Published in final edited form as:

J Community Health. 2018 October ; 43(5): 901–907. doi:10.1007/s10900-018-0501-5.

Food Security and Diet Among American Indians in the Midwest

Kelly Berryhill¹, Jason Hale^{2,*}, Brian Chase³, Lauren Clark³, Jianghua He³, and Christine M. Daley^{1,4}

¹University of Kansas Medical Center, Kansas City, USA

²Department of Family Medicine, University of Kansas Medical Center, MS 1030, 3901 Rainbow Blvd., Kansas City, KS 66160, USA

³Department of Biostatistics, University of Kansas Medical Center, Kansas City, USA

⁴Indigenous Studies, University of Kansas, Lawrence, Kansas, USA

Abstract

The purpose of this study was to determine levels of food security among American Indians (AI) living in the Midwest and possible correlations between food security levels and various health outcomes, diet, and demographic variables. This study used a cross-sectional design to determine health behaviors among AI. Participants (n= 362) were recruited by AI staff through various cultural community events in the Midwest, such as powwows and health fairs. Inclusion criteria included the following: age 18 years or older, self-identify as an AI, and willing to participate in the survey. Of all participants, 210 (58%) had either low or very low food security, with 96 in the very low category (26.5%). Participants with very low food security tended to have significantly more chronic conditions. Additional significant differences for very low food security existed by demographic variables, including having no insurance ($p<0.0001$) or having a regular primary care provider ($p=0.0354$). There was also a significant difference between food security levels and the consumption of fast food within the past week ($p\text{-value} = 0.0420$), though no differences were found in fruit and vegetable consumption. AI in our sample had higher levels of food insecurity than those reported in the literature for other racial/ethnic groups. AI and non-Native health professionals should be aware of the gravity of food insecurity and the impact it has on overall health. Additional research is needed to determine specific aspects of food insecurity affecting different Native communities to develop appropriate interventions.

Keywords

American Indian; food security; community-based participatory research; surveys; questionnaires

Introduction

The Food and Agriculture Organization (FAO) defines food security as existing, “when all people, at all times, have physical, social and economic access to sufficient, safe and

* jhale@kumc.edu, Tel.: 913-945-7822.

Conflict of interest: The authors declare that they have no conflict of interest.

nutritious food which meets their dietary needs and food preferences for an active and healthy life” [1]. This definition highlights food safety and the nutritional value of the food, while “food preferences” refers to socially and culturally acceptable foods. Food insecurity is associated with an increased risk for obesity, type II diabetes, cardiovascular risk factors [2] and some cancers; many of which are highly prevalent in AI communities [3]. There is also some evidence that suggests that children are more likely to suffer from chronic illnesses, acute illnesses, psychosocial problems, and psychiatric distress when they come from a food insecure home (limited access to nutritionally adequate, culturally acceptable, and safe foods) [4, 5].

In 2009, 21.3% of United States households with children experienced food insecurity [4]. According to data from 2001-2004, when comparing American Indian (AI) households with children to non-AI households with children 28% and 16% experienced food insecurity respectively [6]. When we examine regional differences, we see an even clearer picture of food insecurity among AI. For example, on the Pine Ridge Reservation in South Dakota nearly 40% of parents reported experiencing food insecurity within their household in the past 12 months [4], with about 10.5% of all families experiencing very low food security. Alongside AI rates for food insecurity, 21.5% of non-Hispanic Blacks and 19.1% of Hispanic households without children were considered food insecure [7].

Food insecurity is experienced when there is uncertainty about food availability and access, insufficient amount and varieties of foods that are required for a healthy lifestyle, and the need to use socially unacceptable ways of acquiring food [8]. Access to food is one of the largest contributors to food security [9]. On most AI reservations, gas stations and convenience stores are more commonly found than large grocery stores [4, 10], making food less accessible and often more costly. Poverty is another large contributor to food security [11]. The prevalence of very low food security occurs in households with incomes below 185% of the poverty line (13.6%) [7]. AIs experience some of the highest rates of poverty; with 25% of AI living below the poverty line compared to 13% of the total population [12].

