An Overview of the State of Native American Health: Challenges and Opportunities

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Abstract

American Indian/Alaska Native (AIAN) populations are facing a number of serious challenges, including poverty and health-related issues. Many of these problems have, at their root cause, lack of sufficient and consistent access to nutritious foods. Integrally related to poverty, significant portions of reservation residents and urban AIAN populations are reliant of subsidized food programs, community food distribution centers, and soup kitchens for the bulk of their diet. Studies have demonstrated the negative impacts this has on physiological pathologies such as obesity and diabetes mellitus. While these situations are critical, it is important to note that consumption patterns and food choices are modifiable. This provides significant opportunities for positive, sustainable interventions to improve the quality of life for AIAN populations.

Keywords: American Indian, Native American, urban, food distribution, food security, food insecurity, nutrition, poverty, obesity, diabetes, sovereignty, empowerment.

About the Author

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List of Acronyms

AIAN	American Indian/Alaska Native
BIA	Bureau of Indian Affairs
CVD	Cardiovascular Disease
FDPIR	Food Distribution Program on Indian Reservations
IHS	Indian Health Service
ITO	Indian Tribal Organization
NIDDM	Non-Insulin-Dependent Diabetes Mellitus
NIH	National Institutes of Health
TOCC	Tohono O'odham Community College
TOCA	Tohono O'odham Community Action
USDA	United States Department of Agriculture
USDHHS	United States Department of Health and Human Services
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

INTRODUCTION AND JUSTIFICATION

The health of a people is vital for the long-term survival of them and their cultures. Consequently, health and health care issues are central components in sovereignty and self-determination of all indigenous peoples. In the history of United States/American Indian[1] relations, this element of sovereignty was deliberately removed from tribal hands in a conscious policy of assimilation and acculturation. As a result of both the removal and reservation phases, tribal health across the nation began a series of devastating declines. Removed from traditional hunting and gathering places and confined into smaller areas, tribes began a dietary and physical activity shift away from consumption of traditional foods and high energy expenditures and toward a pattern of more sedentary lifestyle and increasingly nutritive-limited and processed foods.

These behavioral trends have been followed by new patterns of disease manifestations at the individual and community levels. Acute diseases have been replaced by chronic conditions that were previously unknown among most Native populations. While food insecurity is estimated to impact approximately 25 percent of reservation and urban Indian populations, undernutrition has generally been replaced by overnutrition, in the forms of overweight and obesity. Co-morbid with these trends have been rapid increases in the percent of populations that have type 2 diabetes, cardiovascular diseases, depression, liver disease and cirrhosis, and other co-morbidities.

These health declines pose a serious threat to long-term cultural survival. Intricately intertwined with traditional foods, medicines, gathering practices, sites for gathering, and songs and rituals associated with harvests are the cultural and linguistic ties that link the spirit of the people to the earth, their heritage, and their life-ways. As these practices have been discontinued, cultural knowledge and language use have been dying.[2]

Not all the news is bad, however. Strides have been made to reduce the negative impacts of health issues on the reservations and among urban populations. Legal changes and economic development successes have allowed some tribes and nations to take greater control over their health care management systems. As a result, they have been able to incorporate western-style medicine with traditional healing and life-way orientations to help reinvigorate cultural pride, knowledge, and healthier ways of living.

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[1] Throughout this work, interchangeable terms are used to refer to indigenous peoples in the United States. The designation "nation" is deliberate, acknowledging the unique political status that these groups maintain. As their usage is common by Native Americans and appears in government documents, the terms "Indian" and "American Indian" are used for consistency across reference sources. It should be noted that these terms are considered problematic by many. Scholars argue that they smack of colonialism and have a pejorative and historically incorrect lineage. It is important to note that any encompassing term ignores the cultural uniqueness of each tribe, the vast diversity between the tribes, and the political realities of internal structures.

[2] It is estimated that "175 living languages remained in 1997…Of these languages, many were spoken by very few, mostly elders or adults. Of the 175 listed…55 were spoken by only 1 to 6 people" (Indigenous Language Institute as quoted in *Cultural Survival Quarterly*, Summer 2007, pg. 13). However, various nations have implemented language reclamation projects with the facilitation and recognition of the federal government: *Native Languages Act of 1990*, U.S. Public Law 101 – 477, 101st Cong., 2nd sess. (October 30, 1990) and *Native American Languages Act of 1992*, U.S. P.L. 102-254, 102nd Cong., 2nd sess. (October 26, 1992).

Despite these successes, there is still a long way to go. Disproportionately, American Indians and Alaska Natives (AIANs) in the United States suffer from higher levels of a range of social and physiological pathologies when compared to the rest of the United States and white-only populations. As many of these are directly related to food access, consumption, and nutrition issues, there are substantial opportunities for intervention. Behavioral changes, combined with increased access to proper diets, can have a significant, positive impact on health outcomes. Tribal colleges offer avenues of capacity building for reservation populations, along with partnerships for developing culturally sensitive and appropriate programs of intervention. For urban populations, there are Indian centers that offer similar opportunities.

This report will begin with an overview of factors that create and reinforce an environment of poor health outcomes at the household and community levels. These factors include high rates of poverty, lower educational attainments, high rates of unemployment, geographic issues, socio-spatial issues that constrain access to food resources, and high levels of dependence of government programs for access to food. These social and programmatic conditions will be linked to a series of nutrition and dietary health outcomes. An overview of successful programs will be presented, followed by suggestions for intervention.

BACKGROUND

Current Socioeconomic Conditions

The Native American population is heterogeneous. Each tribe has its own traditions and cultural heritage. As of 2005, there are 561 federally recognized tribes and communities living in the lower 48 states and Alaska. There are 314 reservations and 40 Indian statistical areas. Total reservation and trust lands represent approximately 72 million acres.

The 2000 Census estimates that there are 4.1 million people in the United States who self-identify[3] as being of American Indian descent (1.5 percent of the United States population) and 2.5 million who claim "single race" Native heritage.[4] Based on the self-reported data, the Native American population tends to be slightly younger (28.5 years) than the overall United States population (35.4 years). This age distribution may have a significant impact on future Native American health and nutrition concerns, as approximately one third of the population is under the age of 18. As Story et al. (2003) and Szathmary et al. (1987) note, dietary shift is a function of both community and age. Patterns of increasing dietary acculturation[5] continue and often accelerate within younger age groups, especially as television viewing and internet usage in

[3] For a detailed discussion of issues surrounding the shift to self-identification in Census surveys, see Kelly, Mary E. and Nagel, Joane. April 2002. Ethnic re-identification: Lithuanian-Americans and Native Americans. *Journal of Ethnic & Migration Studies* 28(2): 275-289 and Nagel, Joane. December 1995. American Indian Ethnic Renewal: Politics and the Resurgence of Identity. *American Sociological Review* 60(6): 947-965.

[4] U.S. Census Bureau, Census 2000, Summary File 3.

[5] Dietary acculturation refers to adopting the traits of the dominant cultural group. In the United States as a whole, this process involves higher levels of consumption of processed and refined foods, as opposed to whole grains and raw foods. This would include snack foods (crackers and chips), microwave meals (burritos, "TV" dinners, etc.), and boxed foods (macaroni and cheese, instant potatoes, etc.). This pattern has been combined with decreased physical activity levels, ultimately leading to higher rates of overweight and obesity across the nation.

becoming increasingly prevalent in reservation areas. This may have a strong influence on the appearance of diabetes mellitus and associated diseases at increasingly lower age ranges.

Native Americans face a number of serious challenges, including education, poverty, and health related issues. According to the 2000 Census, AIANs had significantly lower rates of educational attainment than the overall United States population (see Table 1, below). Differences between the populations are especially dramatic when comparing rates of high school completion and higher education attainment. According to Freeman and Fox (2005), 15 percent of Native students ages 16 – 24 were high school dropouts, while only 9.9 percent of the United States population in the corresponding age range fell into this category. In recognition of the challenges facing AIAN communities and to help address some of the education issues specific to them, President George Bush signed the American Indian and Alaska Native Education Executive Order (13336) in April 2004.[6]

It is important to note that the table also demonstrates positive changes in educational attainment levels. Correspondingly, there has been tremendous growth in the number of tribal colleges and universities. As of 2005, there were 34 tribal colleges in 14 states serving over 30,000 students.[7]

Table 1: Changes in Indian Educational Status, CY 1990 – CY 2000[8]

	1990	2000	Change	AIAN vs. all U.S., 2000
College (Associates degree or higher)				
Reservation	9.2	12.1	+2.9	-18.6
All Indian Areas	10.9	13.5	+2.6	-17.2
All Indians nationwide	15.7	18.0	+2.3	-12.7
All Races, nationwide	26.5	30.7	+4.2	---
High school diploma or GED				
Reservation	29.4	31.3	+1.9	+2.7
All Indian Areas	30.3	33.0	+2.7	+4.4
All Indians nationwide	29.1	29.2	+0.1	+0.6
All Races, nationwide	30.0	28.6	-1.4	---
Less than 9th Grade				
Reservation	21.7	13.9	-7.8	+6.4
All Indian Areas	19.9	12.7	-7.2	+5.2
All Indians nationwide	14.0	11.1	-2.9	+3.6
All Races, nationwide	10.4	7.5	-2.9	---

[6] The purpose of this order is to help AIAN students meet the academic standards of the "No Child Left Behind Act of 2001" (Public Law 107-110) in a manner that is consistent with tribal traditions, languages, and cultures. This order builds on the "No Child Left Behind Act of 2001" by providing for stronger accountability for results, greater flexibility in the use of Federal funds, increased choices for parents, and an emphasizing research-based instruction.
[7] American Indian Higher Education Consortium, http://www.aihec.org.
[8] Numbers represent percentage of population over the age of 25. Sources: U.S. Census Bureau, Census 1990 and 2000, Summary Files 3.

As shown in Table 2, the economic status of the overall Native American population has improved somewhat from 1990, but is still dire. According to the United States Census 2000, the real per capita income for AIANs living on the reservations (excluding Oklahoma) was $7,942. This is $13,645 less than the United States population average. Rates of poverty are severe, as demonstrated by the deep poverty statistics. The Census Bureau defines deep poverty as living at less than 75 percent of the United States poverty line. According to the Census, one in five reservation residents fall into this category.[9] Given the youth of the Indian population, this economic impact is monumental. Over one-half of all reservation Indian children are living **below** the poverty line.

Poverty rates are directly related to the higher-than-average unemployment rates on the reservations. Statistics show that unemployment on the most severely impacted reservations is close to and in some cases exceeds 50 percent. The unemployment rate is only 5.1 percent for the rest of the country (Bureau of Labor Statistics, March 2008).

Table 2: Changes in Indian Poverty Rates, CY 1990 – CY 2000[10]

	1990	2000	Change
Family Poverty Rate (percent)			
Reservation	47.3	35.6	-11.7
All Indian Areas	38.1	28.7	-9.4
All Indians nationwide	27.0	21.8	-5.2
All Races, nationwide	10.0	9.2	-0.8
Child Poverty Rate (percent)			
Reservation	55.5	44.2	-11.3
All Indian Areas	47.7	37.4	-10.3
All Indians nationwide	38.8	31.6	-7.2
All Races, nationwide	18.3	16.6	-1.7
Deep Poverty Rate (percent)			
All Races on Reservations	26.7	20.9	-5.8
All Races nationwide	9.19	8.7	-0.4
Public Assistance (percent)			
All Races on Reservations	18.7	16.8	-1.9
All Races nationwide	7.5	7.8	+0.3

Low socioeconomic status is one of the most powerful risk factors for poor health outcomes.[11] The average life expectancy for Native Americans is 2.4 years less than that of the average United States population (Indian Health Service (IHS), 2006). The infant mortality rate in the

[9] Given other statistical data, it is assumed that these figures underestimate the Indian-only rate of deep poverty.
[10] Sources: U.S. Census Bureau, Census 1990 and 2000, Summary File 3
[11] See for example Halpern, 2007; Wolfe and Sanjur 1988; Story et AL. 1998; and Story et al. 1999.

AIANs population is 8.5 per 1,000 lives births for 2000-2002. This is higher than the United States all-race rate of 6.8 per 1,000 (IHS, 2006). According to Lautenschlager and Smith (2006), poor health outcomes are exacerbated by homelessness. Compliance with diabetes regimens is compromised by inability to refrigerate insulin and/or monitor glucose levels. The cost of medication is frequently cited as a barrier to obtaining or refilling prescriptions. Finally, they find that many respondents have difficulty following a diabetic diet while homeless and/or dependent on soup kitchens and food pantry items.

Poverty also has an impact on sanitation and living conditions. Native families are 7.5 times more likely to live in homes deemed inadequate because they do not comply with current environmental laws and regulations. IHS (2006) reports that safe water supplies and waste disposal facilities are lacking in 12 percent of AIAN homes but only 1 percent of homes for the United States general population. Despite improvements, a number of reservation residents do not have running water, electricity, or proper sanitation facilities. Even when water is available, many reservations, especially those in the Southwest, have a mineral-laden water supply resulting in a sharp, bitter taste. This has been cited as a factor in discouraging water consumption in favor of sweetened beverages and sodas (Stroehla et al., 2005; Taylor et al., 2006 and 2005).

Table 3: Indian Housing[12]

	1990	2000	Change
Overcrowded Homes (1.01 people per room)			
All Races on Reservations	16.9	14.7	-2.2
All Races nationwide	4.7	5.7	+1.0
Homes lacking Complete Plumbing			
Reservation	20.2	13.7	-6.5
All Indian Areas	14.9	10.1	-4.8
All Indians nationwide	6.0	4.4	-1.6
All Races, nationwide	0.8	0.6	-0.2
Homes Lacking Complete Kitchens			
All Races on Reservations	11.5	10.9	-0.6
All Races nationwide	1.1	1.3	+0.2

Social Pathologies

In addition to poverty-related health issues, AIANs also suffer from a serious array of social pathologies, including alcoholism, drug abuse, spousal and child abuse, suicide, and homicide. Table 4 below shows some of the major causes of death for residents of the IHS's service areas

[12] Sources: U.S. Census Bureau, Census 1990 and 2000, Summary File 3

for the years 1996 – 1998.[13] Alarmingly, AIANs are dying at a higher yearly rate than any other group in the United States. Many of these deaths are associated with behavioral manifestations that are related to environmental factors. These are, in turn, aggravated by hopelessness and despair caused by persistent poverty, loss of cultural ways, and perceived lack of opportunities for change. Risky behaviors, combined with high rates of alcohol abuse, have resulted in accidental death rates over three times the national average. Alcohol and drug abuse are also contributing factors to the high rates of chronic liver disease and cirrhosis (35 percent of all deaths), higher than average suicide rates (19 percent vs. 11 percent), and high homicide rates (15 percent vs. 10 percent).

