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The Relevancy of Community-Based Methods: Using Diet within Native American and Alaska Native Adult Populations as an Example

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Abstract

The rates of obesity, diabetes, and heart disease in Native Americans and Alaska Natives far exceed that of the general US population. There are many postulating reasons for these excessive rates including the transition from a traditional to a contemporary diet. Although information on the dietary intakes of Native American and Alaska Native communities are limited, there seems to be a consensus that the Native American and Alaska Native diet is high in total fat, saturated fat, cholesterol, and sodium. Further information on the diet needs to be attained so that dietary interventions can effectively be implemented in these communities. An approach that is community based is proposed as the best solution to understanding the Native diet and developing culturally tailored interventions to sustainably improve diet.

Keywords

community-based participatory research; Native Americans; Alaskan Natives; dietary intake; chronic diseases; obesity

Introduction

The Healthy People 2020 has a renewed focus on alleviating health disparities among the US population.[1] Health disparities occur when differences in health status are closely linked to a social, economic, and/or environmental disadvantage.[1] The recognition of health disparities has evolved in tandem with the adoption of the research paradigm of translational research. This paradigm grew from the desire to link the discoveries of molecular and clinical scientists to applications benefiting patients and the public. For these translational linkages to occur and reduce disparities among subgroups, an appreciation for the benefits of community-engaged research methods needs wider adoption.

Community-based participatory research (CBPR) has been able to effectively reduce and/or eliminate the marginalization of communities on the basis of race, ethnicity, gender, or

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class.[2,3] CBPR can decrease the cultural gap, allow for cultural context to be applied and trusting relationships to be forged.[2–4] This use of local knowledge and lived experiences enhances the relevance, use, quality, and validity of data.[3–6] Working closely with the community and employing community members strengthens study design and implementation.[4,5] A partnership forged with diverse expertise, which is a tenet of CBPR, has the potential to more effectively address complex problems.[6,7]

Diet and nutrition are important indicators of health, hence their inclusion in the objectives for Healthy People 2020.[1] There is an extensive body of literature validating the premise that diet plays a role in health. Diet composition affects the risk for type 2 diabetes,[8] certain types of cancer,[9,10] and coronary heart disease (CHD).[11–13] Obesity is associated with an imbalance in energy intake relative to expenditure.[14] The diseases most commonly related to health disparities such as heart disease, diabetes, and chronic liver disease, are linked to dietary intake. Balancing the many decisions that individuals need to make each day, there are few activities more salient to all people than dietary choices.

The purpose of this paper is to provide a framework to researchers for applying CBPR to a population group known to experience health disparities. Drawing from historical, cultural, and current health research on Native Americans and Alaska Natives, the advantages of using CBPR is outlined to guide the design and implementation of nutrition programs among this population.[15] Information related to the Native American/Alaska Native diet from traditional to modern times and the dietary interventions that have been implemented among Native American/Alaska Native communities will be reviewed. Issues that have impacted dietary assessment and influenced interventions within Native communities will be discussed. Suggestions on how to improve health outcomes through the use of community-based models will be offered as a solution. A specific example drawn from these concepts will bring these principles to life to emphasize that reversal of health disparities within disadvantaged populations, such as Native Americans/Alaska Natives, requires community involvement.

Health Profile

Prior to contact with Europeans, Native Americans, and Alaska Natives were generally considered to be free of chronic and infectious diseases.[15,16] Today these same populations exhibit poor health outcomes relative to the larger US population. Self-reported rates of hypertension, CHD, and diabetes are higher among Native American/Alaska Native respondents in comparison to other ethnic groups.[17] One of the highest rates of type 2 diabetes in the world has been documented in the Pima of Arizona.[18] Excessive rates of obesity have also been observed in Native People.[19–21]

Many theories have been proposed to explain the dramatic changes in the health profiles of Native Americans/Alaska Natives. One theory is that health profiles for these groups have been negatively impacted by outside social influences such as high rates of poverty, displacement, and a loss of connection to their traditional cultural context, alcoholism, depression, and inadequate healthcare.[22–24] For example, social influences unique to Native

American populations would be the US government's legacy of broken treaties and historical misconduct.

These outside social influences and subsequent lifestyle changes substantially impact dietary behaviors, an influential component to overall health.[25] And since diet is important in the maintenance of health and the etiology of disease,[26] understanding dietary profiles is essential, as many of the leading causes of death are diet related.[27] Changing dietary profiles of Native Americans/Alaska Natives, as well as other marginalized groups (e.g., immigrants) are part of a larger picture of dramatic changes in the health profiles for these groups.