Little is known about food security among AI communities in the Midwest. The purpose of this study was to determine levels of food security among American Indians (AI) living in the Midwest and possible correlations between food security levels and various health outcomes, diet, and demographic variables. Results from this study will be used to develop appropriate interventions to address food security issues in these communities.

Methods

Study Design and Population

Data were from a one-time cross-sectional survey designed to determine health behaviors in AI populations. The focus of this study was to recruit AI individuals 18 years and older to examine food security differences between genders from the sample. The digital survey included questions on participant demographics, individual health characteristics, dietary information, and food security. Here, we report results of food security and diet questions.

Recruitment occurred by word-of-mouth at Native-specific events such as powwows and health fairs. Eligibility criteria included: individuals who self-identified as AI, were at least 18 years of age at the time of the survey, and were able to provide consent. Eligible participants provided informed consent and completed a 20-minute self-administered digital survey related to their health behaviors and knowledge. Participants were provided with a \$10 gift card for their time and participation in the study. A total of 362 AI participated from May 2010 to January 2011. All study procedures were approved by the University of Kansas Medical Center Institutional Review Board, as well as the appropriate tribal communities.

Measures

Demographics—Demographic questions were used to collect data regarding participant characteristics. Participants were asked to respond to a series of questions to ascertain information regarding marital status, education level, health insurance status, primary care provider and number of times primary provider was seen. Demographic questions also asked about any children (ages 18 and younger) living in the home. Health characteristic questions asked included health conditions diagnosed by a health professional and perceptions of individual health status.

Food Security—The six-item short form of food security questions from the U.S. Department of Agriculture U.S. Household Food Security Survey was used to assess food security [13]. Participants were asked to respond to statements assessing food security overall (“The food that I bought just didn’t last, and I didn’t have money to get more”), (“I couldn’t afford to eat balanced meals.”). Response options included: “often true”, “sometimes true”, and “never true”. The remaining questions asked about food security within the last 12 months, (“In the last 12 months, did you or any other adults in your household ever cut the size of your meals or skip meals because there wasn’t enough money for food?”), followed by a question asking about the frequency, (“In the last 12 months, did you ever eat less than you felt you should because there wasn’t enough money to buy food?”), (“In the last 12 months, were you ever hungry but didn’t eat because you couldn’t afford enough food?”). Response options included: “yes”, or “no”.

Diet—Questions regarding dietary consumption asked participants about daily fruit and vegetable servings along with frequency of fast food in a period of one week (“How many servings of vegetables do you usually eat per day?”), (“How many servings of vegetables do you usually eat per day?”), (“In the past week, how many times did you eat fast food?”). Response options for all dietary questions included: “none”, “1-2”, “2-3”, “3-4”, and “5 or more”. Dietary survey questions were modified from Indian Health Services diabetes prevention program [14].

Data Analysis

Scoring of the food security questionnaire was done using the published scoring system from the US Department of Agriculture [13]. Participants received 1 point for each “yes” answer, 1 point for each “often or sometimes answer”, and 1 point for each “almost every month or some months” answer. Scores were summed to give a total food security score for each participant. Food security status was assigned as follows: 0-1 as high or marginal food

security, 2-4 as low food security, and 5-6 as very low food security. Frequency counts and population percentages by gender were reported for all six questions of the scale. Counts and percentages of participant health and demographic characteristics were reported by food security category. Pearson's Chi-squared test was used to examine the association of each demographic variable and food security status. If over 20% expected cell counts are less than 5, the Fisher's exact p-value was used. Finally, using stepwise logistic regression, the demographic variables were used to build a model to predict a participant's level of food security. All analysis on this data was done in SAS version 9.4.