Table 4: Age-adjusted Death Rates, American Indians and Alaska Natives, IHS Service Area, 1996 – 1998, and US All Races and White Populations, 1997[14]

	American Indian and Alaska Native		US	US
Cause of Death	*Unadjusted*	*Adj*[15]	All Races	White
All Causes	620.7	715.2	479.1	456.5
Major cardiovascular diseases	168.4	195.9	166.1	159.1
Diseases of the heart	132.9	157.1	130.5	125.9
Cerebrovascular diseases	26.7	29.5	25.9	24.0
Atherosclerosis	2.4	2.5	2.1	2.1
Hypertension	2.4	2.5	2.3	1.9
Unintentional Injuries	82.2	94.7	30.1	29.6
Motor Vehicle	46.6	54.8	15.9	15.9
All Other	35.6	39.9	14.2	13.7
Malignant neoplasms	107.5	124.0	125.6	122.9
Chronic liver disease and cirrhosis	31.7	36.4	7.4	7.3
Diabetes Mellitus	44.4	52.8	13.5	11.9
Pneumonia and Influenza	19.8	21.5	12.9	12.4
Suicide	17.6	20.2	10.6	11.3
Homicide	12.7	14.5	8.0	4.7
Chronic obstructive pulmonary diseases and allied conditions	17.5	19.7	21.1	21.7
Tuberculosis, all forms	1.5	1.5	0.3	0.2
Human Immunodeficiency virus (HIV) infection	2.9	3.3	5.8	3.3
Alzheimer's disease	1.0	1.3	2.7	2.9

NOTE: Rate per 100,000 Population

[13] For additional tables on mortality rates for the last three decades, see tables in Appendix B.
[14] Department of Health and Human Services, Indian Health Service. 2005. *Trends in Indian Health, 2000 - 2001*. Washington, DC: US Government Printing Office, Table 4.11, p. 69.
[15] Adjusted to compensate for miscoding of Indian race on death certificates.

Teufel (1994), in her study of alcohol consumption on the Hualapai reservation in northern Arizona, also links alcohol consumption to altered nutrient consumption patterns. This has an impact on nutritional status. She points out that alcohol intake can result in protein malnutrition by displacing nutrient rich foods and by interfering with the normal processes of food digestion and absorption. As a food, ethanol primarily provides calories. Her study indicates that drinkers are more likely to alter their food consumption patterns in more unhealthy ways than non-drinkers. Drinkers are more likely to eat fast food meals that are high in fat and calories and to eat larger portions. They are also more likely to consume large quantities of soda or fruit-flavored drinks after an evening of drinking. Thus, alcohol consumption not only interferes with the processing of nutrients in foods, it also alters behavior patterns that govern nutrient intake. This is an important factor that is not widely considered in the array of literature on obesity. While those articles, discussed in depth below, focus on intake from fats, carbohydrates, and sugars, they do not account for the caloric or metabolic impact of alcohol consumption on either obesity or diabetes.

It should be noted that nutritional factors contribute to at least four of the 10 leading causes of death among American Indians and Alaska Natives: heart disease, cancer, cirrhosis, and diabetes. Nutritional factors also contribute to the prevalence of overweight, obesity, hypertension, and dental caries. Significant research has examined the causes and impact of these diseases on the AIAN population. Understanding these risk factors will help in the design of intervention programs and in the battle to reduce their incidence rates. Since some of the health problems are nutrition-related, awareness of the etiology will provide the tools to improve the selection and preparation of foods that promote better health and combat disease.

Access to Health Care

The Indian Health Service (IHS), an agency within the United States Department of Health and Human Services (USDHHS), is the primary source of health care on the reservations and for approximately 55 percent of AIANs (IHS, 2006). Others may have private health insurance through their jobs. IHS outreach into urban areas is limited to non-existent. This is exacerbated by a transitory lifestyle, with high levels of migration between reservations and cities. This constant movement may lead to a lack of health care access for this population. Health services are delivered through direct provision at IHS facilities, IHS contractual arrangements with private sectors, tribally operated programs, and urban health programs. The health delivery system is managed through 12 area offices, which cover the 33 states containing reservations. Area offices provide administrative support to 72 local service units.

Among those who are reliant on IHS, there is a great deal of dissatisfaction with coverage. One of the largest problems is the distance traveled to health posts. These health facilities tend to be in major cities on the reservation. Given the issues with poverty and lack of consistent access to transportation, service beneficiaries have often reported great difficulty getting to appointments. Additional issues include lack of cultural sensitivity on the part of IHS doctors and staff and long waiting times (Companion, 2005).

Severe funding shortfalls for IHS make it difficult for the agency to address these deficiencies and cover the gaps in services. By their own admission, the agency is currently overburdened by rapidly increasing rates of chronic diseases. As Harrison (2004) notes, individuals in severely food insecure households were more likely to use the health care system for doctor and emergency room visits, thereby increasing the direct costs associated with poverty and malnutrition.

IHS facilities average 34 years old with equipment that may be six years or more out of date. This impacts expenditures for maintenance at a time when their budget has been falling consistently. In 2005, the average per capita expenditure on IHS clients was projected to be $2,100 compared to the national average for all Americans of $5,298.[16] Warne (2006) points out that, on average, federal expenditures for health care for prison inmates exceeds that for AIANs.

Urban Indian Populations

Prior to the 1950s, the majority of the American Indian population lived proximate to or on reservation lands or in tribal jurisdiction areas such as Oklahoma. As part of the federal government's termination program,[17] the Bureau of Indian Affairs (BIA) added a relocation/employment assistance program in 1955. This was designed to help impoverished Native American families move off the reservations and into urban centers such as San Francisco, Los Angeles, Seattle, Tulsa, Dallas, Chicago, Salt Lake City, Phoenix, Albuquerque, and Denver to integrate them into the larger economic system. The BIA estimates that over 160,000 Indians were relocated between 1955 and 1965.

In response to urban Indian community leaders, Congress appropriated funds through the IHS in 1966 for a pilot urban Indian health clinic in Rapid City. In 1973, Congress funded a study of urban Indian health needs in Minneapolis, MN. The study documented cultural, economic, and access barriers to health care, prompting Congress to support urban health clinics in several relocation cities. In 1976, Congress passed the Indian Health Care Improvement Act (PL 94 – 437). Title V specifies targeted funding for urban Indian health programs. Currently, the IHS Urban Indian Health Program supports contracts and grants to 34 organizations operating at 41 sites under Title V.

According to the United States Census 1990, approximately 62.3 percent of self-identified AIANs live off reservation. The Updated Census (1994) suggests that 58 percent (1.3 million) of AIANs live in urban areas. Based on studies conducted by the IHS, the current funding level is operating at 22 percent of the projected need for primary care services. There is also demonstrated unmeet need: 18 additional cities have been identified as having a population large enough to support an Urban Indian Health Program (UIHI, 2008).

[16] Indian Health Service. January 2005. "Indian Health Service Year 2005 Profile."

[17] HR 108, adopted by Congress in 1953 states, "at the earliest possible time…Indians should be freed from all Federal Supervision and control and from all disabilities and limitations specifically applicable to Indians."

NATIVE AMERICANS AND NUTRITION

Historical Background

Many of the negative health conditions affecting the AIAN population are a legacy of dietary and lifestyle practices adapted from those introduced through the practices of colonialization and forced restriction onto the reservation system. Years of dependence on government food distribution as a result of the loss of traditional land bases has also contributed to the abandonment of many traditional elements of the native diet. High-fiber, nutrient dense pre-European contact foods have been replaced by commercially produced low-fiber, high-fat, high-sugar foods and beverages, many provided by various feeding programs. A more consistent state of food availability has replaced the alternating periods of feast and famine that were common several generations ago. There has also been a corresponding shift in energy expenditure. The more physically active subsistence economy has changed to a wage economy, which is associated with a more sedentary lifestyle. While these dietary and activity shifts are not unique to the AIAN population, the impact of these changes has been pronounced. The adoption of a more "Anglo" diet has contributed to obesity, cardiovascular disease, hypertension, and diabetes.

Behavioral and lifestyle conditions related to diet and physical activity play a critical role in both the manifestation and degree of obesity and related morbidities. Historically, in many Native populations, particularly tribes in the Southwest, the accumulation of body fat was valued. Body fat provides a buffer against food insecurity. Cultural memory of seasonal hunger places many tribal notions of appropriate body size in conflict with current Euro-American ideals of thinness and intentional food restriction.[18] However, obesity has only become a major health concern in the AIAN population in the past one to two generations. It is the result of increased high-fat food availability through social programs and rapid changes from active to sedentary lifestyles.[19] Diabetes among the Native American population was uncommon prior to World War II but **has recently grown at a rate 234 percent higher than for all other United States ethnic groups.**

Historically, the single most important factor affecting AIAN health was the lack of nutritious foods. During periods of relocation and confinement near or in military posts (the mid-1800s), tribal people were meted out portions of military rations. These consisted of white flour, baking powder, salt pork, bacon, potatoes, beans, coffee, sugar, tea, and lard. Fry bread was developed as a means of stretching these rations into a palatable meal. Meats, when available, and potatoes were often fried. Being confined to reservations, often in remote and foreign places, along with the corresponding changes in ecological conditions as a result of population resettlement and development led to a dramatic reduction in the diversity of many tribal diets. Availability of wild plants and wild game decreased and diets became dominated by a few key items: meat, wheat flour, cornmeal, lard, beans, potatoes, sugar, and coffee.

According to a survey conducted by the Office of Indian Affairs in 1926 and 1927, Native American diets were "faulty" in respect to quality and quantity. Many families never had enough

[18] This is changing among teenagers. Phillips and Finn (2000) note the use of unhealthy diet practices, such as laxative consumption and fasting, to achieve weight loss goals.
[19] See Govula et al. 2007; Harvey-Berino at al. 2000; Jackson 1988; Dillinger et al. 1999; Teufel 1996; and Welty 1991.

to eat, while others alternated between gormandizing and starving. A follow-up survey in 1936 showed similar results and indicated that malnutrition in children was common. Studies conducted from 1949 to 1953 found similar problems.

By the 1940s and 1950s, the average Native American diet, particularly in the Southwest, consisted of more purchased foods than grown or foraged foods. Because of monetary and availability issues, many people had little opportunity to eat fresh fruits and vegetables. Consequently, many were indoctrinated into the "meat and potatoes" diet popular with Euro-Americans in the 1940s. The meat and potatoes diet had social status and was practical for families who did not have refrigerators. However, it pushed people further away from the consumption of more "traditional" foods with negative nutritional ramifications. As meat was expensive and often scarce, many tribal peoples relied on meals consisting of beans and potatoes. The complement of beans and potatoes does not yield the high-quality protein provided by the more traditional Native American combination of beans and corn (Teufel, 1996).

Reports of nutritional deficiencies (primarily undernutrition) in the 1960s and 1970s led to an increase in federal food-assistance programs on the reservations. In the 1960s, more than 50 percent of families living on reservations in the southwest received surplus commodities provided through the United States Department of Agriculture (USDA). These food assistance programs introduced and emphasized the importance of non-Native foods. While providing needed calories, USDA commodity foods generally lack fiber and nutrient density and tend to be nutritionally inferior to traditional foods. For example, only four different food items were initially provided: flour, cornmeal, rice, and dry milk. Since then, as USDA's program has expanded, more food types have been included as part of the commodities package (discussed below). The availability of consistent and reliable food sources provided by the various feeding programs increased the overall nutritional status of many Native peoples. However, the substantial reduction in undernutrition has been accompanied by a rapid increase in adult and childhood obesity and a transition to chronic diseases such as diabetes and hypertension (see Tables 5 and 6 below).

Poverty and Nutrition

Food Insecurity

The United States government began to collect data on food insecurity in 1995, with the addition of a food security supplement to the Current Population Survey. This was derived from the 18-item Core Food Security Module (see Appendix A). A household is defined as food secure if they report less than three food-insecure conditions. Food *in*security is classified into two categories: low food security (three or more food insecure conditions) or very low food security (eight or more food insecurity conditions for households with children).[20] In very low food security categories, one or more household members reduced their food intake or had their

[20] It should be noted that a change in terminology occurred in 2006 to distinguish the physiological state of hunger from indicators of food availability (Nord et al. 2007). "Food insecure without hunger" was used to describe households that had a low food security level. Households with very low food security levels were described as "food insecure with hunger."

consumption patterns disrupted due to lack of money or insufficient resources need to acquire food.[21]

Food insecurity (the inability or uncertainty in acquiring enough food for all household or family members due to insufficient money or other resources) is a major concern for all people living below the poverty line. Based on the Healthy People 2010 monitoring project's findings, the 1995-1997 baseline estimates that 22 percent of the AIAN population was food insecure, compared with a national prevalence of 12 percent. Their most recent survey (2004-2006) finds 23 percent are food insecure, compared with a national prevalence of 11 percent.[22] Nord et al. (2007) report that 10.9 percent of United States households (12.6 million) were food insecure in 2005. Approximately 4 percent (4.6 million households) of those had very low food security.

McCloskey and Chee (2006) find that the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) office managers are reporting high incidents of food insecurity among program participants on the Navajo reservation. A recent study conducted among Oglala Sioux (Henry et al., 2000) found that almost 20 percent of respondents have concerns about food insecurity. Approximately 18 percent expressed concerns about food running out before they had money to buy more. Over 17 percent commented that they eat the same things repeatedly because they lack the money to purchase different food items and they only have a few things on hand. Another 10 percent responded that the food they purchased did not last.

A 2002 study of high needs groups on Northern Cheyenne finds that up to 70 percent of the population experiences food insecurity and 35 percent experience persistent hunger (Davis et al.). Those identified as particularly vulnerable are seasonal workers (ranch work, construction, firefighting, school bus drivers) and young families. Seasonal workers are able to provide enough food for parts of the year. However, given high rates of unemployment (71 percent in 2002) and the lag between loss of income and eligibility for food assistance programs, they are unable to keep up a consistent level of food access.

Despite the estimated prevalence of these conditions, discussions about food insecurity issues among the AIAN populations are largely missing from the literature. Halpern (2007) notes that research pertaining to urban Indians is lacking as well. It clear that a more systematic study of this issue is necessary.

Obesity

The risk of nutrition-related health problems, including obesity, is greatest among low-income populations. Poverty limits access to a variety of healthful foods.[23] Inexpensive food items suitable for long-term storage and for stretching the quantity of a meal (e.g., potatoes and rice)

[21] There is a tremendous gap between three and eight questions, so this measurement has been criticized for lack of sensitivity and explanatory power (Gundersen, 2008).
[22] http://www.healthypeople.gov/Data/data2010.htm
[23] Halpern (2007) summarizes the major findings from multiple studies on AIAN nutritional issues. Studies suggest that dietary fat intake was well above the Recommended Dietary Allowances, while mean intake of vitamin A and calcium were well below the recommended amounts. Most women did not meet the daily requirements for iron intake.

tend to be purchased more frequently than are perishable fruits and vegetables (Basiotis et al., 1999; Halpern, 2007). As Pareo-Tubbeh et al. (2000) find, very few reservation stores carry these items or low fat dairy products. As noted above, AIANs are economically disadvantaged in comparison with the general United States population. This puts a large proportion of their population at risk.

