Some experts seemed to grasp that environmental causes shared blame, but only partly. Aleš Hrdlička (1909:31) acknowledged that, "…what now appears to be greater racial susceptibility is a result of other conditions, particularly greater opportunity for infection and malnutrition," but only after first blaming, "the frequent hereditary taint." Could this be what is happening with diabetes among Native Americans today? Are modern doctors, like the Pawnee physician C.W. Driesbach and Dr. Aleš Hrdlička, assigning heredity an unfair position in an attempt to shift blame for soaring rates of Native American diabetes?

Diabetes and tuberculosis are clearly two different diseases, but there seems to exist a parallel between how Western doctors view their manifestation in Native people. Diet is more clearly understood as a contributing factor to diabetes than it was to tuberculosis; but the connection between modern diabetes and the fact that this problematic diet was presented to Native Americans during the reservation era has not

been given an adequate going over. This study should be viewed as exposition to the larger, more complex story of the current dietary issues of indigenous people. Reservation confinement and the introduction of new foods set the stage for current struggles concerning Native American cultural and physical health and the shift from one chronic disease to another should be compared as the same, ultimate causes are present.

FIVE: Conclusion

A century after the US government provided rations for starving Native groups living on reservations, it appears as if little has changed. Lisa Hug's (1994) examination of diabetes on the Omaha reservation looks at federally funded programs like the Food Distribution Program on Indian Reservations (FDPIR), Food Stamps and the Emergency Food Assistance Program, all of which provide food for low income Omaha families. While the programs are clearly meant to do good, Hug points out (1994:288) that bad distribution methods and poor quality of food may be contributing to the problem of diabetes among Omaha people as much as it is alleviating hunger. The parallel between nineteenth century government rations and modern FDPIR programs and their associated chronic diseases (tuberculosis and diabetes, respectively) demonstrates that the same problems concerning Native American health persist.

Although the rates of tuberculosis among the Omaha and Winnebago were not directly correlated with government rations, other environmental factors contributed to the high disease rates among both tribes. For the Pawnee, the connection between tuberculosis and diet was stronger, indicating that diet was a considerable factor in this specific case. Along with much higher death rates, the Pawnee suffered from more enteric diseases, like diarrhea and dysentery, due to the poor quality food they ate. This study demonstrated that food is not the only factor determining virulence of tuberculosis, but in particular cases, it can be an important, contributing factor.

Poor diet and malnutrition can affect the body in many ways, since food is essentially fuel for growth, development and maintenance. Among the Pawnee, Omaha

and Winnebago of Nebraska, the change from a traditional diet—lean bison, deer and elk meat; wild roots, vegetables and fruits; and traditional grains and vegetables grown in a polyculture—to a new, Western diet was rapid and overwhelming in the late nineteenth- and early twentieth centuries. This change in nutrition was accompanied by endemic disease like tuberculosis and, more currently, diabetes, which today has grown into a serious concern for all American Indian and Alaskan Native groups. A diet based on flour, beef, pork, sugar and coffee, introduced first as emergency rations, took root in Pawnee and Omaha society and exist as staples today among these groups (Miewald 1995:98). Similarly, the destruction of the traditional subsistence base of the Pawnee and Omaha caused a loss of dietary diversity and forced their entrance into a foreign economy where the most plentiful and cheap foods are the least nutritious and most energy-dense (Doughty 1979:279).

Is this sudden change in subsistence only a part of the diabetes problem, another being genetic predisposition? The answer to this is not currently known for certain, except to say that the same was thought of tuberculosis—that it was due in part to an inherited trait among Indians, causing them to suffer from it in great numbers. Later, experts began to unravel all the components of this deadly disease such as sanitation, close proximity of sick patients to healthy ones, and, finally, malnutrition (Dormandy 2000:242). Clearly an unintended consequence of a government program, the fundamentally altered diets of Native Americans was one of the leading causes of epidemic illness and population decline. Instead of questioning the quality of food being distributed, Indian agents assigned blame to the victim's "constitution" and watched helplessly, and often indifferently, as they died.

What is evident from the case study above of tuberculosis and the epidemic of diabetes today among Native Americans is that reservation life in the late nineteenth century was a major contributor to both of these chronic diseases. Not only did enforced sendentism eradicate the traditional means of subsistence, and the important rituals associated with it, but also it reduced traditionally meaningful physical activity and caused depression among Native Americans. New foods were introduced in the place of old, unavailable ones: beef for bison, wheat flour for corn. Others, which had no precursor in the native diet, like refined sugar, coffee, bacon and whiskey, found a permanent home in the dietary regimen of people who had no access to their old way of life and were kept too poor to have access to nutritious foods. It would normally have taken a few generations for the cultural memory of a diet based on bison meat and corn, beans and squash to be replaced by beef, pork and frybread; however, poverty and forced assimilation would have made this possible in a few decades. It is in this same period of time, from the end of the nineteenth century until around World War II, that diabetes began to emerge, eventually becoming a full-blown crisis by the 1960s.

As this paper has tried to demonstrate, diet can be an important factor in the spread and maintenance of tuberculosis. It is far from the only factor, but it is an important, and often overlooked, piece of the whole puzzle, especially in the case of Native Americans. One of the goals of this paper has been to attempt to erase the traditional mode of thinking: that genetic imperfections and the "uncivilized" way of life of Native Americans were responsible for the spread of tuberculosis. The factors that contributed to this spread were largely external and beyond control of Indian people. There are many parallels that can be drawn between tuberculosis and diabetes among

American Indians in their relation to poor diet and malnutrition. This statistical analysis and literature review of rationing and disease in the 1880s and 1890s among the Pawnee, Omaha and Winnebago is offered in order to pose the question, “Could the same thing be happening today with diabetes?” It is a question that hopefully someday will be answered.

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