Traditional Diets

The Native American/Alaska Native traditional food system (TFS) included all food within a particular culture available from local, natural resources and was culturally accepted.[28] TFS incorporated sociocultural meanings, acquisition and processing techniques, use, composition, and nutritional consequence for consumption.[28] These foods were dependent on seasonality, although preservation techniques such as smoking were used.[29] All of the essential nutrients necessary were provided as long as traditional methods were followed.[30,31]

As interaction with colonization forces increased, the Native American/Alaska Native diet transitioned. For example, the indigenous people of the southwest found that their TFS, which formerly consisted of corn, beans, squash, melons, mutton, goat, a variety of wild plants, game, and herbs, were being replaced by reservation commodity foods.[25,32] Quantitative analysis of trace elements in the teeth of 16th century versus contemporary (1970s) Hopi children found marked differences in tooth composition of strontium, a marker of traditional foods[33]; and less than one quarter of Hopi women and children recalled consuming a traditional dietary food item in a 24-hour period.[34]

Many reasons are cited for the transition away from traditional foods. Colonization influenced drastic demographic changes. Many Native American/Alaska Native communities were forced from their traditional homelands and onto reservations or into urban areas.[28,35] Enacted legislation restricted access to traditional food resources and harvesting areas. The onset of industrialization and modernization increased concern for the presence of contaminants.[36,37] The forced determination and imposition of outside, modern perspectives undermined the traditional foundations of these populations. Attempts to forcibly convert these cultures to more European-centric mores led to an interruption in the knowledge transfer across the generations. Coinciding with these forces, the increase in the availability and use of processed foods as a result of necessity (e.g., commodity food distribution) as well as an increased concern of self-support through employment ventures restricted engagement in traditional food acquisition.[28,35] This *nutrition transition* has been documented in the United States and the world.[38]

Epidemiology of Current Dietary Intakes Among Native Americans/Alaska Natives

Initially, information on the diets of Native Americans/Alaska Natives was gained through qualitative assessments by nutritional anthropologists. Prior to 1996, only eight studies were published that quantitatively assessed the Native diet.[39] Within the last two decades there has been considerable movement to enrich modern literature regarding Native American/ Alaska Native dietary intakes.

The modern assessment of the Native diet suggests that the nutrition transition has been detrimental. Analysis of dietary intakes from select Native American/Alaska Native adult populations to the Dietary Guidelines for Americans, 2005 (DGA 2005)[40] shows that these populations are not meeting recommendations for a healthy lifestyle (see Table 1).[41–52] For most of the communities assessed, intakes of fat, saturated fat, cholesterol, and sodium exceed DGA (2005). Further, suboptimal intakes of micronutrients have also been documented.[41–43,47] These dietary practices place these communities at risk for chronic diseases such as diabetes and heart disease.[8,11,12]

Summary of Interventions among Native Americans/Alaska Natives

Examinations of Native American/Alaska Native diets have resulted in the conclusion that current diets are not meeting the recommendations for overall health.[40] Although multiple interventions across First Nations of Canada and Native Hawaiian communities have occurred to improve overall dietary behaviors,[35,53–59] relatively few published interventions have taken place among Native Americans/Alaska Natives.

In a review by LeMaster and Connell,[60] of the 19 health education interventions evaluated, only four emphasized improving nutrition to reduce disease risk in Native American/Alaska Native adult communities. The interventions reviewed included two community wide exercise-education programs that used goal-setting and incentives that modestly improved physical activity and diet.[61,62] In the Winnebago and Omaha, nutrition education minimally reduced blood sugar and weight.[63] Nutrition education was also found to improve diabetes care and decrease weight at Fort Totten, North Dakota.[64]

Separate intervention programs were also implemented in the Pima and an urban community of Native American women. In the Pima, a program implemented as a randomized clinical trial that emphasized Pima history and culture and self-directed general learning improved dietary intake better than a structured nutrition intervention based on behavioral theories.[65] In the community of urban Native American women, a nutrition intervention that used the Social Cognitive Theory in combination with culturally appropriate content improved diet and decreased waist circumference.[66] Findings from these interventions suggest that adding culturally appropriate content enhances desired outcomes.[66]

Issues that Influence Dietary Assessment and Intervention Progress

A primary factor that influences dietary assessment and intervention efforts among Native populations is the incomplete “bank of information” on their dietary intakes. This may be

due in large part to two main issues: the historical and cultural contexts of Native People, and the methodological challenge of examining the Native diet. The paucity of information on dietary intakes may be an indication of the manner in which the history and culture of Native American/Alaska Native communities have been incorporated into nutritional assessments and/or interventions.[65,67] History has a profound impact on shaping the future of a people and culture influences the way a person views environmental control, biological variability, social organization, communication, personal space, and time orientation.[68]

Basis for mistrust

American indigenous groups have been plagued with previous unethical research experiences.[60,69] These experiences have led to general reluctance to participate in research efforts from outside institutions.[60,69] Repairing and then maintaining positive relationships with Native People will be an important element in future efforts to build an accurate profile of the dietary intakes of Native People. Recognizing the unique historical context of these population groups is an important initial step.