For many Native American families, the major factors affecting food choice are cost, availability, and shelf life. Many families have limited cash resources. Since transportation is often unavailable, they must make the majority of their food purchases on the reservation. Selection is often limited in these stores because of infrastructure limitations, remoteness of locations, and cost of healthful options (Pareo-Tubbeh et al., 2000; Frisvold and Fonte, 2007), which can be prohibitive because of transportation and spoilage issues. These problems are compounded by the fact that many families do not have refrigerators or have small "dorm style" ones and cannot adequately store perishable items.

Teufel and Dufour (1990), in their study of nutrition and food choices on the Hualapai reservation in northern Arizona, found that diets dominated by starches, flour, and similar items had additional negative impacts on nutritious food consumption. Boredom with diets dominated by bland foods led to the frequent, and often spontaneous, purchase of sweets, soda, chips, and high-fat restaurant foods (French fries, pizza, etc.). Story et al. (2003, 1999), in their study of diets among the Navajo, also report this eating pattern. They find a high prevalence of sweets and snacks in adolescent diets, with consumption of sweetened soft drinks at more than twice the national average.[24]

Young children are especially vulnerable to a number of nutrition and food access problems (Zeipher et al., 2006; Harvey-Berino et al., 2000). Food preferences are established at young ages. Diets that are dominated by saturated fats, sugars, and simple carbohydrates and are low in fiber, protein, and other nutrients can lead to the development of obesity and increase the risk of diabetes mellitus and heart disease.

The Link of Nutrition to Disease

The recent epidemiological history of AIAN populations can be characterized by the decline but persistence of infectious diseases and the rise in chronic diseases, especially diabetes (see Table 5 below). Due to concerted efforts by government feeding programs (discussed below), undernutrition on many reservations has been significantly reduced. However, studies demonstrate (Compher, 2006; Zeipher et al., 2006; Schulz et al. 2006; Brown and Barrett, 1994) that AIANs now appear to be more vulnerable to health conditions related to overnutrition than the general United States population. This is especially true for obesity, diabetes, heart disease, hypertension, liver cirrhosis, and dental caries.

While individual diseases and health conditions have their own unique causes or risk factors, there are some common observable links between many of them. Data reflect the relationship between morbidity and mortality among the IHS service population and socioeconomic and

[24] Teufel (1996) and others have pointed out that soft drinks have a high social status, adding to their appeal.

environmental conditions. Though some of the determinants may relate to individual physiology and genetics, the data illustrate the important combined effects of living conditions, environment, and personal behavior on the patterns of disease and health (Compher, 2006; Rhoades et al., 1987). It is clear that the lower income levels of many AIAN communities are exacerbated by infrastructure problems.

Table 5: Diabetes Mellitus Deaths and Death Rates, American Indians and Alaska Natives, IHS Service Area, and U.S. All Races and White Populations 1955 - 1997[25]

	American Indian and Alaska Native			U.S. All Races	U.S. White
Calendar Year(s)	*Un adj. no.*	*Adj. no.*	*Rate (adj.)*	*Rate*	*Rate*
(1998)	516	604			
1996 – 1998 (1997)	546	649	52.8	13.5	11.9
1995 – 1997 (1996)	449	527	50.5	13.6	12.0
1994 – 1996 (1995)	426	497	46.4	13.3	11.7
1993 – 1995 (1994)	399	467	43.7	12.9	11.5
1992 – 1994 (1993)	354	412	41.1	12.4	11.0
1991 – 1993 (1992)	324	373	35.1	11.9	10.5
1990 – 1992 (1991)	275	320	31.7	11.8	10.5
1989 – 1991 (1990)	285	330	30.0	11.7	10.4
1988 – 1990 (1989)	301	349	29.7	11.5	10.3
1987 – 1989 (1988)	260	303	30.0	10.1	9.0
1986 – 1988 (1987)	227	274	29.1	9.8	8.7
1985 – 1987 (1986)	195	234	26.0	9.6	8.5
1984 – 1986 (1985)	208	245	25.0	9.6	8.6
1983 – 1985 (1984)	189	222	24.4	9.5	8.5
1982 – 1984 (1983)	179	212	24.3	9.9	8.9
1981 – 1983 (1982)	164	197	24.0	9.6	8.7
1980 – 1982 (1981)	156	185	24.8	9.8	8.8
1979 – 1981 (1980)	173	206	25.2	10.1	9.1
1978 – 1980 (1979)	153	180	25.6	10.0	9.0
1977 – 1979 (1978)	147	174	24.6	10.4	9.4
1976 – 1978 (1977)	133	158	24.4	10.4	9.4
1975 – 1977 (1976)	125	151	24.3	11.1	10.0
1974 – 1976 (1975)	123	145	24.3	11.6	10.4
1973 – 1975 (1974)	110	131	25.5	12.5	11.4
1972 – 1974 (1973)	117	134	28.1	13.2	11.8
(1972)	129	153			
1954 – 1956 (1955)	64		17.0	13.0	12.6

NOTE: Age-Adjusted Rate Per 100,000 Population
Adj – specifies a number, rate, or ratio of rates adjusted to compensate for miscoding of Indian race on death certificates.

As Byers and Hubbard (1997) and others point out, the substantial increase in the rate of obesity among AIAN populations in recent years, as manifested by the particularly high prevalence of central adiposity, suggests a nutritional imbalance. Story et al. (2003 and 1998) observe that obesity and overweight are prevalent in Native American youth. Two studies have shown that

[25] Department of Health and Human Services, Indian Health Service. 2005. *Trends in Indian Health, 2000-2001*. Washington, DC: US Government Printing Office, Table 4.46, pg. 133.

Indian children have increased central body fat (Gilbert et al. 1992; Goran et al. 1995). Studies have also shown that obesity in adult Native Americans is almost always upper-body fat (Howard et al. 1995). Story et al. (1986), in their study of Cherokee health and nutrition, found that the participants had greater skin fold thicknesses. The skin fold values, compatible with the greater mean weights observed, suggest that the heavier weight is largely adipose tissue. Centrally distributed body fat, as opposed to peripheral body fat distribution, is a risk factor for several chronic diseases. Obesity is a risk factor for hypertriglyceridemia, low HDL cholesterol, and endometrial cancer in women and colorectal cancer in men (see Percy et al., 1997; Story et al., 1999). Obesity may also contribute to adverse pregnancy outcomes (Welty, 1991).

Hypertension, elevated cholesterol, and diabetes are, in part, a consequence of obesity and represent mechanisms through which obesity mediates its effect on coronary heart disease risks (Galloway, 2005; Archer et al., 2004; National Institutes of Health (NIH), 1998; Welty, 1991; Tinker, 1994). Hypertension occurs when there is resistance to blood flow through the arteries and the heart has to exert extra pressure to get blood to organs and muscles. Hypertension, in turn, is a risk factor for cardiovascular disease (CVD), especially coronary artery disease, stroke, and peripheral vascular diseases (Stang et al, 2005). According to the NIH (1998), "the risk of cardiovascular morbidity, disability, and mortality increases progressively with incremental increases in blood pressure…data show that even a slight decrease in blood pressure levels can substantially reduce cardiovascular risk" (14).

In addition, hypertension itself is co-morbid with diabetes. Percy et al. (1997) found that hypertension was associated with diabetes mellitus and impaired glucose tolerance. Tinker (1994) found that hypertension increases the risk of renal disease, a major complication of diabetes. As noted by NIH (1998), many of the risks associated with CVD are modifiable. These include high blood cholesterol, high blood pressure, smoking, physical inactivity, diabetes, obesity, and heavy alcohol consumption.

Table 6: Heart Disease Deaths and Death Rates, American Indians and Alaska Natives, IHS Service Area, and U.S. All Races and White Populations 1955 - 1997[26]

	American Indian and Alaska Native			U.S. All Races	U.S. White
Calendar Year(s)	*Un adj. no.*	*Adj. no.*	*Rate (adj.)*	*Rate*	*Rate*
(1998)	1684	1964			
1996 – 1998 (1997)	1683	1970	157.1	130.5	125.9
1995 – 1997 (1996)	1600	1877	158.5	134.5	129.8
1994 – 1996 (1995)	1573	1852	156.0	138.3	133.1
1993 – 1995 (1994)	1515	1754	156.2	140.4	135.4
1992 – 1994 (1993)	1524	1779	157.6	145.3	139.9
1991 – 1993 (1992)	1484	1764	158.4	144.3	139.2
1990 – 1992 (1991)	1416	1682	157.5	148.2	143.1
1989 – 1991 (1990)	1349	1599	157.9	152.0	146.9
1988 – 1990 (1989)	1408	1661	161.3	155.9	151.0
1987 – 1989 (1988)	1359	1600	164.5	166.3	161.5
1986 – 1988 (1987)	1312	1553	160.4	169.6	165.0
1985 – 1987 (1986)	1190	1389	159.0	175.0	170.4
1984 – 1986 (1985)	1223	1422	160.0	180.5	176.1
1983 – 1985 (1984)	1206	1405	164.8	183.6	179.5
1982 – 1984 (1983)	1117	1306	168.4	188.8	184.6
1981 – 1983 (1982)	1102	1285	166.1	190.5	186.8
1980 – 1982 (1981)	1000	1162	173.6	195.0	191.1
1979 – 1981 (1980)	1096	1300	181.5	202.0	197.6
1978 – 1980 (1979)	1096	1282	190.8	203.5	199.8
1977 – 1979 (1978)	965	1157	185.7	207.6	204.0
1976 – 1978 (1977)	873	1036	175.1	210.4	206.8
1975 – 1977 (1976)	798	934	166.6	216.7	213.5
1974 – 1976 (1975)	729	858	171.4	220.5	217.2
1973 – 1975 (1974)	796	940	177.7	232.7	228.8
1972 – 1974 (1973)	716	847	193.4	244.4	239.9
(1972)	763	902			
1954 – 1956 (1955)				291.3	285.6

NOTE: Age-Adjusted Rate Per 100,000 Population
Adj – specifies a number, rate, or ratio of rates adjusted to compensate for miscoding of Indian race on death certificates

According to Heath et al. (1991), non-insulin-dependent diabetes mellitus (NIDDM) is characterized by glucose intolerance, resistance to developing ketosis, and is a major risk factor for cardiovascular disease. Often called Adult-Onset Diabetes, the disease typically manifests itself after age 40. Above average NIDDM rates in many Native American populations are largely attributable to the increasing prevalence of obesity.[27] The age of onset of diabetes has been occurring at younger ages as the prevalence of obesity and overweight increases. This is especially true in the offspring of women who have gestational diabetes during pregnancy (Welty, 1991). This disease is often accompanied by hyperlipidemia, hypertension, and the development of microvascular and macrovascular complications.

[26] Department of Health and Human Services, Indian Health Service. 2005. *Trends in Indian Health, 2000-2001*. Washington, DC: US Government Printing Office, Table 4.48, pg. 137.
[27] See Broussard et al., 1991 and their discussion of the relationship between diabetes mellitus and obesity in the Pima Indian peoples. As a group, Pimas tend to be obese. They also have the highest rates of NIDDM in the world.

Because obesity is a major *modifiable* risk factor for both cardiovascular disease and non-insulin-dependent diabetes mellitus, weight loss and diet modification programs offer a great potential benefit for AIANs. Koehler et al. (2000) point out that diet and nutrition are important factors for promoting change in health behavior for the prevention of cancer as well. However, successful management of a chronic disease such as diabetes requires lifestyle changes (see Kunitz, 2008). Changes in dietary patterns and treatment regimes typically take time to realize and effort to manage.

In 1985, the Indian Health Service held 20 nutrition and disease prevention workshops at field locations near Indian reservations and at the Training Center in Santa Fe, NM.[28] The curriculum of the workshops focused on the reduction of risk factors associated with diseases frequently encountered at IHS treatment facilities (obesity, diabetes mellitus, cardiovascular diseases, hypertension, iron deficiency anemia, and dental caries) through dietary alterations. Native foods, such as fry bread, bread pudding, and corn soup were prepared. Reductions in fat, calories, cholesterol, and sodium, along with an increase in the consumption of dietary fiber, were emphasized. Portion control, as opposed to major changes in food behaviors, was also emphasized. These workshops achieved some measure of success with participants, indicating that small changes in dietary patterns will have a more lasting impact and will be more likely to be adapted into daily practice than major lifestyle alterations. This demonstrates that working collaboratively with tribes to help develop tasty, culturally sensitive foods can help to counteract some of the negative impacts of improper nutrition without requiring major alterations to dietary patterns or lifestyle habits.

The Current Nutritional Balance in AIAN Diets

Historically, Drevets (1972) found that Choctaw diets had almost no variety. The diets were low in protein and fiber and high in carbohydrates and fats. The foods consumed consisted primarily of beans, pork, lard, and starches. In addition, the overall quantity of calories consumed per day was much higher than the average United States daily recommendations. He argued that this diet contributed to the high rates of diabetes mellitus and related morbidities that were common within the population he studied, such as diabetic gangrene. In addition, he found that obesity and gallbladder disease were also prevalent.

In a study that same year involving tribal peoples in the Southwest, Sievers (1972) found above average rates of gallbladder disease, enteric infections, tuberculosis, and diabetes mellitus. He concluded that alcoholism and dietary deficiency were major health problems for most of the tribes in the area due to low protein ingestion combined with an almost exclusive use of lard and extremely low consumption of unsaturated fats.

[28] For a detailed list of the leading IHS clinical nutrition patient/client contacts for FY 1996, see Appendix B.

More recent studies of other tribal nations[29] have had similar findings. Recent studies of tribal diets and nutrition have found them to be dominated by fry bread, coffee, potatoes, beans, eggs, sugar, butter, lard, soda and canned fruit drink, processed meats (bacon, sausage, hot dogs, hamburger, canned meats such as Spam, and lunch meats such as bologna), snack foods (chips, sweet rolls), white flour, and pasta. All these foods are low in fiber. Wolfe and Sanjur (1988) point out that this low fiber intake is of concern, as ingestion of dietary fiber has been linked with the control of diabetes. Wild and locally cultivated foods are not eaten on a regular basis. Fruit and vegetable consumption has consistently fallen below recommended daily levels. As a result on these consumption patterns, diets tend to be poor in lean energy, calcium, iron, phosphorous, vitamins A and C, and riboflavin.