Results

The median age for male participants was 39 years (range 18-86) and for female participants was 41 years (range 18-76). For male participants the median weight was 214.5 pounds (range 105-372); for female participants, 190 pounds (range 100-405). The majority of participants were AI alone (78.7%) rather than in combination with another race. Participants grew up in primarily urban or suburban areas (48.1%), followed by reservation or tribal trust areas (28.2%), and rural non-reservation areas (18.8%). Most participants were married or living with a partner (51.1%) and had no children (71.5%). Detailed demographic information by food security status is provided in Table 1 below.

Overall, 42.0% of participants had high food security, 31.5% had low food security, and 26.5% had very low food security. Significant differences in food security level were found based on an individual's health insurance status, whether or not an individual had a primary care provider, and the type of primary care provider the individual regularly saw (i.e. physician, nurse practitioner, etc.). Respondents with low or very low food security were more likely to either have no insurance or use the Indian Health Service for their health care ($p<0.0001$). Respondents with very low food security were more likely to have a regular primary care provider ($p=0.0354$), but that provider was less likely to be a physician and more likely to be either a physician's assistant or nurse practitioner ($p=0.0274$). Educational attainment and marital status trended towards significance ($p=0.0527$ and $p=0.0556$ respectively). Higher educational attainment and being married were associated with higher food security. All of these demographic variables were included in our binary logistic regression model; higher educational attainment became significant in our model ($p=0.0482$). Fitting this model to food security, two characteristics make for the best model: the type of insurance you have and what kind of primary care provider you use. These results pass the Pearson and Hosmer-Lemeshow tests for goodness of fit, but fail the Deviance test.

Participants with very low food security indicated their general health to be fair or poor (37.5%) compared to participants who had higher food security (23.68%, $p=0.0524$). Participants with very low food security also tended to have more chronic conditions diagnosed by their health care providers. These chronic conditions included significant differences in diagnoses of arthritis ($p=0.0282$), cancer ($p=0.0285$), depression ($p=0.002$), emphysema ($p=0.0231$), high blood pressure ($p=0.0512$), and high cholesterol ($p=0.0466$). See Table 2 below.

There was also a significant difference among participants with differing food security levels and their reported consumption of fast food within the past week, with participants with lower food security more likely to consume more fast food (p -value = 0.0420). Of participants who ate fast food 3 times or more within the past week ($N=56$), 32.1% had very low food security, 37.5% had low food security and 30.4% had high food security. Among participants who had not eaten fast food in the last week ($N=62$), 21.0% had very low food security, 29.0% had low food security, and 50% had high food security.

Results of individual food security questions are provided in Table 3 overall and by gender; significant differences were not found by gender on any aspects of food security. Among all participants, the median food security score was 2.0 with a range in score of 0 to 6. Over the past year, approximately two-thirds of participants (67.7%) ate less than they should have because they didn't have the money to buy more food; even more (72.1%) didn't eat when they were hungry due to lack of money for food. Approximately two-thirds of participants (66.3%) said that they food they bought sometimes or often didn't last and they didn't have money to buy more; 59% couldn't always afford balanced meals.

Discussion

Overall, 58.0% of our sample had low or very low food security, with 26.5% in the very low category. This is an alarming figure compared to other data available in the literature, showing 28% of AI households with children with food insecurity [6] or even compared to the highest regional data for AI available at 40% on the Pine Ridge Reservation, with 10.5% with very low food security [4]. No significant differences were found in our sample between households with and without children. Though our low sample size ($N=362$), convenience sample, and self-report data may have led to a biased sample, these numbers are nevertheless concerning and highlight the need for further investigation of this topic area in our region and among AI nationally and the need for implementation of programs to assist with food security.

We found no significant differences in the prevalence of food insecurity between AI men and women in the Midwest. However, there were significant differences among food security levels based on other demographic variables, including health insurance status, regular primary care provider, and type of primary care provider and participant health characteristics, including overall self-reported health status and particular diagnoses (arthritis, cancer, depression, emphysema, high blood pressure, and high cholesterol). Of the diagnosed health conditions that were significant, high blood pressure ($p=0.0512$) was consistent with another study that examined food insecurity and cardiovascular disease related health outcomes in AI in rural Oklahoma [3]. It is unknown whether food security has a causative relationship with these diagnoses; further inquiry is warranted.