The history of Native Americans/Alaska Natives has been grouped into six phases.[70] These phases include pre-Western era, first contact with Westerners, economic competition for vital resources, invasion and war, subjugation, and forced placement on to reservations and into boarding schools with the ultimate goal of assimilation.[70,71] The history of Native People since contact has been characterized by a change from the traditional close connection between the land and culture, disruption of the family unit, and an impaired ability to pass on cultural practices and traditions.[70–73] The inherent sovereignty of these communities was undermined and for many not honored.[70] When health, social, and economic disparities are viewed outside of this historical context, there is the potential for these problems to be misunderstood and perpetuated rather than resolved.[67]

The role of culture

The cultural value system of Native people is rooted in a system quite different from the linearly framed Westernized views. Native Americans/Alaska Natives are now seen to be part of a high context culture whose thinking is circular in manner as a means to provide a strong sense of coherence and meaning.[67,74] This also applies to the difference in the language orientation between Natives and Westerners.[67,69]

Aboriginal values of health and wellness are also often viewed as holistic. Good health is the benefit of deeply intertwined harmonious interpersonal relationships with the environment.[31,75] Traditional views of illness often do not abide by the germ-theory or Western medical practice but rather subscribe to the view that events occur as a result of past or future occurrences.[27] Living a traditional lifestyle based on reciprocity, respect, sharing, and maintaining harmony with the human, natural, and spiritual realm is often highly valued in Native populations and associated with better well-being.[74,76] Many Native communities believe that the increase of chronic disease has occurred due to decreases in tradition and traditional foods, the loss of culture, and/or the loss of morale.[28,74]

The role of food in Native American/Alaska Native culture has often been dictated by the belief that balance with the environment is necessary. For many, a relationship existed

between humans, animals, the physical and spiritual world.[77] Humans and animals were dependent on each other for survival and required a relationship of respect. Among the Quileute, the bones and head of the first salmon caught were thrown into the river to ensure good will of the salmon spirits.[78] This was also meant to symbolize taking only what was needed and served as a reminder to strive for balance.[77]

Food is a significant source of Native identity, central to cultural expression, and participation.[31,79] There is pride associated with being traditional and not eating the “white man's food.”[77] Many believe that traditional, “whole” foods are superior to “processed” foods because they have better taste, are more nutritious, keep hunger satiated longer, and/or increase physical health.[74] For many, traditional food is a source of health, of en referred to as medicine.

Methodological issues of examining diet in Native American/Alaska Native communities

Table 1 lists nutritional epidemiological investigations of Native American/Alaska Native communities. A majority of the over 500 federally recognized and 200 unrecognized Native American/Alaska Native communities residing in this country have not been assessed.[80] In national surveys, Native Americans/Alaska Natives are grouped into one homogenous category despite their geographic, cultural, and historical diversity. Therefore, the current dietary profile available for Native Americans/Alaska Natives is not a conclusive picture of these populations' diets. Only two prospective cohort studies have been initiated and/or completed to investigate the link between diet and disease solely in this population.[20,81–83]

Community-Based Models: Proposed Solutions

The type of effort that is needed in Native American/Alaska Native communities is one that seeks to examine diet through a process that is viewed and anchored through “Native lenses” and is sensitive to the sociocultural and historical experiences of Native People. CBPR emphasizes research/intervention being tailored with the target population and respects their social and structural determinants of health. For a comprehensive review of CBPR, see Israel et al.[84]

Health is influenced by history and defined within a given culture (values and norms).[85] CBPR offers an opportunity for researchers to engage in a process that emphasizes unique community and cultural factors to understand the dynamics of diet and health in Native communities. Culture is a representation of both past and present experiences. It is a people's shared history, language, and psychological lineage carried across generations. Using CBPR, knowledge is produced through and connected to a population's culture and history.[85–87] Approaches that emphasize culture and history to empower a community are believed to work the best within collectivists' cultures that have experienced significant disempowerment, such as Native Americans/Alaska Natives.[88] This type of knowledge will directly benefit the community and provide the basis for the acquiring and application of vital resources to address identified dietary/health needs unique to that community.[84,89] There is tremendous potential to produce findings that can guide the development of further research, intervention, and policy change. CBPR has successfully been used to assess chronic disease-related risk factors in a Southwestern Alaska Native community.[88]

The principles of CBPR provide a framework for researches to understand the dynamics of diet in Native communities. However, establishing and maintaining trust, the foundation of CBPR, requires significant time and effort. Also, developing agreed upon CBPR principles, goals, and objectives can be challenging and further compounded by ethnic, cultural, social, and organizational differences between partnerships. Flexibility and compromise is necessary as the process works toward a fair distribution of resources and benefits.[89]

Applying Community-Based Concepts: A Hypothetical Case

Fry bread is a basic food of flour, salt, baking powder, and water fried in lard/oil, an outcome of commodity food distribution, and is consumed widely across Native communities. This simple food will be used to demonstrate use of community-based approaches within Native communities.