When meats and vegetables are consumed, they are often fried in butter, lard or with bacon. Beans are commonly prepared using generous amounts of lard. Even breads, tortillas, and sopaipillas are prepared using lard, commodity shortening, or butter. Koehler et al. (1989) found that lard was a core food (a staple item in a particular meal) for the tribes in their study. Nearly all of the fat consumed is saturated fat. These factors may be contributing to the increased incidence of heart disease and obesity.

As evidenced by the tables presented above, many AIANs' lack of social and economic power provides little opportunity to change the environmental conditions that support poor nutrition and inactivity. Studies have repeatedly shown that diets in many Native American populations have little variation (NIH, 1998; Compher, 2006; Dillinger et al., 1999). They are heavily reliant on simple carbohydrates and fats (Stroehla et al., 2005; Taylor et al., 2005; Taylor et al., 2006; Weber et al, 2004; Phillips and Finn, 2000). Staples from commodity food programs contribute to these eating patterns, as food packages are typically comprised of canned meats and vegetables and American cheese. Dishes such as cheese crisps (cheese melted on a tortilla or fry bread) and corned beef with gravy and potatoes are popular dishes made from commodity foods.

FOOD CONSUMPTION PATTERNS

For Native Americans living in reservation communities, food selection is governed by cultural, economic, seasonal and geographic factors.[30] The major factors affecting food choice are cost, availability, and shelf life (Phillips and Finn, 2000). As noted earlier, most families have limited cash resources and purchase food on the reservation where selection is limited. Teufel and Dufour (1990) and Teufel (1994) noted that the market on the Hualapai reservation carried a wide array of prepackaged foods, but a very limited supply of fresh produce or meats. Food was purchased or received from commodities programs, with vouchers distributed through WIC, food

[29] See Bass and Wakefield (1974) – Standing Rock Reservation; Teufel (1994, 1996) – Hualapai; McCloskey and Chee (2006), Wolfe and Sanjur (1988), Byers and Hubbard (1997), Story et al. (1999), and Ballew et al. (1997), – Navajo Nation; Story et al. (1986) – Cherokee Nation; Koehler et al. (1989) - Southwestern Tribes; Dillinger et al. (1999) - Round Valley Reservation; Schultz et al (2006), Knowler et al. (1991) and Broussard et al. (1991) – Pima Indians; Olson (2001) – Dakota; Flora et al. (2007), Brown and Barrett (1994) – Hopi; Zeipher et al. (2006), Brown (2007), Robertson et al. (2007) – Northern Plains; Davis et al. (2002) – Northern Cheyenne.

[30] See Story et al. (2003, 1999, 1998); Compher (2006); Taylor et al. (2006, 2005); Teufel (1996); Bass and Wakefield (1974); Wolfe and Sanjur (1988); Welty (1991); Teufel and Dufour (1990); Dillinger et al. (1999); Ballew et al. (1997); and Byers and Hubbard (1997).

stamps, and some cash. Most frequently purchased items were inexpensive simple carbohydrates (white flour and potatoes), processed meat (bologna and hot dogs), and a range of canned foods (pork and beans, soup, peaches, corn, canned milk, and potted meat). The vegetables and legumes available for purchase consisted almost entirely of potatoes and pinto beans. Most of the grain products were made from white flour. Other researchers have found similar situations on other reservations (see Pareo-Tubbeh et al., 2000; Brown, 2007; Frisvold and Fonte, 2007).

Food purchased in reservation grocery stores tends to be more expensive due to high shipping and transportation costs associated with more isolated rural areas and poor road conditions. This reduces the purchasing power of food stamps. Despite high prices and limited supplies, families often have no other shopping options. Some families do not own vehicles, so there are difficulties in obtaining transportation to towns with supermarkets. In addition, road conditions and fuel costs often prevent people from making the longer trips to more urban areas to purchase supplies. Finally, many families lack refrigeration or have limited space, limiting their shopping purchase to foods with longer shelf lives.

In addition to small markets or convenience stores, many reservations now have a cafe or diner. Others have access to fast food restaurants on or near the reservations. Given the same transportation costs and spoilage constraints as the markets, the local eateries present menus dominated by non-traditional fast foods, such as fried hamburgers, fried potatoes, bacon, sausage, and sodas. These foods tend to be high in saturated fat, sodium, and calories and low in fiber. The portions served also tend to be larger than average meals eaten at home, contributing to the high caloric intake.

Bass and Wakefield (1974) and others (Phillips and Finn, 2000; Basiotis et al., 1999; Brown, 2007) have noted that food consumption patterns on reservations tend to vary directly with the arrival of checks and the distribution of government commodities. Government food distribution programs, along with grocery stores, are now the main sources of food and nutrient intake for many reservation residents.[31] Wolfe and Sanjur (1988) found that, with the exceptions of vitamins A and C, the commodity foods were the sources of approximately 50 percent of nutrient intakes in their study population. This indicates that Food Distribution Program on Indian Reservations (FDPIR) makes an important nutritional contribution to the contemporary Navajo diet. Dillinger et al. (1999) found that almost complete reliance upon food commodities is necessitated by poverty for many families at the Round Valley Reservation. The program represents the majority of energy intake for these recipients despite the fact that the Food Commodities Program was originally intended to provide supplemental foods.

While the food distribution programs represent a crucial food source for AIANs, the programs have been criticized for their overall nutritional quality and its contribution to the current nutrition-related health problems on the reservations. As noted above, many AIAN populations developed obesity in less than a generation. Welty (1991), Wolfe and Sanjur (1988), and others have noted that many of the commodity foods are high in fat as well as calories and low in fiber. Nearly all of the high-fat foods in the program at the time of these studies were saturated. Dillinger et al. (1999) found that food provided by the supplemental food programs varied

[31] See also Story et al. (2003, 1999, 1998); Teufel (1996); Wolfe and Sanjur (1988); Welty (1991); Teufel and Dufour (1990); Dillinger et al. (1999); and Ballew et al. (1997).

considerably in their nutritional quality and healthier foods such as fresh fruits, vegetables, and meats were either completely lacking or in short supply. Despite recent improvements, items remain high in sodium (canned vegetables), fat (meats, oil, butter, and shortening), and sucrose (canned fruit). Reliance food distribution programs may ultimately precipitate, aggravate, or lead to complications associated with cardiovascular disease, diabetes, hypertension, and obesity. The term "Commod-bod" was coined during the past decade on many reservations to describe the link between food distribution programs and increased body weight. The term refers to the obese physique of long-term food commodities recipients.

There is great concern in the medical community, tribal nations, and among food package recipients about the long-term implications of these diets. The overall health and well being of Native peoples has far reaching consequences beyond individuals. The long-term cultural survival of native nations and their traditions is being threatened by the impacts of disease on the population. Indian youth are perceived as being particularly at risk. Many researchers (Story at al., 2003; Stroehla et al., 2005; Szathmary et al., 1987) note that dietary shift is a function of community and of age. The pattern of increasing dietary acculturation continues within younger age groups. This pattern may be reflected in the increasingly lower age ranges for the appearance of diabetes mellitus and associated diseases. Weiner (2001) observes that many Native Americans feel that diabetes is partially a result of being economically, politically, and socially dependent upon outsiders. They believe that one does not inherit diabetes per se, but rather, one inherits the dietary habits that increase the possibility of developing the disease.

Dillinger et al. (1999) feel that federal food assistance programs may also be creating unhealthy food preferences among young Native Americans. As food preferences are established and eating patterns developed at young ages, they believe that Indian children raised almost exclusively on FDPIR will be more inclined to select highly processed foods over fresh fruit, vegetables, and meats. Because obesity is a major modifiable risk factor for both cardiovascular disease and non-insulin-dependent diabetes mellitus, diet modification options offer a great potential benefit for AIANs. Given the heavy reliance on FDPIR for nutritional intake, efforts to improve the quality of the commodities baskets could have a tremendous impact on the overall health status of recipient populations.

There is also concern that they are quickly losing their connections to their culture. However, there are opportunities for positive and sustainable change in this area. Teaching cultural knowledge is part of the pathway away from diabetes. Elders can pass down recipes that incorporate traditional foods to the younger generation.

Food Distribution Program on Indian Reservations (FDPIR)[32]

This is a federally administered program that provides commodity foods to low-income households living within reservation boundaries and to Native American families living in designated areas near the reservations. For fiscal year 2006, FDPIR has averaged congressional appropriations in the area of $82.5 million. This program falls under the aegis of the USDA and is administered at the federal level by the Food and Nutrition Service. Locally, the program is run in cooperation with Indian Tribal Organizations (ITO) and 22 state agencies and was being used by 257 tribes during fiscal year 2006 (Halpern, 2007).

To be eligible to receive commodity packages, households must be on a federally recognized reservation. Households that are in designated areas near a reservation boundary must have at least one Native American member to qualify for the program.[33] Household assets and incomes must fall within a specified limit; those limits are established by the Federal Government and do not vary by tribe. Participating households receive a monthly food package by either traveling to a central distribution site or by tailgate distribution from trucks.

FDPIR is an alternative to the Food Stamp Program and can be used in combination with the WIC. Because of a combination of isolated or rural geographic location and infrastructure problems, easily accessible grocery stores are often not available to the most needy populations. Even when grocery stores and trading posts do exist, the selections of available foods are often very limited and more expensive than those at larger urban supermarkets. This reduces the purchasing power of food stamps. Each participant receives a monthly food package that consists of meats, vegetables, fruits, dairy products, grains and cereals.[34] On some reservations, the program also allows participants to choose from a variety of fresh produce, rather than canned items.

Given the number of health problems on the reservations that are nutrition and lifestyle related (diabetes, obesity, and hypertension), the FDPIR food package was updated in 1997 and again in 2004. Tribal program managers, elected tribal officials, USDA nutritionists, and other experts on Native American health and nutrition worked together to improve the nutritional quality and the cultural acceptability of the foods provided. The addition of bison in certain areas reflects response to these requests. However, the FDPIR Food Package Work Group has denied requests for some culturally preferred foods, such as blue cornmeal, when they have been determined to be much more expensive and provide no nutritional advantage over products that are currently being offered (Finegold et al., 2005). Changes were also made in the packaging of food products

[32] FDPIR is authorized under Section 4(b) of the Food Stamp Act of 1977 and Section 1336 of the Agriculture and Food Act of 1981. Federal regulations governing the program can be found at 7 CFR, Parts 250 ("Administration of the Food Distribution Program for Households on Indian Reservations"), 253 ("Administration of the Food Distribution Program for Indian Households in Oklahoma"), and 254 ("Donations of Food For Use in the United States, Its Territories and Possessions and Areas Under Its Jurisdiction").

[33] The state of Oklahoma presents an exception to this requirement. As Oklahoma was initially designated in its entirety as "Indian Territory," it lacks reservations. Thus, only income-eligible households that reside in a designated service area and include at least one Native American member can participate. For more specific information, see 7 CFR 253.

[34] For a complete list of current FDPIR commodities products, see Appendix C.

to increase ease of use and reduction of stigma. USDA labels, wherever possible have be exchanged for commercial brand-name labels (Finegold, et al., 2005).

Food Stamps

In fiscal year 2002, an estimated monthly average of 303,000 American Indians participated in the food stamp program (Finegold et al, 2005). The average benefit level in 2007 was $96 per person or $215 per household per month (ver Ploeg, 2008). Purchasing power varies dramatically based on location, with more geographically isolated or rural areas having higher prices (Frisvold and Fonte, 2007; Dillinger et al 1999; Davis et al., 2002).

Food stamp programs are a popular alternative to FDPIR. Dillinger et al. (1999) find that AIAN respondents prefer food stamps because the commodity food is monotonous. Others perceive that they can get more food with food stamps. Finegold et al. (2005) report preferences for food stamps centers around the ability to choose for themselves what they wish to purchase.

However, other studies have revealed problems with participation in this program. Some have commented on the impact that changes in eligibility requirements have had on food security issues. Davis et al. (2002) report that work requirements are making food stamp programs more difficult to use. Many mothers report having difficulty finding enough child care to cover their required work hours. The cost of gas and the onus of finding transportation to work have also increased problems with food stamp usage.

WIC

This program is administered by the USDA. It is designed to provide supplemental food, nutrition education, and health care referrals for pregnant and postpartum women, infants, and children (< 5 years old). In 1998, 48 percent of infants and children under the age of 5 and 65 percent of pregnant Native women were enrolled in WIC (USDA, 2002). Applicants to the program must demonstrate nutritional risk (nutritionally related medical conditions, dietary deficiencies, conditions that predispose them to inadequate nutritional patterns, etc.). USDA (2002) reports that reservation WIC participants are more likely to present with multiple risks than all other WIC enrollees.

According to one study conducted by McCloskey and Chee (2006), there are numerous barriers to more healthful outcomes among WIC participants. Many participants do not receive nutritional training because they cannot afford gas or get rides to office locations. Traditions of food sharing often mean that resources are divided across a much larger group than intended, thereby reducing portion sizes. Extended family living patterns also have an impact. Navajo women live in matrilineal structures. As a result, mothers or grandmothers, not the WIC recipients, are responsible for the food shopping and preparation. Thus, even if they have received proper nutritional education and counseling, WIC recipients may not be able to put these lessons into practice in their households. This suggests that nutrition education and food preparation programs be targeted to older generations and brought to local areas.

STRATEGIES FOR INTERVENTION

Many of the diseases plaguing AIAN populations are amenable to management, and are sometimes preventable through modifications in behavior. This provides significant opportunities to make sustainable positive changes in the health outcomes of a large number of people. As discussed above, with healthier populations, resources can be redirected to other efforts to continue to improve living conditions and cultural survival (Harrison, 2004).

Successful strategies must be tailored to preferences of the target population. As noted, the Native American population is heterogeneous. The Winnebago Reservation Diabetes Wellness Project (see Halpern, 2007) found great success by using "talking circles" to share information about nutrition-related diseases and to provide support and encouragement for community members. They also had some success with home visit components to help reinforce healthier cooking practices. However, this model cannot be mapped onto every culture. In fact, the Gila River Pima find the notion of home visits intrusive, rude, and inappropriate. "Talking circle" models do not mesh well with their cultural mores either. The population responded much better with personalized goals that focused on the individual and respected anonymity and privacy (Smith-Morris, 2006).

Even within the same reservation boundary, there are distinct areas with specific sets of needs. Community participation is essential in identifying and prioritizing local needs, opportunities, and resources to design successful programs (Ho et al, 2006; Saksvig et al. 2005; Smith-Morris, 2006). Collaborative partnerships with tribal colleges are a viable option for this level of investigation (Ambler, 2003). The colleges, while underfunded, can provide a substantial resource base in the form of faculty and students from the local areas. They can maximize social capital to help to identify key informants, conduct interviews, etc. Experience suggests that more accurate data is collected when local residents are used to help in the preparation of surveys, the implementation of interviews, and the creation of programming efforts. In addition to addressing some issues of trust, local participants are more likely to speak local languages. This can increase the comfort and response levels of older participants.