It is possible, and probably likely, that there is an independent, but linked, factor that influences both food security and health. One potential factor that may account for all of these issues is poverty, which we know is higher among AI than others. The most predictive factor we found for food insecurity was type of insurance or, more accurately, lack of insurance or sole use of the Indian Health Service. This is also tied to poverty. We did not

collect income data at the request of community members who felt it was invasive. However, educational attainment can be used as a proxy for income and lower education was also associated with low food security.

These data provide possible predictors for low and very low food security among AI living in the Midwest, all of which can be tied to poverty. Because addressing poverty as a whole is a nearly insurmountable task, addressing food security as an associated factor with many chronic health conditions may be a way to impact the health of our regional AI communities in a positive way. Our team plans several follow-up studies to understand this issue further and to identify specific ways to intervene to improve food security and, thus, health. It is likely that food insecurity is also an issue among other AI communities given the high levels of poverty on many reservations. Programs dedicated to improving food security could help any community living in poverty, including AI and non-Natives.

Acknowledgments

The authors would like to thank the reservation and urban American Indian communities who participated in this study.

Funding: This project was supported by the National Cancer Institute at NIH (R24 MD 002773). Additional support was provided by P20 MD 004805.

References

1. Pinstrup-Andersen P. Food security: definition and measurement. *Food Security*. 2009; 1(1):5–7.
2. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. *J Nutr*. 2010; 140(2):304–310. [PubMed: 20032485]
3. Blue Bird Jernigan V, Wetherill MS, Hearod J, et al. Food Insecurity and Chronic Diseases Among American Indians in Rural Oklahoma: The THRIVE Study. *Am J Public Health*. 2017; 107(3):441–446. [PubMed: 28103070]
4. Bauer KW, Widome R, Himes JH, et al. High food insecurity and its correlates among families living on a rural American Indian Reservation. *Am J Public Health*. 2012; 102(7):1346–1352. [PubMed: 22594740]
5. Gundersen C, Kreider B. Bounding the effects of food insecurity on children's health outcomes. *Journal of Health Economics*. 2009; 28(5):971–983. [PubMed: 19631399]
6. Gundersen C. Measuring the extent, depth, and severity of food insecurity: an application to American Indians in the USA. *Journal of Population Economics*. 2009; 21(1):191–215.
7. USDA, U.S.D.o.A. Economic Research Service: Food Security in the U.S. key statistics and graphics. 2015
8. NRC, N.R.C. Food Insecurity and Hunger in the United States: An Assessment of the Measure. 2006
9. Gorton D, Bullen CR, Mhurchu CN. Environmental Influences on food security in high-income countries. *Nutrition Reviews*. 2010
10. O'Connell M, Buchwald DS, Duncan GE. Food access and cost in American Indian communities in Washington State. *J Am Diet Assoc*. 2011; 111(9):1375–1379. [PubMed: 21872701]
11. Nord M, Prell M. Struggling To Feed the Family: What Does It Mean To Be Food Insecure?. 2007. Available from: <https://www.ers.usda.gov/amber-waves/2007/june/struggling-to-feed-the-family-what-does-it-mean-to-be-food-insecure/>
12. NCAI Policy Research Center, N.C.o.A.I. Demographic Profile of Indian Country. 2012
13. USDA, U.S.D.o.A. U.S. Household Food Security Survey Module: Six-Item Short Form. 2012

14. IHS, I.H.S. Special Diabetes Program for Indians Toolkits. 2010. Available from: <https://www.ihs.gov/sdpi/sdpi-toolkits/diabetes-prevention-program-toolkit/appendices/>