An objective evaluation of this high-fat, nutrient-poor food might lead a health professional to recommend its elimination from the diet of Native communities. However, through engaging the community it becomes apparent that the importance of fry bread goes beyond nutritional considerations. Fry bread has many positive and unique qualities. Fry bread is a representation of the historical legacy of Native People arising from the distribution of commodity foods.[90] Fry bread is a marker of history; it is symbolic of the journey of survival that Native People have made and represents their ability to cope with adversity. It has become a unifying item.[32,42–44,90–92] Eliminating fry bread would be ill advised and most likely unsuccessful due to its cultural and historical significance. However, modifying fry bread's preparation to improve nutrient content may be a more appropriate, sustainable option.[90] Community-based approaches can inform practitioners about the unique cultural practices, history, and traditions surrounding Native communities and lead to more sustainable behavioral change efforts.

Conclusion

Recognizing the profound implications of history, culture, and traditions on Native diets and other practices related to health will be essential to reduce the disproportionate level of disease in this population. Community-based methods provide a foundation of trust and hold promise to improve the validity, reliability, and usefulness of findings related to improving the health of disadvantaged groups. Developing a research process or designing an intervention under the direction of community-based methods, which emphasizes empowerment, can be a more effective way in which communities can improve their health.

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References

1. United States Department of Health and Human Services. [Accessed March 26, 2011] Healthy People 2020. http://www.healthypeople.gov [serial online]
2. Hatch J, Moss N, Saran A, Presley-Cantrell L, Mallory C. Community research: partnership in Black communities. Am J Prev Med. 1993; 9:27–31. [PubMed: 8123284]
3. Vega WA. Theoretical and pragmatic implications of cultural diversity for community research. Am J Community Psychol. 1992; 20:375–391.
4. Schulz AJ, Parker EA, Israel BA, Becker AB, Maciak B, Hollis R. Conducting a participatory community-based survey: collecting and interpreting data for a community health intervention on Detroit's east side. J Public Health Manag Pract. 1998; 4:10–24. [PubMed: 10186730]
5. Altman DG. Sustaining interventions in community systems: nn the relationship between researchers and communities. Health Psychol. 1995; 14:526–536. [PubMed: 8565927]
6. Hall BL. From margins to center? The development and purpose of participatory research. Am Sociol. 1992; 23:15–28.
7. Butterfoss FD, Goodman RM, Wandersman A. Community coalitions for prevention and health promotion. Health Educ Res. 1993; 8:315–330. [PubMed: 10146473]
8. Parillo M, Riccardi G. Diet composition and the risk of type 2 diabetes: epidemiological and clinical evidence. Br J Nutr. 2004; 92:7–19. [PubMed: 15230984]
9. Le Marchand L, Hankin JH, Wilkens LR, Kolonel LN, Englyst HN, Lyu LC. Dietary fiber and colorectal cancer risk. Epidemiology. 1997; 8:658–665. [PubMed: 9345666]
10. Kelemen LE, Cerhan JR, Lim U, Davis S, Cozen W, Schenk M, Colt J, Hartge P, Ward MH. Vegetables, fruit, and antioxidant-related nutrients and risk of non-Hodgkin lymphoma: a National Cancer Institute-Surveillance, Epidemiology, and End Results population-based case-control study. Am J Clin Nutr. 2006; 83:1401–1410. [PubMed: 16762953]
11. Willett WC. Diet and health: What should we eat? Science. 1994; 264:532–537. [PubMed: 8160011]
12. Hu FB, Stampfer MJ, Manson JE, Rimm E. Dietary fat intake and the risk of coronary heart disease in women. N Engl J Med. 1997; 337:1491–1499. [PubMed: 9366580]
13. Kris-Etherton PM, Harris WS, Appel LJ. Fish consumption, fish oil, omega-3 fatty acids, and cardiovascular disease. Circulation. 2002; 106:2747–2757. [PubMed: 12438303]
14. Frayn, K. Metabolic Regulation: A Human Perspective. 2nd. Oxford: Blackwell Science; 2003. Energy balance and body weight regulation; p. 300-320.
15. Westberg, J. Winds of Change. Vol. 24. American Indian Science & Engineering Society (AISES); Boulder, CO: 2009. Careers in dietetics and nutrition; p. 22-29.
16. Young, TK. The Health of Native Americans: Toward a Biocultural Epidemiology. New York: Oxford University Press; 1994.
17. Pleis JR, Lethbridge-Cejku M. Summary health statistics for U.S. adults: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat. 2007; 10(235)
18. Pavkov ME, Hanson RL, Knowler WC, Bennett PH, Krakoff J, Nelson RG. Changing patterns of type 2 diabetes incidence among Pima Indians. Diabetes Care. 2007; 30:1758–1763. [PubMed: 17468358]
19. Doshi SR, Jiles R. Health behaviors among American Indian/Alaska Native women, 1998–2000 BRFSS. J Womens Health. 2006; 15:919–927.
20. Slattery ML, Schumacher MC, Lanier AP, Edwards S, Edwards R, Murtaugh MA, Sandidge J, Day GE, Kaufman D, Kanekar S, et al. A prospective cohort of American Indian and Alaska Native people: study design, methods and implementation. Am J Epidemiol. 2007; 166:606–615. [PubMed: 17586578]
21. Zhang Y, Lee ET, Devereux RB, Yeh J, Best LG, Fabsitz RR, Howard BV. Prehypertension, diabetes, and cardiovascular disease risk in a population-based sample: the Strong Heart Study. Hypertension. 2006; 47:410–414. [PubMed: 16446387]