Tribal colleges are also rich in cultural capital. They have knowledge about social mores and values and can be a vital asset in gathering information about sensitive topics (Ambler, 2003). In addition to ensuring the cultural sensitivity of any programming or training efforts, this type of partnership contributes directly to capacity-building at the tribal college level and at the community level. For example, Keweenaw Bay Ojibwa Community College offers a summer science camp to educate children about diabetes and science careers in veterinary medicine and wildlife management. For a detailed example of how tribal colleges can contribute to both social ecology and empowerment based models of nutrition intervention, refer to Appendix D for a discussion of Tohono O'odham Community College.

Social Ecology Models

To institute lasting change and be sustainable, interventions should be guided by *Social Cognitive Theory* (Gittelsohn et al., 2006; Saksvig et al., 2005). Under this framework,

programming efforts have to focus on positive change in the broader environment in which consumption takes place. As Story et al (2003) note, there is an ecology of poverty that is consistent with the prevalence of obesity and other related diseases. Thus, social ecology models of intervention should focus on integrating multiple levels of programming efforts (Ho et al. 2006). Changes in interpersonal processes (characteristics and/or preferences of the individual), primary groups (family) and their relation to individuals, institutional factors (schools), community factors (social norms), and public policy (local regulations and policies) should all be targeted simultaneously (Halpern, 2007). Refer to Appendix E for a discussion of the Zuni Diabetes Project as a detailed example of a social ecology model.

As part of this larger environmental construct (Social Cognitive Theory), it is not enough to simply increase availability of healthy food options, promote healthier food choices, or cooking methods. Partnerships must be developed between the communities, local businesses and store owners, and interested agencies. According to Gittelsohn et al. (2006), many people in their survey have low food knowledge, little label reading knowledge, and low knowledge of healthy food preparation practices and portion sizes. These influence diet quality. Improved awareness of healthful options and cooking tips can be implemented by store promotions and demonstrations with taste tests (Collins et al., 2006). Ho et al. (2006) finds that partnering with local grocery stores to use shelf labels to identify foods that are lower in fats and sugars and high in fiber is a successful option.

Brown's findings (2007) support this use of this type of programming. Respondents on a Northern Plains reservation are very interested in nutritional programs. The most popular request is for shopping tips: how to get the most for their money at the store. Respondents want help reading and understanding nutritional facts labels on food to enable them to make better choices. They are also amenable to cooking demonstrations and taste samples to show them how to combine all of these things in a practical setting. The use of models or visual aids such as marked glass bowls, plates, cups, and spoons help people to understand portion sizes (Slattery et al., 2008; Stang et al., 2005; Archer et al., 2004).

Community-wide activities can be used to transmit and reinforcement these messages as well. Community potlucks, cultural feasts, festivals, and powwows are places where cooking and preparation demonstrations can take place and recipes can be exchanged (Dillinger et al., 1999). Traditional dance is also a great way to get people moving in a social context.

Utilizing existing community structures and tribal colleges can also help to alter the pace of educational components for better impact. Ho et al. (2006) report many of their respondents having difficulties understanding the information presented to them in biomedical language (see also Smith-Morris, 2006, for problems with the biomedical emphasis to health messages). Respondents in multiple studies (Ho et al., 2006; Lautenschlager and Smith, 2006; Halpern, 2007) complained that the pace of health and nutrition education that is being provided by IHS and other agencies is "too much, too fast." This gap between teaching and learning styles inhibits the ability to put nutritional knowledge into daily practice (Lautenschlager and Smith, 2006). Fort Bertold created "Diabetes Bingo!" to help fill this gap. Coeur d'Alene created a "Rock n' the Rez" summer program to transmit health and nutrition messages kids and youth in "their language."

Finally, schools and learning institutions are important loci for nutritional information transmission and the development of healthy eating preferences and living habits. "Pathways," a multiple school study and program, developed culturally appropriate lessons for school aged children by working collaboratively with tribal members and elders. Informational posters were placed in classrooms and hallways. Students actively engaged in a variety of mentally stimulating and fun activities such as completing worksheets and coloring pages. They also had hands-on activities such as measuring foods according to serving size. Participation incentives and rewards included hula hoops and books. Govula et al. (2007) report increased knowledge about the importance of fruits and vegetables and serving sizes.

Empowerment Models

Empowerment models should play a central role in nutritional modification programs. People not only react to external influences, but actively and proactively engage in creating and regulating their own environments. The ability to perform new skills empowers individuals to take greater responsibility and control over their situations.[35] Intervention strategies should focus on ownership of these programs, which implies more control and investment, rather than simple participation (Companion, 2004).

One direct method of empowerment is to link nutrition and food choices to food sovereignty (Companion, 2005; USDHHS, 2004; Conti, 2006). Food sovereignty refers to the "rights of people to define how they will hunt, grow, gather, sell, or give away their food with respect to their own cultures and own systems of management of natural resources" (Conti, 2006, 234). Several studies have argued that this increases the transmission of cultural knowledge, the revitalization of cultural practices such as songs and ceremonies, reaffirms a positive collective identity (e.g., "Native Pride," "Cherokee Pride," "Healthy O'odham People"), and helps to establish and reinvigorate social ties.

Flora et al. (2007) looked at the centrality of food and food knowledge among the Hopi. Food serves as a form of social capital in that community. Gathering practices reinforce social ties and establish network connections between people. These can be useful for creating reciprocal obligation structures and other coping mechanisms in times of shortage or need. Gathering practices also promote exercise, increase knowledge of wild foods and native language and provide opportunities for mutual support and other forms of knowledge sharing.

Other nations that have been actively and successfully involved in linking food to sovereignty issues include the Tohono O'odham people (Lopez and Reader, 2003), discussed in Appendix D below. The Lakota have been working to restore buffalo herds to tribal lands, planting gardens of traditional foods, increasing water quality standards, and establishing game reserves. The White Earth Land Recovery Project in northern Minnesota supports traditional harvesters of rice, maple

[35] These skills can include how to properly monitor and understand blood sugar levels, how to properly perform (without injury) appropriate physical exercises, measure one's own blood pressure and heart rates, and select and prepare foods. Lautenschlager and Smith (2006) report that programs found success by teaching skills associated with goal setting, problem solving, coping with diabetes, and seeking social support.

syrup, and other foods and arts and has established an on-line retail outlet for their products. Some plains groups have created a new "food wheel" adapted from the traditional medicine wheel concept. Traditional foods and food choices are linked to spirituality and health through this venue (Conti, 2006). Finally, some California nations have created the California Foodway Model. This is designed for easy adaptation for each individual California tribe to include their specific regional foods in the food basket.

CONCLUSION

As with any behavioral modification program, there are numerous challenges to implementing long-term positive changes. While Archer et al. (2004) find that nutritional education has a positive impact on eating habits, the issues that surround poverty complicate the integration of knowledge into daily practice. These include transportation and storage of fresh and frozen foods. Significant, but not widely discussed in the literature, is the impact of high levels of alcohol consumption. Additionally, the realities of wage labor and the need for child care make it much more difficult for people to engage in traditional gathering practices. Time constraints are a significant factor in structuring daily household routines and food preparation.

There are also significant barriers to participation in physical activity. One of the most often cited is lack of access to child care. In addition to time constraints (work, school, homework, chores), there are problems getting to exercise facilities. There are large numbers of reservation residents who don't own a car or can't afford the added expenditure of gas in their budgets. In some places, the exercise facilities are too far away or there may not be one. The quantity and quality of available exercise equipment and trained physical education specialists in exercise facilities and in school settings is also a serious issue. Improper performance of exercises can lead to strain and injuries. Even if these injuries are minor, this represents a disincentive to continue.

For those who are seeking alternatives to specialized facilities, weather conditions can play a major factor in whether someone is even able to go for a walk. Many reservation areas experience extreme conditions (heat or cold) during significant portions of the year. Social stigma and safety concerns are other disincentives. Dusty roads, snakes, unleashed dogs, cars/drunks, and living in "bad neighborhoods" reduce the desirability of engaging in outdoor activities. Finally, those with already limited or compromised mobility have fewer options and need to participate in specialized programs (Halpern, 2007; Compher, 2006; Ho et al, 2006; Lautenschlager, 2006; Powell et al., 2004; Phillips and Finn, 2000).

It is also impossible to ignore the role that mass media (television programming, targeted commercials, and the internet) has on popularizing certain "status foods" and fast foods at the expense of traditional foods. Western culture and television are also having an impact on body image and standards of attractiveness (Story et al, 2003; Phillips and Finn, 2000). This area needs to be explored in greater depth.

However, with all of these challenges also come opportunities. Robertson and Kattlemann (2007) found that internet-based diabetes support groups were very appealing to younger generations of

reservation residents. Tohono O'odham Community Action has found a way to increase production of local foods to make them more consistently available to all reservation residents (see Appendix D). Many diseases that are prevalent among reservation populations are manageable and their impacts modifiable. With targeted, collaborative, and strategic programming, improvements in quality of life can continue to improve and increase the pace of reservation gains. As the impact of physiological pathologies are reduced, greater opportunities for development and lifestyle improvements will follow.

REFERENCES

Archer, SL, Greenlund, KJ, Valdez, R, Casper, ML, Rith-Narjarian, S, and Croft, JB. 2004. Differences in food habits and cardiovascular health among Native Americans with and without diabetes: the Inter-Tribal Heart Project. *Public Health and Nutrition* 7(8): 1025-1032.

Aspenland, Sara and Suzanne Pelican. March-April 1992. "Traditional Food Practices of Contemporary Taos Pueblo." *Nutrition Today* 27(2): 6 – 13.

Ballew, Carl, Linda L. White, Karen F. Strauss, Lois J. Benson, James M. Medlein, and Ali H. Mokdad. 1997. "Intake of Nutrients and Food Sources of Nutrients Among the Navajo: Findings from the Navajo Health and Nutrition Survey." *The Journal of Nutrition* 127: 2085S – 2093S.

Bass, Mary A. and Lucille M. Wakefield. January 1974. "Nutrient Intake and Food Patterns of Indians on Standing Rock Reservation." *Journal of the American Dietetic Association* 64: 36 – 41.

Basiotis, PP, Lino, M and Anand, R. 1999. The Diet Quality of American Indians: Evidence from the Continuing Survey of Food Intakes by Individuals. *Family Economics and Nutrition Review* 12(2): 44 -46.

Bliss, RM. 2004. Breaking Barriers to American Indian Nutrition Research. *Agricultural Research* 52(7): 18-19.

Broussard, Brenda A., Ayah Johnson, John H. Himes, Mary Story, Ronal Fichtner, Fern Hauck, Karen Bachman-Carter, Joy Hayes, Karen Frohlich, Norma Gray, Sarah Valway, and Dorothy Gohdes. 1991. "Prevalence of Obesity in American Indians and Alaska Natives." *American Journal of Clinical Nutrition* 53: 1535S – 1542S.

Brown, Amy C. and Barrett Brenton. May 1994. "Dietary Survey of Hopi Native American Elementary Students." *Journal of the American Dietetic Association* 94(5): 517 – 522.

Brown, Blakely. 2007. Measuring Food Purchases, Community Needs and Tribal Policy for Healthy Foods in Local Grocery Stores on and Near a Northern Plains Indian Reservation. Tucson, AZ: Native Peoples Technical Assistance Office.

Byers, Tim and John Hubbard. 1997. "The Navajo Health and Nutrition Survey: Research that Can Make a Difference." *The Journal of Nutrition* 127: 2075S – 2077S.

Campbell, Gregory R. 1989. "The Changing Dimension of Native American Health: A Critical Understanding of Contemporary Native American Health Issues." *American Indian Culture and Research Journal* 13(3 & 4): 1 – 20.

CDC, USDHHS. August 2003. Surveillance for Health Behaviors of American Indians and Alaska Natives: Findings from the Behavioral Risk Factor Surveillance System, 1997 – 2000. Atlanta, GA: Morbidity and Mortality Weekly Report, Surveillance Summaries, Vol. 52, No. SS-7.

Collins, JK, Davis, AR, Adams, A, Manness, M and Perkins-Veazie, PM. 2006. Consumer Acceptability of Low-sugar Watermelon Sweetened with Non-calorie Sweetener by a Native American Community. *International Journal of Food Sciences and Nutrition* 57(5/6): 363-368.

Companion, Michèle. 2005. "The Impacts of Public Policy Implementation on Tribal Health Care Management: The Case of OEO/CAP." *Research in the Sociology of HealthCare* (23): 217–232.

Companion, Michèle. April 2004. "Constructing an Analytical Model of Indigenous Sovereign Action: An International Development Approach." *Indigenous Peoples' Journal of Law, Culture, and Resistance*, UCLA School of Law 1(1): 87-109.

Compher, C. 2006. The Nutrition Transition in American Indians. *Journal of Transcultural Nursing* 13(3): 217-223.

Contri, KM. 2006. Diabetes Prevention in Indian Country: Developing Nutrition Models to Tell the Story of Food-System Change. *Journal of Transcultural Nursing* 17(3): 234-245.

Cunningham, Peter J. and Llewellyn J. Cornelius. 1995. "Access to Ambulatory Care for American Indians and Alaska Natives: The Relative Importance of Personal and Community Resources." *Soc. Sci. Med.* 40(3): 393 – 407.

Davis, Judith, Hiwalker, Rita, Ward, Calor, and Dahlin, Eric. 2002. How have Welfare Reforms Affected Access to Food Assistance Programs Among Two High Needs Groups at Northern Cheyenne: Young Families and Families Depending on Seasonal Employment? Tucson, AZ: Native Peoples Technical Assistance Office.

Dillinger, Teresa L., Stephen C. Jett, Martha J. Macri, and Louis E. Grivetti. 1999. "Feast or Famine? Supplemental Food Programs and Their Impacts on Two American Indian Communities in California." *International Journal of Food Sciences and Nutrition* 50: 173 – 187.

Drevets, Curtis C. 1972. "Diabetes Mellitus in Choctaw Indians." In *Health Problems of U.S. and North American Indian Populations,* David Rabin, ed. New York: MSS Information Corporation, 114 – 121.

Evans, Robert G., Morris L. Barer, and Theodore R. Marmor, eds. 1994. *Why are Some People Healthy and Others Not? The Determinants of Health of Populations.* New York: Aldine De Gruyter.

Finegold, K., Pindus, N., Wherry, L., Nelson, S., Triplett, T., and Capps, R. January 2005. Background Report on the Use and Impact of Food Assistance Programs on Indian Reservations. Washington, D.C.: USDA Food Assistance and Nutrition Research Program, Contractor and Cooperator Report No. 4.

Flora, C.B., Livingston, M., Honyestewa, I., and Koiyaquaptewa, H. 2007. Understanding Access to and Use of Traditional Foods by Hopi Single Parent Female Headed Households: Outreach to the Hopis Community and its Organizations. Tucson, AZ: Native Peoples Technical Assistance Office.