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1

Demographic characteristics of participants

	High food security	Low food security	Very low food security	p value
	N (%) (152, 42.0%)	N (%) (114, 31.5%)	N (%) (96, 26.5%)	
Race/ethnicity				0.3815
American Indian alone	121 (79.61%)	93 (81.58%)	71 (73.96%)	
American Indian in combination with another race/ethnicity	31 (20.39%)	21 (18.42%)	25 (26.04%)	
Where participants grew up				0.4912
Reservation or tribal trust	46 (31.29%)	33 (30.84%)	23 (25.56%)	
Rural non-reservation	28 (19.05%)	23 (21.5%)	17 (18.89%)	
Urban or suburban	66 (44.9%)	41 (38.32%)	46 (51.11%)	
Multiple locations	7 (4.76%)	10 (9.35%)	4 (4.44%)	
Marital status				0.0556
Married/living with partner	86 (56.58%)	58 (50.88%)	41 (42.71%)	
Never married	33 (21.71%)	26 (22.81%)	25 (26.04%)	
Divorced/separated/widowed	24 (15.79%)	17 (14.91%)	26 (27.08%)	
Other	9 (5.92%)	13 (11.4%)	4 (4.17%)	
Children				0.1527
Yes	40 (26.32%)	40 (35.09%)	23 (23.96%)	
No	112 (73.68%)	74 (64.91%)	73 (76.04%)	
Highest level of education completed				0.0527
High school/GED or less	54 (35.53%)	40 (35.09%)	33 (34.38%)	LR: 0.0482
Any college	36 (23.68%)	38 (33.33%)	36 (37.5%)	
College graduate	43 (28.29%)	30 (26.32%)	24 (25%)	
Graduate degree	19 (12.5%)	6 (5.26%)	3 (3.13%)	
Health insurance				<0.0001
No insurance	19 (12.5%)	24 (21.05%)	36 (37.5%)	
Private or tribal insurance	66 (43.42%)	41 (35.96%)	15 (15.63%)	
Indian health service	16 (10.53%)	23 (20.18%)	25 (26.04%)	
Medicaid/medicare/VA	10 (6.58%)	6 (5.26%)	6 (6.25%)	
Multiple insurance	41 (26.97%)	20 (17.54%)	14 (14.58%)	
Regular primary care provider				0.0354
Yes	34 (22.37%)	27 (23.68%)	35 (36.46%)	
No	118 (77.63%)	87 (76.32%)	61 (63.54%)	
Type of primary care provider				0.0274 (e)
Doctor	118 (77.63%)	78 (68.42%)	56 (58.33%)	
Physician's assistant or nurse practitioner	25 (16.45%)	25 (21.93%)	27 (28.13%)	
Traditional healer	4 (2.63%)	8 (7.02%)	5 (5.21%)	
Other	5 (3.29%)	3 (2.63%)	8 (8.33%)	

	High food security	Low food security	Very low food security	p value
	N (%) (152, 42.0%)	N (%) (114, 31.5%)	N (%) (96, 26.5%)	
Last time saw provider				0.0635
Less than 1 month	59 (38.82%)	35 (30.70%)	26 (27.08%)	
Between 1 and 12 months	82 (53.95%)	67 (58.77%)	53 (55.21%)	
More than 12 months ago	11 (7.24%)	12 (10.53%)	17 (17.71%)	
Number of times saw a provider in the last year				0.3459
None	25 (16.45%)	21 (18.42%)	14 (14.58%)	
1–4 times	101 (66.45%)	81 (71.05%)	62 (64.58%)	
5 or more times	26 (17.11%)	12 (10.53%)	20 (20.83%)	