22. Barnes PM, Adams PF, Powell-Griner E. Health characteristics of the American Indian and Alaska Native adult population: United States, 2004–2008. Natl Health Stat Report. 2010; 20:1–22. [PubMed: 20583451]
23. Indian Health Service. Trends in Indian Health. [Accessed August 19, 2008] 1998–1999. Available at: http://www.ihs.gov/PublicInfo/Publications/trends98/trends98asp [serial online]
24. Joe, J.; Young, RS. Introduction. In: Joe, J.; Young, RS., editors. Diabetes as a Disease of Civilization: The Impact of Culture Change on Indigenous Peoples. New York: Mouton de Gruyter; 1994. p. 1-18.
25. Teufel NI. Nutrient-health associations in the historic and contemporary diets of Southwest Native Americans. J Nutr Environ Med. 1996; 6:179–189.
26. Rhoades ER, Hammond J, Welty TK, Handler AO, Amler RW. The Indian burden of illness and future health interventions. Public Health Rep. 1987; 102:361–368. [PubMed: 3112844]
27. Spector, RE. Cultural Diversity in Health and Illness. 6th. Upper Saddle River: Prentice Hall; 2004. Health and illness in the American Indian and Alaska Native population.
28. Kuhnlein HV, Receveur O, Chan HM. Traditional food systems research with Canadian indigenous peoples. Int J Circumpolar Health. 2001; 60:112–122. [PubMed: 11507960]
29. Jackson, MY. Diet, culture, and diabetes. In: Joe, JR.; Young, RS., editors. Diabetes as a Disease of Civilization: The Impact of Culture Change on Indigenous Peoples. 2nd. Berlin: Mouton de Gruyter; 1994. p. 381-406.
30. Draper HH. The aboriginal Eskimo diet in modern perspective. Am Anthropol. 1977; 79:309–316.
31. Kuhnlein HV, Receveur O. Dietary change and traditional food systems of indigenous peoples. Annu Rev Nutr. 1996; 16:417–442. [PubMed: 8839933]
32. Darby WJ, Adams CM, Pollard M, Dalton E, McKinley P. A study of the dietary background and nutriture of the Navajo Indian. Dietary pattern. J Nutr. 1956; 60:19–33.
33. Kuhnlein HV, Calloway DH. Minerals in human teeth: differences between preindustrial and contemporary Hopi Indians. Am J Clin Nutr. 1977; 30:883–886. [PubMed: 326020]
34. Kuhnlein HV, Calloway DH. Contemporary Hopi food intake patterns. Ecol Food Nutr. 1978; 6:16–24.
35. Kuhnlein HV. Change in the use of traditional foods by the Nuxalk Native people of British Columbia. Ecol Food Nutr. 1992; 27:259–282.
36. Schell LM, Gallo MV, Ravenscroft J, DeCaprio AP. Persistent organic pollutants and anti-thyroid peroxidase levels in Akwesasne Mohawk young adults. Environ Res. 2009; 109:86–92. [PubMed: 18995849]
37. Hightower JM, O'Hare A, Hernandez GT. Blood mercury reporting in NHANES: identifying Asian, Pacific Islander, Native American, and multiracial groups. Environ Health Perspect. 2006; 114:173–175. [PubMed: 16451850]
38. Popkin BM. Dynamics of the nutrition transition and its implications for the developing world. Forum Nutr. 2003; 56:262–264. [PubMed: 15806892]
39. Byers T. Nutrition and cancer among American Indians and Alaska Natives. Cancer. 1996; 78:1612–1616. [PubMed: 8839581]
40. United States Department of Agriculture and Department of Health and Human Services. [Accessed August 1, 2010] Dietary Guidelines for Americans. 6th2005. Available at: http://www.healthierus.gov/dietaryguidelines/ [serial online]
41. Stang J, Zephier EM, Story M, Himes JH, Yeh JL, Welty T, Howard BV. Dietary intakes of nutrients thought to modify cardiovascular risk from three groups of American Indians: the Strong Heart Dietary Study, Phase II. J Am Diet Assoc. 2005; 105:1895–1903. [PubMed: 16321595]
42. Vaughan LA, Benyshek DC, Martin JF. Food acquisition habits, nutrient intakes, and anthropometric data of Havasupai adults. J Am Diet Assoc. 1997; 97:1275–1282. [PubMed: 9366866]
43. Ballew C, White LL, Strauss KF, Benson LJ, Mendlein JM, Mokdad AH. Intake of nutrients and food sources of nutrients among the Navajo: findings from the Navajo Health and Nutrition Examination Survey. J Nutr. 1997; 127:2085S–2093S. [PubMed: 9339174]