Freedman, David S., Mar K. Serdula, Christopher A. Percy, Carol Ballew, and Linda White. 1997. "Obesity, Levels of Lipids and Glucose, and Smoking Among Navajo Adolescents." *The Journal of Nutrition* 127: 2120S – 2127S.

Freeman, Catherine and Fox, May Ann. 2005. Status and Trends in the Education of American Indians and Alaska Natives. Washington, D.C.: National Center for Education Statistics.

Frisvold, George and Fonte, Anita. 2007. The Cost and Availability of Healthier Foods for the Pascua Yaqui Pueblo and the Old Nogales Highway Colinia: Community Baselines and Benefits of Mobile Markets. Tucson, AZ: Native Peoples Technical Assistance Office.

Galloway, JM. 2005. Cardiovascular Health Among American Indians and Alaska Natives: Successes, Challenges and Potentials. *American Journal of Preventive Medicine* 29: 11-17.

Gittelsohn, J, Anliker, JA, Sharma, S, Vastine, AE, Caballero, B and Ethelbah, B. 2006. Psychosocial Determinants of Food Purchasing and Preparation in American Indian Households. *Journal of Nutrition Education and Behavior* 38(3): 163-168.

Govula, C, Kattelman, K and Cuirong, R. 2007. Culturally Appropriate Nutrition Lessons Increased Fruit and Vegetable Consumption in American Indian Children. *Topics in Clinical Nutrition* 22(3): 239-245.

Gunderson, C. 2008. Measuring the Extent, Depth and Severity of Food Insecurity: an Application to American Indians in the USA. *Journal of Population Economics* 21: 191-215.

Halpern, Peggy. April, 2007. Obesity and American Indians/Alaska Natives. USDHHS, Office of the Assistant Secretary for Planning and Evaluation: Washington, D.C.

Harrrison, Gail G. July 20, 2004. Unpublished draft report on Household Food Insecurity.

Harvey-Berino, Jean, Wellman, A., Hood, V., Rourke, J. and Secker-Walker. May 2000. Preventing Obesity in American Indian Children: When to Begin. *Journal of the American Dietetic Association* 100(5): 564-566.

Heath, Gregory W., Robert H. Wilson, Juneal Smith, and Bruce E. Leonard. 1991. "Community-based Exercise and Weight Control: Diabetes risk reduction and Glycemic Control in Zuni Indians." *American Journal of Clinical Nutrition* 53: 1642S – 1646S.

Helitzer, DL, Peterson, AB, Sanders, M and Thompson, J. 2007. Relationship of Stages of Change in Attendance in a Diabetes Prevention Program. *American Journal of Health Promotion* 21(6): 517-520.

Henry, Leslie Rae. 2000. A Summary of Findings of Assessment of Food Concerns, Nutrition Knowledge and Food Security of Oglala Lakota College Students on the Pine Ridge Reservation. Tucson, AZ: Native Peoples Technical Assistance Office.

Ho, LS, Gittelsohn, J, Harris, SB, and Ford, E. 2006. Development of an Integrated Diabetes Prevention Program with First Nations in Canada. *Health Promotions International* 21(2): 88-97.

Howard, Barbara V., Clifton Bogardus, Eric Ravussin, James E. Foley, Stephen Lillija, David M. Mott, Peter H. Bennett, and William C. Knowler. 1991. "Studies of the Etiology of Obesity in Pima Indians." *American Journal of Clinical Nutrition* 53: 1577S – 1585S.

Ikeda, J.P., S. Murphy, R.A. Mitchell, N. Flynn, I.J. Mason, A. Lizer, C. Lamp. July 1998. "Dietary Quality of Native American Women in Rural California." *Journal of the American Dietetic Association* 98(7): 812 – 816.

Jackson, M. Yvonne. November 1986. "Nutrition in American Indian Health: Past, Present, and Future." *Journal of the American Dietetic Association* 86(11): 1561 – 1565.

Jackson, M.Y., M.S. Cornelius, and W.A. Harrison. May – June 1985. "Food Nutrition Training for Tribal Cooks – Promoting Native American Health." *Public Health Reports* 100(3): 284 – 285.

Jackson, M. Yvonne and Floyd Godfrey. April 1990. "Federal Nutrition Services for American Indian and Alaska Native Elders." *Journal of the American Dietetic Association* 90(4): 568 – 572.

Jackson, M. Yvonne, Joanne M. Proulx, and Suzanne Pelican. 1991. "Obesity Prevention." *American Journal of Clinical Nutrition* 53: 1625S – 1630S.

Johnson, Francis E., John I. McKigney, Sharol Hopwood, and Jean Smelker. June 1978. "Physical Growth and Development of Urban Native Americans: A Study in Urbanization and Its Implications for Nutritional Status." *American Journal of Clinical Nutrition* 31: 1017 – 1027.

Keating, Daniel P. and Clyde Hertzman, eds. 1999. *Developmental Health and the Wealth of Nations: Social, Biological, and Educational Dynamics.* New York: The Guilford Press.

Knowler, William C., David J. Pettitt, Mohammed F. Saad, Marie A. Charles, Robert G. Nelson, Barbara V. Howard, Clifton Bogardus, and Peter H. Bennett. 1991. "Obesity in the Pima Indians: Its Magnitude and Relationship with Diabetes." *American Journal of Clinical Nutrition* 53: 1543S – 1551S.

Koehler, Kathleen M., Leslie Cunningham-Sabo, Lori C. Lambert, Raylene McCalman, Betty J. Skipper, and Sally M. Davis. February 2000. "Assessing Food Selection in a Health Promotion Program: Validation of a Brief Instrument for American Indian Children in the Southwest United States." *Journal of the American Dietetic Association* 100 (2): 205 – 211.

Koehler, Kathleen M., Mary B. Harris, and Sally M. Davis. April 1989. "Core, Secondary, and Peripheral Foods in the Diets of Hispanic, Navajo, and Jemez Indian Children." *Journal of the American Dietetic Association* 89(4): 538 – 541.

Kuhnlein, Harriet. August 1989. "Culture and Ecology in Dietetics and Nutrition." *Journal of the American Dietetic Association* 89(8): 1059 – 1063.

Kunitz, SJ. 2008. Changing Patterns of Mortality Among American Indians. *American Journal of Public Health*, 98(3), 404-411.

Lautenschlager, L and Smith C. 2006. Low-Income American Indians' Perception of Diabetes. *Journal of Nutrition Education and Behavior* 38(5): 307-315.

LeMaster, Pamela L. and Cathleen M. Connell. Winter 1994. "Health Education Interventions Among Native Americans: A Review and Analysis." *Health Education Quarterly* 21(4): 521 – 539.

Little Priest Tribal College, Winnebago, NE. 2000. The Impact of Food Assistance Programs on American Indian Reservations. Tucson, AZ: Native Peoples Technical Assistance Office, contract Y541958.

Lopez, Daniel and Reader, Tristan. 2003. Nutrition, Diabetes, and the Tohono O'odham Food System. Tucson, AZ: Native Peoples Technical Assistance Office

Mahoney, Martin C. and Arthur M. Michalek. 1999. "Cancer Control Research Among American Indian and Alaska Native: A Paradigm for Research in the Next Millennium." In Duane Champagne, ed. *Contemporary Native American Cultural Issues.* Walnut Creek: Alta Mira Press, 263 - 273.

Marjane, A. 2003. Reclaiming Native Health. *Tribal College Journal* 15(2): 8-9.

McCloskey, Joanne and Chee, Melvatha. 2006. An Ethnographic Study of the Factors Affecting the Nutritional Patterns of Navajo Women and Their Children in the WIC Program. Tucson, AZ: Native Peoples Technical Assistance Office.

McGinnis, J. Michael and Rachel M. Ballard-Barbash. 1991. "Obesity in Minority Populations: Policy Implications of Research." *American Journal of Clinical Nutrition* 53: 1512S – 1514S.

Mendlein, James M., David S. Freedman, Douglas G. Peter, Beulah Allen, Christopher A. Percy, Carol Ballew, Ali H. Mokdad, and Linda L. White. 1997. Risk Factors for Coronary Heart Disease Among Navajo Indians: Findings from the Navajo Health and Nutrition Survey. *The Journal of Nutrition* 127: 2099S – 2105S.

National Institutes of Health, National Heart, Lung, and Blood Institute, Office of Prevention, Education, and Control. November, 1998. Building Healthy Hearts for American Indians and Alaska Natives: A Background Report. USDHHS, Public Health Services: Washington, D.C.

Nord, Mark, Andrews, Mararet, and Carlson, Steven. November 2007. Household Food Security in the United States, 2006. USDA, Economic Research Service, Economic Research Report Number 49.

Noren, Jay, David Kindig, and Audrey Sprenger. January-February 1998. "Challenges to Native American Health Care." *Public Health Reports* 113(1): 22 – 33.

Olson, Brooke. 2001. "Meeting the Challenges of American Indian Diabetes: Anthropological Perspectives on Prevention and Treatment." In Clifford E. Trazfer and Diane Weiner, eds. *Medicine Ways: Disease, Health, and Survival Among Native Americans.* Walnut Creek: Alta Mira Press, 163 - 184.

Osterkamp, LK and Longstaff, L. 2004. Development of a Teaching Tool for American Indians and Alaskan Natives in Southern Arizona. *Journal of Nutrition Education and Behavior* 36(5): 272-274.

Pareo-Tubbeh, S.L., Shorty, M., Bauer, M.C., and Agbolosoo, E. 2000. The Variety, Affordability, and Availability of Healthful Foods at Convenience Stores. Tucson, AZ: Native Peoples Technical Assistance Office.

Pego, Christina M., Robert F. Hill, Glenn W. Solomon, Robert M. Chisolm, and Suzanne E. Ivey. 1999. "Tobacco, Culture, and Health Among American Indians: A Historical Review." In Duane Champagne, ed. *Contemporary Native American Cultural Issues.* Walnut Creek: Alta Mira Press, 245 – 262.

Percy, Chris, David S. Freedman, Tim J. Gilbert, Linda White, Carol Ballew, and Ali Mokdad. 1997. "Prevalence of Hypertension among Navajo Indians: Findings from the Navajo Health and Nutrition Survey." *The Journal of Nutrition* 127: 2114S – 2119S.

Phillips, J. and Finn, J. 2000. Dietary Choices and Weight Loss Practices Among Cheyenne River Lakota Households. Tucson, AZ: Native Peoples Technical Assistance Office.

Powell, Lisa M., Slater, Sandy, and Chaloupka, Frank J. 2004. The Relationship Between Community Physical Activity Settings and Race, Ethnicity, and Socioeconomic Status. *Evidence-Based Preventative Medicine* 2: 135-144.

Rhoades, Everett R., John Hammond, Thomas K. Welty, Aaron O. Handler, and Robert W. Amler. July-August 1987. "The Indian Burden of Illness and Future Health Interventions." *Public Health Reports* 102(4): 361 – 368.

Robertson, C, Kattelman, K and Ren, C. 2007. Control of Type 2 Diabetes Mellitus Using Interactive Internet-Based Support on a Northern Plains Indian Reservation. *Topics in Clinical Nutrition* 22(2): 185-193.

Rombeck, T. 2006. Simple Sustenance: Confronting Obesity by Returning to our Roots. *Indian Life* 26(5): 6.

Saksvig, BI, Gittelsohn, J, Harris, SB, Hanley, AJG, Valente, TW and Zinman, B. October 2005. A Pilot School-Based Healthy Eating and Physical Activity Intervention Improves Diet, Food Knowledge and Self-Efficacy for Native Canadian Children. *The Journal of Nutrition* 135: 2392-2396.

Sandefur, Gary D., Ronald R. Rindfuss, and Barney Cohen. 1996. "Introduction." In Gary D, Sandefur, Ronald R. Rindfuss, and Barney Cohen, eds. *Changing Numbers, Changing Needs: American Indian Demography and Public Health*. Washington, D.C.: National Academy Press, pp. 1 – 13.

Schulz, LO, Bennett, PH, Ravussin, E, Kidd, JR, Kidd, KK, Esparza, J and Valencia, ME. 2006. Effects of Traditional and Western Environments on Prevalence of Type 2 Diabetes in Pima Indians in Mexico and the U.S. *Diabetes Care* 29: 1866-1871.

Severson, K. 2005. Native Foods Nourish Again. *New York Times*, 11/23/2005, Vol. 155 Issue 53407, pF1-F5, 3p, 7c.

Sievers, Maurice L. 1972. "Disease Patterns Among Southwestern Indians." In *Health Problems of U.S. and North American Indian Populations,* David Rabin, ed. New York: MSS Information Corporation, 269 – 277.

Slattery, ML, Murtaugh, MA, Schumacher, MC, Johnson, J, Edwards, S, Edwards, R, Benson, J, Tom-Orme, L and Lanier, AP. 2008. Development, Implementation and Evaluation of a Computerized Self-Administered Diet History Questionnaire for Use in Studies of American Indian and Alaskan Native People. *Journal of the American Dietetic Association* 108: 101-109.

Smith-Morris, C. 2006. Community Participation in Tribal Diabetes Programs. *American Indian Culture and Research Journal* 30(2): 85-110.

Stang, J, Zephier, EM, Story, M, Himes, JH, Yeh, JL, Welty, T and Howard, BV. 2005. Dietary Intake of Nutrients to Modify Cardiovascular Risk from Three Groups of American Indians: The

Strong Heart Dietary Study, Phase II. *Journal of the American Dietetic Association* 105: 1895-1903.

Stevens, June, Carol E. Cornell, Mary Story, Simone A. French, Sarah Levin, Alberta Becenti, Joel Gittelsohn, Scott B. Going, and Raymond Reid. 1999. "Development of a Questionnaire to Assess Knowledge, Attitudes, and Behaviors in American Indian Children." *The American Journal of Clinical Nutrition* 69 (suppl): 773S – 781S.

Story, M, Stevens, J, Himes, J, Holy Rock, B, Ethelbah, B and Davis, S. 2003. Obesity in American-Indian Children: Prevalence, Consequences, and Prevention. *Preventative Medicine* 37: S3-S12.

Story, Mary, Marguerite Evans, Richard R. Fabsitz, Theresa E. Clay, Bonnie Holy Rock, and Brenda Boussard. 1999. "The Epidemic of Obesity in American Indian Communities and the need for Childhood Obesity-Prevention Programs." *The American Journal of Clinical Nutrition* 69 (suppl): 747S – 754S.

Story, Mary, Karen F. Strauss, Elenora Zephier, Brenda A. Broussard. February 1998. "Nutritional Concerns in American Indian and Alaska Native Children: Transitions and Future Directions." *Journal of the American Dietetic Association* 98(2): 170 – 177.