Table 2

Participant health characteristics

	High food security	Low food security	Very low food security	p value
	N (%)	N (%)	N (%)	
In general, you would say your health is...				0.0524
Excellent or very good	57 (37.5%)	45 (39.47%)	24 (25%)	
Good	59 (38.82%)	44 (38.6%)	36 (37.5%)	
Fair or poor	36 (23.68%)	25 (21.93%)	36 (37.5%)	
Which of the following conditions have you been told you have by a health care provider?				
Arthritis	37 (24.34%)	21 (18.42%)	33 (34.38%)	0.0282
Asthma	21 (13.82%)	17 (14.91%)	18 (18.75%)	0.5669
Cancer	3 (1.97%)	2 (1.75%)	8 (8.33%)	0.0285 (e)
Chronic pain	14 (9.21%)	12 (10.53%)	16 (16.67%)	0.1848
Depression	23 (15.13%)	13 (11.40%)	28 (29.17%)	0.002
Diabetes	32 (21.05%)	28 (24.56%)	24 (25.00%)	0.7095
Emphysema	0	1 (0.88%)	3 (3.13%)	0.0231 (e)
Heart condition	12 (7.89%)	7 (6.14%)	5 (5.21%)	0.6872
High blood pressure	47 (30.92%)	23 (20.18%)	33 (34.38%)	0.0512
High cholesterol	30 (19.74%)	10 (8.77%)	16 (16.67%)	0.0466
Alcoholism/substance abuse				
How many servings of fruit do you usually eat per day?				0.5290 (e)
None	17 (11.18%)	15 (13.16%)	9 (9.38%)	
1-2	102 (67.11%)	77 (67.54%)	75 (78.13%)	
3-4	28 (18.42%)	20 (17.54%)	10 (10.42%)	
5 or more	5 (3.29%)	2 (1.75%)	2 (2.08%)	
How many servings of vegetables do you usually eat per day?				0.9619
None	11 (7.24%)	8 (7.02%)	9 (9.38%)	
1-2	90 (59.21%)	70 (61.40%)	58 (60.42%)	
2-3	32 (21.05%)	25 (21.93%)	20 (20.83%)	
3-4	16 (10.53%)	8 (7.02%)	6 (6.25%)	
5 or more	3 (1.97%)	3 (2.63%)	3 (3.13%)	
In the past week, how many times did you eat fast food?				0.0420
None	31 (20.39%)	18 (15.79%)	13 (13.54%)	
1-2	81 (53.29%)	43 (37.72%)	49 (51.04%)	
2-3	23 (15.13%)	32 (28.07%)	16 (16.67%)	
3-4	12 (7.89%)	13 (11.4%)	14 (14.58%)	
5 or more	5 (3.29%)	8 (7.02%)	4 (4.17%)	

Table 3

Participant food security characteristics

	Overall N (%)	Male N (%)	Female N (%)	p value between men and women
The food that I bought just didn't last, and I didn't have money to get more				0.9942
Often true	58 (16.02%)	23 (15.97%)	35 (16.06%)	
Sometimes true	182 (50.28%)	72 (50%)	110 (50.46%)	
Never true	122 (33.70%)	49 (34.03%)	73 (33.49%)	
I couldn't afford to eat balanced meals.				0.4171
Often true	54 (14.92%)	18 (12.5%)	36 (16.51%)	
Sometimes true	160 (44.20%)	62 (43.06%)	98 (44.95%)	
Never true	148 (40.88%)	64 (44.44%)	84 (38.53%)	
In the last 12 months, did you or any other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?				0.2534
Yes	131 (36.19%)	47 (32.64%)	84 (38.53%)	
No	231 (63.81%)	97 (67.36%)	134 (61.47%)	
How often did this happen?				0.7889
Almost every month	39 (10.77%)	14 (29.79%)	25 (29.76%)	
Some months, but not every month	68 (18.78%)	23 (48.94%)	45 (53.57%)	
Only 1 or 2 months	24 (6.63%)	10 (21.28%)	14 (16.67%)	
In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?				0.2033
Yes	245 (67.68%)	103 (71.53%)	142 (65.14%)	
No	117 (32.32%)	41 (28.47%)	76 (34.86%)	
In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?				0.6625
Yes	261 (72.10%)	102 (70.83%)	159 (72.94%)	
No	101 (27.90%)	42 (29.17%)	59 (27.06%)	
Median score (range)	2.0 (0,6)	2.0 (0,6)	2.0 (0,6)	