44. Smith CJ, Nelson RG, Hardy SA, Manahan EM, Bennett PH, Knowler WC. Survey of the diet of Pima Indians using quantitative food frequency assessment and 24-hour recall. J Am Diet Assoc. 1996; 96:778–784. [PubMed: 8683009]
45. Teufel NI, Dufour DL. Patterns of food use and nutrient intake of obese and non-obese Hualapai Indian women of Arizona. J Am Diet Assoc. 1990; 90:1229–1235. [PubMed: 2398214]
46. Harland BF, Smith SA, Ellis R, O'Brien R, Morris ER. Comparison of the nutrient intakes of blacks, Siouan Indians, and whites in Columbus County, North Carolina. J Am Diet Assoc. 1992; 92:348–350. [PubMed: 1313056]
47. Fialkowski MK, McCrory MA, Roberts SM, Tracy JK, Grattan LM, Boushey CJ. Estimated nutrient intakes from food compared to Dietary Reference Intakes among adult members of Pacific Northwest Tribal Nations. J Nutr. 2010; 140:992–998. [PubMed: 20237069]
48. Fialkowski MK, McCrory MA, Roberts SM, Tracy JK, Grattan LM, Boushey CJ. Evaluation of dietary assessment tools used to assess the diet of adults participating in the Communities Advancing the Studies of Tribal Nations Across the Lifespan (CoASTAL) cohort. J Am Diet Assoc. 2010; 110:65–73. [PubMed: 20102829]
49. Bell RA, Shaw HA, Dignan MB. Dietary intake of Lumbee Indian women in Robeson County, North Carolina. J Am Diet Assoc. 1995; 95:1426–1428. [PubMed: 7594148]
50. Risica PM, Nobmann ED, Caulfield LE, Schraer C, Ebbesson SOE. Springtime macronutrient intake of Alaska Natives of the Bering Straits region: the Alaska Siberia Project. Int J Circumpolar Health. 2005; 64:222–233. [PubMed: 16050316]
51. Nobmann ED, Ponce R, Mattil C, Devereux R, Dyke B, Ebbesson SO, Laston S, MacCluer J, Robbins D, Romenesko T, et al. Dietary intakes vary with age among Eskimo adults of Northwest Alaska in the GOCADAN Study, 2000–2003. J Nutr. 2005; 135:856–862. [PubMed: 15795447]
52. Nobmann ED, Lanier AP. Dietary intake among Alaska native women residents of Anchorage, Alaska. Int J Circumpolar Health. 2001; 60:123–137. [PubMed: 11507961]
53. Kuhnlein HV, Moody SA. Evaluation of the Nuxalk food and nutrition program: traditional food use by a Native Indian group in Canada. J Nutr Educ. 1989; 21:127–132.
54. Schurman M. Community teamwork in nutrition education: an example in Canada's north. Hum Nutr Appl Nutr. 1983; 37A:172–179. [PubMed: 6874408]
55. Rosecrans AM, Gittelsohn J, Ho LS, Harris SB, Naqshbandi M, Sharma S. Process evaluation of a multi-institutional community-based program for diabetes prevention among First Nations. Health Educ Res. 2008; 23:272–286. [PubMed: 17639123]
56. Ho LS, Gittelsohn J, Harris SB, Ford E. Development of an integrated diabetes prevention program with First Nations in Canada. Health Promot Int. 2006; 21:88–97. [PubMed: 16407394]
57. Daniggelis E, Ramirez V, Davison N, Gittelsohn J, Novotny R. Healthy foods Hawaii: a community food systems program for improving health in the Hawaiian Islands. Summary Report from the Waianae Community Workshop #1. 2004
58. Shintani TT, Hughes CK, Beckham S, O'Connor HK. Obesity and cardiovascular risk intervention through the ad libitum feeding of traditional Hawaiian diet. Am J Clin Nutr. 1991; 53:1647S–1651S. [PubMed: 2031501]
59. Shintani T, Beckham S, Tang J, O'Connor HK, Hughes C. Waianae diet program: long-term follow-up. Hawaii Med J. 1999; 58:117–122. [PubMed: 10377604]
60. LeMaster PL, Connell CM. Health education interventions among Native Americans: a review and analysis. Health Educ Behav. 1994; 21:521–538.
61. Leonard B, Leonard C, Wilson R. Zuni diabetes project. Public Health Rep. 1986; 101:282–288. [PubMed: 3086921]
62. Wilson R, Smith J, Marfin AM, Helgerson S. A low-cost competitive approach to weight reduction in a Native American community. Int J Obes. 1989; 13:731–738. [PubMed: 2621048]
63. Stegmayer P, Lovrien FC, Smith M, Keller T, Ghodes DM. Designing a diabetes nutrition education program for a Native American community. Diabetes Educ. 1988; 14:64–66. [PubMed: 3335190]
64. Newman WP, Hollevoet JJ, Frohlich KL. The diabetes project at Fort Totten, North Dakota, 1984–1988. Diabetes Care. 1993; 16:361–363. [PubMed: 8422811]