Story, Mary, Ruby A. Tompkins, Mary Ann Bass, and Lucille M. Wakefield. November 1986. "Anthropometric Measurements and Dietary Intakes of Cherokee Indian Teenagers in North Carolina." *Journal of the American Dietetic Association* 86(11): 1555 – 1560.

Strauss, Karen F., Ali Mokdad, Carol Ballew, James M. Mendlein, Julie C. Will, Howard I. Goldberg, Linda White, and Mary K. Serdula. 1997. "The Health of Navajo Women: Findings from the Navajo Health and Nutrition Survey." *The Journal of Nutrition* 127: 2128S – 2133S.

Stroehla, BC, Malcoe, LH, and Velie, EM. 2005. Dietary Sources of Nutrients Among Rural Native American and White Children. *Journal of the American Dietetic Association* 105(12): 1908-1916.

Stuart, Paul. 1987. *Nations Within a Nation: Historical Statistics of American Indians*. Westport, CT: Greenwood Press Inc.

Szathmary, Emoke J.E., Cheryl Ritenbaugh, and Carol-Sue M. Goodby. 1987. "Dietary Change and Plasma Glucose Levels in an Amerindian Population Undergoing Cultural Transition." *Soc. Sci. Med.* 24(10): 791 – 804.

Taylor, CA, Keim, KS, and Gilmore, AC. 2005. Impact of Core and Secondary Foods on Nutritional Composition of Diets in Native American Women. *Journal of the American Dietetic Association* 105: 413-419.

Taylor, CA, Keim, KS, Gilmore AC, Parker, SP, and Van Delinder, JL. 2006. Most Commonly Consumed Foods and Food Perceptions in Native American Women. *American Journal of Health Behavior* 30(6): 613-625.

Taylor, Timothy L. January/February 1988. "Health Problems and Use of Services at Two Urban American Indian Clinics." *Public Health Reports* 103(1): 88 – 95.

Teufel-Stone, N. 2006. Promising Strategies for Obesity Prevention and Treatment within American Indian Communities. *Journal of Transcultural Nursing* 17(3): 224-229.

Teufel, Nicolette I. June 1996. "Nutrient-Health Associations in the Historic and Contemporary Diets of the Southwest Native Americans." *Journal of Nutritional and Environmental Medicine* 6(2): 179 – 190.

Teufel, Nicolette I. 1994. "Alcohol Consumption and Its Effect on the Dietary Patterns of Hualapai Indian Women." *Medical Anthropology* 16: 79 – 97.

Teufel, Nicolette I. and Darna L. Dufour. September 1990. "Patterns of Food Use and Nutrient Intake of Obese and Non-Obese Hualapai Indian Women of Arizona." *Journal of the American Dietetic Association* 90(9): 1229 – 1235.

Tinker, Lesley Fels. September 1994. "Diabetes Mellitus – A Priority Health Care Issue for Women." *Journal of the American Dietetic Association* 94((): 976 – 986.

Trafzer, Clifford E and Diane Weiner, eds. 2001. *Medicine Ways: Disease, Health, and Survival Among Native Americans.* Walnut Creek: Alta Mira Press.

U.S. Census Bureau, Census 2000 Summary Tape File 3.

U.S. Census Bureau, Census 1990 Summary File 3.

USDA, Food and Nutrition Service. May 2002. The Characteristics of Native American WIC Participants, On and Off Reservations. Washington, D.C.: Nutrition Assistance Program Report Series, The Office Of Analysis, Nutrition and Evaluation. Special Nutrition Programs, report no. WIC-02-NAM.

USDA. December 20, 2000. "USDA's Reinvention Plan for Household Programs: Final Report." http://www.fns.usda.gov/fdd/MENU/fd2000/fd2rpts.htm. Select USDA Proposal for Change.

USDHHS, Indian Health Service. January 2006. Facts on Indian Health Disparities. Washington, D.C.

USDHHS, Indian Health Services National Diabetes Program. 2004. Best Practices from the Special Diabetes Program for Indians. Washington, D.C.

USDHHS, Indian Health Service. 2005. Regional Differences in Indian Health, 2000-2001. Washington, D.C.

USDHHS, Indian Health Service. 2005. Trends in Indian Health, 2000-2001. Washington, D.C.

USDHHS, Indian Health Service, Urban Indian Health Program Branch. September 2001. Urban Indian Health Program Statistics, FY 2000. Wheaton, MD.

US Department of Health and Human Services, Indian Health Service. 1997. *Trends in Indian Health*. Washington, DC: US Government Printing Office.

Urban Indian Health Institute. February 2008. "Reported Health and Health-Influencing Behaviors Among Urban American Indians and Alaska Natives." Seattle Indian Health Board, Seattle, WA.

Urban Indian Health Institute. January 2008. "Urban American Indian/Alaska Native Maternal, Infant, and Child Health Capacity Needs Assessment. Seattle Indian Health Board, Seattle, WA.

ver Ploeg, Michele and Talston, Katherine. March 2008. Food Stamps and Obesity: What Do We Know? Washington, D.C.: USDA Economic Research Service, Economic Information Bulletin Number 34.

Warne, D. 2006. Research and Educational Approaches to Reducing Health Disparities Among American Indian and Alaska Natives. *Journal of Transcultural Nursing* 17(3): 266-271.

Weber, JL, Lytle, L, Gittelsohn, J, Cunningham-Sabo, L, Heller, K, Anliker, JA, Stevens, J, Hurley, J and Ring, K. 2004. Validity of Self-Reported Dietary Intake at School Meals by American Indian Children: The Pathways Study. *Journal of the American Dietetic Association* 104(5): 746-752.

Weiner, Diane. 2001. "Interpreting Ideas about Diabetes, Genetics, and Inheritance." In Clifford E. Trazfer and Diane Weiner, eds. *Medicine Ways: Disease, Health, and Survival Among Native Americans.* Walnut Creek: Alta Mira Press, 108 - 133.

Welty, Thomas K. 1991. "Health Implications of Obesity in American Indians and Alaska Natives." *American Journal of Clinical Nutrition* 53: 1616S – 1620S.

White, Linda L., Carol Ballew, Tim J. Gilbert, James M. Mendlein, Ali H. Mokdad, and Karen F. Strauss. 1997. "Weight, Body Image, and Weight Control Practices of Navajo Indians: Findings from the Navajo Health and Nutrition Survey." *The Journal of Nutrition* 127: 2094S – 2098S.

White, Linda L., Howard I. Goldberg, Tim J. Gilbert, Carol Ballew, James M. Mendlein, Douglas G. Peter, Christopher A. Percy, and Ali H. Mokdad. 1997. "Rationale, Design and Methodology for the Navajo Health and Nutrition Survey." *The Journal of Nutrition* 127: 2078S – 2084S.

Will, Julie C., Clark Denny, Mary Serdula, and Ben Muneta. March 1999. "Trends in Body Weight Among American Indians: Findings from a Telephone Survey, 1985 Through 1996." *American Journal of Public Health* 89(3): 395 – 398.

Will, Julie C., Karen F. Strauss, James M. Mendlein, Carol Ballew, Linda L. White, and Douglas G. Peter. 1997. "Diabetes Mellitus Among Navajo Indians: Findings from the Navajo Health and Nutrition Survey." *The Journal of Nutrition* 127: 2106S – 2113S.

Wolfe, Wendy S. and Diva Sanjur. July 1988. "Contemporary Diet and Body Weight of Navajo Women Receiving Food Assistance: An Ethnographic and Nutritional Investigation." *Journal of the American Dietetic Association* 88(7): 882 – 827.

Wolford, Johanna K., Clifton Bogardus, Victoria Ossowski, and Michal Prochazka. 2000. "Molecular Characterization of the Human *PEA15* gene on 1q21-q22 and association with Type 2 Diabetes Mellitus in Pima Indians." *Gene* 241: 143 – 148.

Young. T. Kue. 1996. "Recent Health Trends in the Native American Population." In Gary D, Sandefur, Ronald R. Rindfuss, and Barney Cohen, eds. *Changing Numbers, Changing Needs: American Indian Demography and Public Health.* Washington, D.C.: National Academy Press, pp. 53 – 75.

Zephier, E., Himes, J.H., Story, M., and Zhou, Xia. January 2006. Increasing Prevalences of Overweight and Obesity in Northern Plains American Indian Children. *Arch Pediatr Adolesc Med.* 160: 34-39.

APPENDIX A:

Current Population Survey Food Security Assessment Questions:

1. "We worried whether our food would run out before we got money to buy more." Was that *often, sometimes, or never* true for you in the last 12 months?
2. "The food that we bought just didn't last and we didn't have money to get more." Was that *often, sometimes, or never* true for you in the last 12 months?
3. "We couldn't afford to not eat balanced meals." Was that *often, sometimes, or never* true for you in the last 12 months?
4. In the last 12 months, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food? (*Yes/No*)
5. (If yes to Question 4) How often did this happen – almost every month, some months but not every month, or only in 1 or 2 months?
6. In the last 12 months, did you ever eat less that you felt you should because there wasn't enough money for food? (*Yes/No*)
7. In the last 12 months, were you ever hungry, but didn't eat, because there wasn't enough money for food? (*Yes/No*)
8. In the last 12 months, did you lose weight because there wasn't enough money for food? (*Yes/No*)
9. In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food? (*Yes/No*)
10. (If yes to Question 9) How often did this happen - almost every month, some months but not every month, or only in 1 or 2 months?

(Questions 11-18 are asked only if the household included children age 0-18)

11. "We relied on only a few kinds of low-cost food to feed out children because we were running out of money to buy food." Was that *often, sometimes, or never* true for you in the last 12 months?
12. "We couldn't feed our children a balanced meal, because we couldn't afford that." Was that *often, sometimes, or never* true for you in the last 12 months?
13. "The children were not eating enough because we just couldn't afford enough food." Was that *often, sometimes, or never* true for you in the last 12 months?
14. In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food? (*Yes/No*)
15. In the last 12 months, were the children ever hungry but you just couldn't afford more food? (*Yes/No*)
16. In the last 12 months, did any of the children ever skip a meal because there wasn't enough money for food? (*Yes/No*)
17. (If yes to Question 16) How often did this happen – almost every month, some months but not every month, or only in 1 or 2 months?
18. In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food? (*Yes/No*)

APPENDIX B:

Leading Clinical Nutrition Patient/Client Contacts, FY 1996[36]

Purpose	Number	Percent Distribution
Total Contacts[1]	*162,448*	*100.0*
General Nutrition	84,988	52.3
Diabetes	41,628	25.6
Weight Control	7,172	4.4
Prenatal	6,280	3.9
Cardiovascular Disease	3,364	2.1
Breastfeeding	2,540	1.6
Enteral/Parenteral Nutrition	2,320	1.4
Gestational Diabetes	2,300	1.4
Alcohol Related	1,868	1.1
Undernutrition	1,840	1.1
Renal	1,488	0.9
Gallbladder Disease	968	0.6
Trauma/Surgery/Burn/Severe Infection	880	0.5
Hypertension	688	0.4
Anemia	612	0.4
All Other	3,512	2.2

[1] Excludes activities that are not directly patient/client services and activities associated with program planning, administration, evaluation, and continuing education.
NOTE: Percentages do not sum to 100.0 due to rounding

[36] Department of Health and Human Services, Indian Health Service. 1997. *Trends in Indian Health*. Washington, DC: US Government Printing Office, 187.

APPENDIX C:

FDPIR Commodities List 2008*

FDPIR COMMODITY	PACK SIZE
GROUP (A) --	
VEGETABLES	
Beans, Green (A059)	24/15.5 oz cans
Beans, Lt Red Kid 300 (A076)	24/15.5 oz cans
Beans, Refried (A093)	24/15.5 oz cans
Beans, Vegetarian (A090)	24/15.5 oz cans
Carrots (A098)	24/15.5 oz cans
Corn, Cream (A122)	24/15.5 oz cans
Corn, Whole Kernel (A119)	24/15.5 oz cans
Peas (A144)	24/15.5 oz cans
Potatoes, Sliced (A170)	24/15.5 oz cans
Potatoes, Dehydrated (A196)	12/1 lb packages
Pumpkin (A164)	24/15.5 oz cans
Spaghetti Sauce (A236)	24/15.5 oz cans
Spinach (A167)	24/15.5 oz cans
Sweet Potatoes (A223)	24/15.5 oz cans
Tomatoes Diced (A234)	24/15.5 oz cans
Tomato Sauce (A244)	24/15.5 oz cans
Tomato Soup low salt (A219)	24/10.5 cans
Veg Mix (A057)	24/15.5 oz cans
Vegetable Soup low salt (A218)	24/10.5 cans
JUICES	
Apple Juice (A282)	12/46 oz cans
Crnbry Apple J (A279)	12/46 oz cans
Grape Juice 46 (A284)	12/46 oz ctn
Grape J (A285)	12/46 oz cans
Orange Juice (A300)	12/46 oz cans
Pineapple Juice (A286)	12/46 oz cans
Tomato Juice (A290)	12/46 oz cans
Grapefruit Juice (A280)	
FRUITS	
Apricots (A353)	24/15.5 oz cans
Applesauce (A351)	24/15.5 oz cans
GROUP (B) --	
DAIRY & GRAINS	
Bakery Mix (B367)	6/5 lb bags
Bakery Mix, Lowfat (B368)	6/5 lb bags
Cheese, Process (B064)	6/5 lb loaves
Cheese, Blend (B119)	6/5 lb sliced
Cornmeal, Yellow (B138)	8/5 lb bags
Crackers Unsalted (B370)	12/16 oz boxes
Egg Noodles (B424)	12/1 lb packages
Evaporated Milk (B117)	24/12 oz cans
Instant Nonfat Dry Milk (B095)	12/25.6 oz packages

FDPIR COMMODITY	PACK SIZE
FRUITS (Cont'd)	
Mixed Fruit (A404)	24/15.5 oz cans
Peaches (A411)	24/15.5 oz cans
Pears (A437)	24/15.5 oz cans
Dried Plums (A489)	24/1 lb package
Raisins (A501)	24/15 oz pack
MEATS	
Beef, Canned (A721)	24/24 oz cans
Beef, Froz Fn Grnd (A609)	40/1 lb pack
Beef Stew, Can (A590)	24/24 oz cans
Beef Roasts (A613)	38-42 lb carton
Chix Cut Up 4 lb (A557)	12/4 lb pack
Chicken, Can (A532)	48/12.5 oz cans
Tuna, Canned (A743)	24/12 oz cans
Turkey Hams (A581)	40 lb carton
DRY BEANS	
Beans, Grt Northern (A917)	12/2 lb pack
Beans, Lima (A912)	12/2 lb pack
Beans, Pinto (A914)	12/2 lb pack
MISCELLANEOUS	
Egg Mix (A570)	48/6 oz pack
SPECIALITY ITEMS	
(Subject to available funds)	
Ham, Frozen (A669)	12/3 lb carton
Spaghetti (B835)	12/2 lb pack
Vegetable Oil (B666)	8/48 oz bottles
READY TO EAT CEREALS boxes	
Cereal WB Flakes 14 (B876)	14/17.3 oz
Ceral WB Flakes 17 (B859)	14/17.3 oz
Cereal Corn Flk 18 (B878)	12/18 oz
Cerl Crn Flk 18 (B879)	12/18 oz
Cereal Crn & Rice 12 (Sqrs) (B855)	14/12 oz

USDA FDPIR FOODS AVAILABLE FOR 2008*

FDPIR COMMODITY	**PACK SIZE**	**FDPIR COMMODITY**	**PACK SIZE**
GROUP (B) -- **DAIRY & GRAINS (cont.)**		**READY TO EAT CEREALS** boxes	
Farina (B160)	24/14 oz boxes	Cereal Oats 15 (Circ) (B853)	12/15 oz
Flour, All Purpose (B182)	8/5 lb bags	Cereal Rice Crisp 12 (B833)	16/12 oz
Flour, Whole Wheat (B352)	8/5 lb bags	Cereal Rice (Crisps) (B838)	16/12 oz
Macaroni (B425)	24/1 lb packages	Cereal Corn (Squares) (B834)	14/14 oz
Mac N Cheese (B433)	48/7.25 oz packages		
Milk, Fluid 1 percent UHT (B385)	12/32 oz packages		
Oats (B437)	12/42 oz tube		
Peanut Butter (B474)	12/18 oz jars		
Peanuts, Roasted (B502)	12/16 oz packages		
Rice L 30/2 (B528)	30/2 lb packages		

Purchases are subject to market conditions. Does not include bonus commodities.

APPENDIX D:

Tohono O'odham Nation

Tohono O'odham Community College (TOCC) is a two-year tribal community college. Their goal is to enhance the Tohono O'odham's *Himdag* or "Desert People's Way" by strengthening individuals, families, and communities. The founding principles behind *Himdag* look to the traditions of the past to help create solutions for the future (Lopez and Reader, 2003). They have partnered with Tohono O'odham Community Action (TOCA), a grassroots organization, to create culturally based responses to community problems. Their goal is to reduce social, economic, and physiological pathologies through cultural revitalization and community self-sufficiency, thereby increasing individual and community capacity.

A primary focus has been the reinvigoration of traditional food production systems and reincorporation of elements of traditional diet to address nutrition-related pathologies. They note that all elements of traditional culture (language, songs, ceremonies, art, and stories) revolve around the system of food production. As grocery stores and commodities have replaced traditional gathering practices, ceremonies are no longer being performed and are being lost as elders die. For the Tohono O'odham, food sovereignty is directly linked to all aspects of their status as a people and is critical to their long-term cultural survival.

TOCA and TOCC acknowledge that the realities of modern wage labor strain a family and individual's ability to devote the time needed to gather sufficient quantities of traditional foods to have a marked impact on health. To make these foods more easily and readily available, they established a traditional agriculture project in 2002 as a learning laboratory and training area for traditional practices. Among other things, they established community gardens in multiple locations across the reservation to serve as learning centers for youth and young adults and to keep elders integrated into the community. They also organize numerous trips to collect wild foods. These not only provide exercise, but also encourage healthier diets and provide opportunities for cultural revitalization and knowledge transfer.

They have been conducting market analyses to demonstrate demand for traditional foods in their community and create solutions and partnerships to meet those demands. They are focused on direct marketing to families, wholesale markets, and restaurants to improve knowledge about and demand for native foods. As these purchases increase, so does the profitability and size of the reservation farms. To date, they have been able to market products to *Native Seed Search* and gift shops at cultural sites (Arizona-Sonora Desert Museum, the Heard Museum, the Arizona State Museum, Tohono Chul Park, and Casa Grande National Monument). They are in the process of reaching out to upscale natural food chains such as Wild Oats and Whole Foods. In addition, they are actively marketing products such as tepary beans, Tohono O'odham squash, and Tohono O'odham yellow-meated watermelons to high-end resorts such as Canyon Ranch and Wild Horse Pass Ranch.

It is believed that the partnership between TOCC, TOCA, and community residents will increase demands for locally produced foods, providing a larger number of jobs and income flow to the reservation. Making increased amounts of locally produced foods available will drop prices for local residents, making it easier to increase consumption of healthy food choices. Increasing the visibility of local foods will also strengthen cultural ties by reintroducing and reinforcing language and cultural elements at the family and community levels.

APPENDIX E:

Zuni Diabetes Project

The Zuni Diabetes Project is a perfect example of the social ecology model in action. This project began in the summer of 1983 (Smith-Morris, 2006). Shortly after the construction of the Zuni Wellness Center, team weight loss programs were implemented (Teufel-Stone, 2006). Teams work to reduce a collective amount of body weight in a designated period of time. The group focus employs a friendly form of peer pressure and competition to promote behavioral change, utilizing social networks and also emphasizing team and group loyalty (Teufel-Stone, 2006). This reinforces social cohesion and collective efficacy. As noted above, this is an essential component is building a strong identity. Teams design t-shirts with their own names and logos and also promote a Zuni collective identity ("Zuni Pride") at the same time. Unlike traditional sports oriented competitions, this type of program encourages the inclusion of heavier individuals, as they have more to lose and can make a significant contribution to the team's total.

The teams are self-selected (co-workers, family, friends) to maximize motivation and support. Results are posted publicly to inspire more progress. To make this more fun and knowing that their results are posted, teams devote significant effort to choosing clever names, abundant with puns and other local references. Over the course of the challenge, booster sessions are offered. These events provide food, motivational speakers, and health tips. At the end of the time frame, all participants are rewarded with certificates and gifts that encourage continued activity like calorie counters or pedometers.

Another on-going event is the "100 Mile Club." The objective is for participants to accumulate 100 miles of distance traveled through walking or jogging in a specified time period. These programs charge a small fee (reduced for youth and elders) to encourage commitment to completion. Incentives that support progress, such as water bottles and sun visors, are provided at registration and at periodic intervals in the program. Participants' progress is posted for competition and motivation. Elders, council members and other prominent community figures are specifically recruited for participation to increase the visibility and acceptance of the activity and associated events. Participation has also been supported in the workplace by providing longer lunch breaks for walkers to accumulate miles. Weekend runs and other public events are scheduled during that time frame. These provide enthusiasm and a venue to accumulate miles in a more festive and communal environment. The program usually closes with a traditional banquet that celebrates everyone's achievements. The visibility of these events has reduced some of the social stigma associated with walking for fun and exercise (implication is that you are too poor to have a car, therefore you have to walk).

This project has targeted multiple institutional levels within the community, including the school system. Poor water quality contributes to high levels of soft drink consumption. A study found that students were consuming an average of four sodas during the school day alone. It was also determined that school meals were high in fat and salt and low in fiber and fresh fruits and vegetables. Menu and food supplies were prioritized for immediate intervention.

Community leaders and outside organizations such as the American Diabetes Association worked with school administrators, personnel, and students to develop incremental shifts in consumption patterns. School food service personnel were interviewed about preparation methods and food availability. Their unanimous response was of feeling constrained by the

limited range of foods offered by commodity programs and vendors. They also reported being highly amenable to working with representatives from outside agencies to learn better recipes and food preparation methods. Based on this request, diabetes prevention staff members were brought in from the American Diabetes Association to provide food service personnel with low-fat recipes and easily implemented cooking suggestions, such as rinsing gravy and syrups off of canned foods.

A community task force comprised of diabetes prevention staff, school administrators, and tribal authorities focused on improving access to foods for school meals. They reached out to vendors from around the state. They were able to identify partnerships and grants for funding. They were also able to identify vendors who were willing to transport hard to obtain fruits and vegetables to the Pueblo for reasonable.

To mobilize and include the targets of intervention (students) in programming efforts, the schools mobilized a number of "teen task forces." Task force members were charged with conducting taste tests and preference surveys to identify healthy alternative snacks that could be sold in the school commissary. As it turns out, the teen palate is most satisfied by a combination of sweet and tart, as can be seen in the popularity of combination candies like "Sour Patch Kids" and "Atomic Warheads." As a result of the task force, dill pickles and lemon wedges have become best sellers. Students said that the pickles offer satisfaction for multiple forms of cravings: salty, sour, and crunchy.

The other major area of intervention was soda consumption. Teens and other students recommended a slow pace of implementation. In the first year of the program, diet soda was added to vending machines. In year two, the entire soft drink selection became sugar-free. Some juices were added. Coolers with bottled water were installed in various locations around the school. By year three, students were reporting noticeable declines in soft drink consumption.

Finally, a Zuni Teen Wellness Center, modeled after the original, was established. Surveys showed that young people were less likely to use the adult facility due to conflicts over noise levels and the types of music being played. The teen center is located at the high school, and has a diabetes resource center, some exercise equipment, and "bait" to attract youth who are not "gym oriented." There are video machines, foosball, vending machines that offer diet drinks and water, and a climbing/rappelling wall. Students are allowed to program their own music. The atmosphere focuses on interaction, encouragement, and fun. The results are positive: insulin levels have dropped, as have sitting heart rates, pulse rates, and heart recovery rates.

APPENDIX F:

Glossary of Selected Terms

Acculturation: The process of adopting the cultural traits or social patterns of another group.

Adipose Tissue: Connective tissue in which fat is stored and which has cells distended by droplets of fat.

Assimilation: The process whereby a minority group gradually adopts the customs and attitudes of the prevailing culture.

Carbohydrates: Classified as "simple" or "complex" depending on the chemical structure of the food. The classification reflects how quickly the sugar is digested and absorbed. Simple carbohydrates have one sugar (e.g. fructose, which is found in fruit, or galactose, which is found in milk products) or two sugars (e.g. lactose, which is found in dairy products, or sucrose, which is found in table sugar), while complex carbohydrates have three or more sugars.

Complex carbohydrates include whole grain breads and cereals, starchy vegetables, and legumes. Simple carbohydrates occur naturally in fruits, dairy products, and vegetables. Simple carbohydrates are also found in processed and refined sugars such as candy, table sugar, artificial syrups, and non-diet soda.

Refined sugars provide calories, but lack vitamins, minerals, and fiber ("empty calories") and can lead to weight gain. Excessive carbohydrates can cause an increase in the total caloric intake, causing obesity. Deficient carbohydrates can cause a lack of calories (malnutrition) or excessive intake of fats to make up the calories.

Cirrhosis: A chronic disease of the liver characterized by the replacement of normal tissue with fibrous tissue and the loss of functional liver cells. It can result from alcohol abuse, nutritional deprivation, or infection, especially by the hepatitis virus.

Co-morbid: Pertaining to two diseases that occur together.

Co-morbidity: A concomitant but unrelated pathological or disease process.

Cultural Capital: Refers to the cumulative products of the human mind that are imbued with symbolic meaning, including language, art, stories, music, and ideas.

Diabetes Mellitus: A disorder of carbohydrate metabolism, usually occurring in genetically predisposed individuals. It is characterized by inadequate production or utilization of insulin and results in excessive amounts of glucose in the blood and urine, excessive thirst and weight loss. It can also cause the progressive destruction of small blood vessels. This can lead to complications such as infections, gangrene, or blindness.

Type I Diabetes: also known as insulin-dependent diabetes and juvenile diabetes - A severe form of diabetes mellitus in which insulin production by the beta cells of the pancreas is impaired. This generally results in dependence on externally administered insulin. The onset of the disease usually occurs before age 25.

Type II Diabetes: also known as non-insulin dependent diabetes, adult-onset diabetes, or maturity-onset diabetes - A mild, sometimes asymptomatic form of diabetes mellitus that is characterized by diminished tissue sensitivity to insulin and sometimes by impaired beta cell function. This condition is exacerbated by obesity and is often treatable by diet and exercise.

Epidemiology: The branch of medicine dealing with the incidence and prevalence of disease in large populations and with detection of the source and cause of epidemics of infectious disease.

Endometrium: The mucous membrane that lines the uterus.

Etiology: The cause or origin of a disease.

Food Insecurity: A condition in which people lack basic food intake to provide them with the energy and nutrients for fully productive lives.

Food Sovereignty: The "rights of people to define how they will hunt, grow, gather, sell or give away their food with respect to their own cultures and own systems of management of natural resources" (Conti, 2006, 234).

Hypertension: Abnormally high arterial blood pressure that: 1) occurs without apparent or determinable prior organic changes in the tissues possibly because of hereditary tendency, emotional tensions, faulty nutrition, or hormonal influence or 2) occurs as a result of demonstrable organic changes (nephritis, diabetes, and hyperthyroidism).

Legumes: A plant whose characteristic fruit is a seed pod. They are widely cultivated for food, as fodder for livestock, and as a means of improving the nitrogen content of soils. Beans, peas, clover, alfalfa, and locust and acacia trees are all legumes.

Matrilineal: Inheriting or determining descent through the female line.

Mores: The accepted traditional customs and manners of a particular social group. Mores often serve as moral guidelines for acceptable behavior but are not necessarily religious or ethical.

Obesity: A condition characterized by excessive bodily fat.

Overnutrition: The excessive intake of food, especially in unbalanced proportions. This includes both quantity of direct intake and micronutrient composition.

Overweight: Bodily weight in excess of the normal for one's age, height, and build.

Pathology: The conditions and processes of a disease; any deviation from a healthy, normal, or efficient condition.

Physiological Pathology: As distinguished from social pathology, any deviation from a healthy, normal, or efficient physical condition.

Postpartum: The period shortly following childbirth.

Purchasing Power: The value of money in terms of what it can buy (goods and services) at a specified time or place compared to what it could buy at another period or place that is established as a base.

Renal: Pertaining to the kidneys or surrounding region.

Social Capital: The strength and breadth of connections within and between social networks; how people and resources are linked to each other across social space.

Social Ecology: The relationship between individuals, families, and communities and their natural, social, and created environments; how societies and communities interact with their environments.

Social Pathology: Any social factor, such as poverty, alcoholism, old age, or crime, that tends to increase social disorganization and inhibit personal adjustment. Also, the study of such factors and the social problems they produce.

Socioeconomic: Involving both social and economic factors; the relationship between economic activity and social life.

Sovereignty: Supreme and independent power or authority in government as possessed or claimed by a state or community.

Talking Circle: A method used by a group to discuss a topic in a non-confrontational manner and sharing fashion. The method relies on rules to maintain order and ensure equal opportunity for participation by all present. Group members sit in a circle. Only the person holding the "talking stick" or other symbolic item may speak. Others must listen and not interrupt the person who has the talking stick. The talking stick passes around the circle until everyone has had an initial chance to speak and then may be passed around again to those who wish to add additional comments. Some circles add additional ritualistic components by including a ceremonial opening and closing.

Undernutrition: A nutritional deficiency resulting from lack of food or from the inability of the body to convert or absorb it.