65. Venkat Narayan KM, Hoskin M, Kozak D, Kriska AM, Hanson RL, Pettitt DJ, Nagi DK, Bennett PH, Knowler WC. Randomized clinical trial of lifestyle interventions in Pima Indians: a pilot study. Diabet Med. 1998; 15:66–72. [PubMed: 9472866]
66. Thompson JL, Allen P, Helitzer DL, Qualls C, Whyte AN, Wolfe VK, Herman CJ. Reducing diabetes risk in American Indian women. Am J Prev Med. 2008; 34:192–201. [PubMed: 18312806]
67. Fisher PA, Ball TJ. Tribal Participatory Research: mechanisms of a collaborative model. Am J Community Psychol. 2003; 32:207–216. [PubMed: 14703257]
68. Spector, RE. Cultural Diversity in Health and Illness. 6th. Upper Saddle River: Prentice Hall; 2004. Cultural heritage and history; p. 3-28.
69. Native American Cancer Research. [Accessed August 6, 2008] American Indian Alaska Native Demographics, Cancer Data, Historical Trauma. Available at: http://natamcancerorg/handoutshtml [serial online]
70. Duran, E.; Duran, B. Native American Postcolonial Psychology. Albany: State University of New York Press; 1995.
71. Prucha, FP. Documents of United States policy. 3rd. Lincoln: University of Nebraska Press; 2000.
72. Willett WC, Stampfer MJ. The authors reply. Am J Epidemiol. 1991; 133:1293. [PubMed: 2063838]
73. Smith, LT. Decolonizing Methodologies: Research and Indigenous Peoples. New York: St. Martin's Press; 1999.
74. Wolsko C, Lardon C, Hopkins S, Ruppert E. Conceptions of wellness among the Yup'ik of the Yukon-Kuskokwim Delta: the vitality of social and natural connection. Ethn Health. 2006; 11:345–363. [PubMed: 17060033]
75. Labun ER, Emblem J. Health as balance for the Sto:lo Coast Salish. J Transcult Nurs. 2007; 18:208–214. [PubMed: 17607057]
76. Hopkins SE, Kwachka P, Lardon C, Mohatt GV. Keeping busy: a Yup'ik/Cup'ik perspective on health and aging. Int J Circumpolar Health. 2007; 66:42–50. [PubMed: 17451133]
77. Borre K. Seal blood, Inuit blood, and diet: a biocultural model of physiology and cultural identity. Med Anthropol Q. 1991; 5:48–62.
78. Quileute Nation. Quileute Nation: History. Quileute Nation; Available at: http://www.quileutenation.org/culturehistory [serial online] [Accessed April 25, 2008]
79. Redwood DG, Ferucci ED, Schumacher MC, Johnson JS, Lanier AP, Helzer LJ, Tom-Orme L, Murtough MA, Slattery ML. Traditional foods and physical activity patterns and associations with cultural factors in a diverse Alaska Native population. Int J Circumpolar Health. 2008; 67:335–348. [PubMed: 19024803]
80. United States Department of the Interior. [Accessed April 4, 2008] Indian Ancestry: Enrollment in a Federally Recognized Tribe. Available at: http://www.doi.gov/enrollment.html [serial online]
81. Sambo BH, Lee ET, Welty TK, Howard BV, Rhoades ER, Fabsitz RR. The Strong Heart Study: interaction with and benefit to American Indian communities. Am J Med Sci. 2001; 322:282–285. [PubMed: 11876189]
82. Xu J, Eilat-Adar S, Loria C, Goldbourt U, Howard BV, Fabsitz RR, Zephier EM, Mattil C, Lee ET. Dietary fat intake and risk of coronary heart disease: the Strong Heart Study. Am J Clin Nutr. 2006; 84:894–902. [PubMed: 17023718]
83. Murtaugh MA, Ma KN, Greene T, Redwood D, Edwards S, Johnson J, Tom-Orme L, Lanier AP, Henderson JA, Slattery ML. Validation of a dietary history questionnaire for American Indian and Alaska Native people. Ethn Dis. 2010; 20:429–436. [PubMed: 21305833]
84. Israel BA, Schulz AJ, Parker EA, Becker AB. Review of community-based research: assessing partnership approaches to improve public health. Annu Rev Public Health. 1998; 19:173–202. [PubMed: 9611617]
85. Airhihenbuwa, CO. Health and Culture: Beyond the Western Paradigm. Thousand Oaks CA: Sage Publications; 1995.
86. Airhihenbuwa CO. Of culture and multiverse: renouncing “the universal truth” in health. J Health Educ. 1999; 30:267–273.

87. Airhihenbuwa, CO. Healing Our Differences: The Crisis of Global Health and the Politics of Identity. Lanham, MD: Rowman & Littlefield Publishers; 2007.

88. Mohatt GV, Plaetke R, Klejka J, Luick B, Lardon C, Bersamin A, Hopkins S, Dondanville M, Herron J, Boyer B. Center for Alaska Native Health Research. The Center for Alaska Native Health Research Study: a community-based participatory research study of obesity and chronic disease-related protective risk factors. Int J Circumpolar Health. 2007; 66:8–18. [PubMed: 17451130]

89. Israel, BA.; Eng, E.; Schulz, AJ.; Parker, EA. Methods in Community-Based Participatory Research for Health. San Francisco: Jossey-Bass; 2005.

90. Smith J, Wiedman D. Fat content of south Florida Indian frybread: health implications for a pervasive Native-American food. J Am Diet Assoc. 2001; 101:582–585. [PubMed: 11374355]

91. Wang DH, Kogashiwa M, Kira S. Development of a new instrument for evaluating individuals' dietary intakes. J Am Diet Assoc. 2006; 106:1588–1593. [PubMed: 17000191]

92. Gittelsohn J, Wolever TMS, Harris SB, Harris-Giraldo R, Hanley AJG, Zinman B. Specific patterns of food consumption and preparation are associated with diabetes and obesity in a Native Canadian community. J Nutr. 1998; 128:541–547. [PubMed: 9482761]

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Table 1

Modern mean dietary intakes of select groups of Native American/Alaska Native adults compared to Dietary Guidelines for Americans (DGA), 2005.

Native American/Alaska Native study population	*n*	Age range (years)	Mean energy intake (kcal/day)	Total fat (% kcal)	Saturated fat (% kcal)	Cholesterol (mg/day)	Sodium (mg/day)	Fiber (g/day)
DGA, 2005 (Ref. 40)			N/A	20–35%	10% or less	<300 mg/day	<2,300 mg/day	>20 g/day
Strong Heart Study (SHS)*,+ (Ref. 41)	3,482	45–74						
Men								
AZ			1,907	34	12	398	3,143	N/A
OK			2,067	36	13	356	3,544	N/A
ND/SD			1,942	36	12	383	3,608	N/A
Women								
AZ			1,623	34	12	304	2,717	N/A
OK			1,708	35	12	265	2,879	N/A
ND/SD			1,624	34	12	275	2,858	N/A
Havasupai* (Ref. 42)	92	18–59						
Men			2,467	35	N/A	N/A	N/A	N/A
Women			2,389	35	N/A	N/A	N/A	N/A
Navajo Health & Nutrition Survey* (Ref. 43)	985	20–59						
Men								
		20–39	2,127	34	11	388	N/A	15
		40–59	2,066	35	12	403	N/A	14
Women								
		20–39	1,958	35	11	334	N/A	14
		40–59	1,708	34	12	320	N/A	13
Pima* (Ref. 44)	575	18–74						
Men			2,234	34	12	517	3,315	29
Women			1,813	36	13	430	2,787	23
Hualapai women* (Ref. 45)	28	18–35	2,602	35	13	N/A	N/A	N/A

Native American/Alaska Native study population	*n*	Age range (years)	Mean energy intake (kcal/day)	Total fat (% kcal)	Saturated fat (% kcal)	Cholesterol (mg/day)	Sodium (mg/day)	Fiber (g/day)
Siouan[§] (Ref. 46)	56	18–87						
Men			2,722	44	14	459	3,918	15
Women			1,643	47	15	290	2,231	8
Pacific Northwest Tribal Nations[‡] (Refs. 47 and 48)	418	18[+]						
Men			2,524	36	12	364	1,178	15
Women			2,264	36	12	288	1,369	14
Lumbee women[‡] (Ref. 49)	107	21–60	1,538	36	12	207	2,515	10
Alaska Natives (Northwest AK)[*] (Ref. 50)	433	25–65[+]						
Men			2,273	35	10	N/A	N/A	N/A
Women			1,899	36	10	N/A	N/A	N/A
Eskimo[§] (Ref. 51)	850	17–60						
Men								
		17–39	3,150	35	12	493	N/A	16
		40–60	3,088	38	13	551	N/A	18
Women								
		17–39	2,684	37	12	369	N/A	14
		40–60	2,349	39	12	373	N/A	14
Alaska Native women (Anchorage, AK)[*] (Ref. 52)			1,804	31	11	241	3,157	14

[*] Intakes estimated by 24-hour recall.

[+] Study sampled AI from AZ, OK, ND, and SD during Phase 2 of SHS.

[‡] Intakes estimated by dietary record.

[§] Intakes estimated by food frequency questionnaire.