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Food Security, Depression and Quality of Life in Northern Plains Indians

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Cover Page Footnote

This research was conducted through the U.S. Department of Agriculture, Agricultural Research Services, Grand Forks Human Nutrition Research Center with the approval of the tribes where the data was collected. The tribes own the data and we use it in aggregate form with their permission. We thank the contributions of the summer interns who worked on this project: Patty Stensland, Ellen Wilson, and R.J. Smith. With this research we stand on the shoulders of all the tribal members who participated in this project, the elders who referred people to us, and all of those involved in making the project happen. It would not exist without you.

Introduction

The American Indian/Alaskan Native (AI/AN) population in the U.S. population generally experiences some of the most significant physical and mental health disparities in the nation in addition to high rates of poverty and food insecurity (Blue Bird Jernigan, Salvatore, Styne, & Winkleby, 2012; Center for Disease Control and Prevention, 2011; Center for Disease Control and Prevention, 2012; Gundersen, 2008; Indian Health Service, 2003; Macartney, Bishaw, & Fontenot, 2013). Research in AI/AN communities with regard to these issues indicate there are genetic, nutritional, socioeconomic, physiological, psychological, sociological and environmental factors involved in the prevention and treatment of these problems (U.S. Department of Health and Human Services, 2001). However, only three major studies have looked at the relationship among these factors in AI/AN communities: the Strong Heart Study, the Pathways study, and the Navajo Health and Nutrition Study (NHANS) (Lee et al., 2002; Story et al., 1999; Thompson et al., 2001). Additionally, while the physical and mental health correlates of food insecurity have been explored in numerous studies, only three studies involve food insecurity have pursued this in AI/AN communities (Bauer et al., 2012; Blue Bird Jernigan et al., 2012; Casey et al., 2004; Gundersen, 2008; Hadley, Patil, Hadley, & Patil, 2006; Maddigan, Feeny, Majumdar, Farris, & Johnson, 2006; Olson, 1999; Shariff & G, 2005; Whitaker, Phillips, & Orzol, 2006). Limiting the generalizability of the significant findings from these studies is the heterogeneous nature of the AI/AN population (U.S. Department of Health and Human Services, 2001).

To further investigate the relationship between these factors in AI/AN communities a pilot study was conducted. This study was designed to identify basic relationships between food security, cultural identification, physical health, mental health, and nutrition within a subgroup of the AI/AN population, specifically Northern Plains Indians (NPI). This manuscript is a partial report of the findings of that study, with a focus on the relationship between depression and food insecurity. In this regard, the hypothesis of this study was that there was a positive relationship between food insecurity and depression and an inverse relationship between food insecurity and quality of life.

Subjects and Methods

Subjects and Procedure

Before conducting research, this project sought and received approval from the responsible tribal councils, powwow committees and tribal college presidents, and the University of North Dakota Institutional Review Board.

Participants were 458 self-identified American Indian adults (283 women and 175 men) residing in North and South Dakota, Minnesota, Montana and

Wyoming, who were attending 10 powwows and health fairs in North Dakota and western Minnesota during 2002 and 2003. Participants ranged in age from 18 to 78 years (38.1 ± 14.1; Mean ± SD). **Table 1** shows additional demographic information.

Participants were solicited by signs posted on a mobile nutrition research laboratory located at the Native events noted above, some were in the tribal language, and by word of mouth at these events. Native researchers provided interested attendees with a general verbal description of the research and, to those who expressed interest in participating, a packet containing a written description, the informed consent, and the questionnaires. If an attendee agreed to participate, he or she signed the consent and then completed the questionnaires while sitting at a table located in front of the laboratory, then had his or her blood pressure taken while still seated and had his or her height and weight measured on the mobile laboratory. Each participant then received a bag of hand-harvested wild rice, a bottle of ice water, and health education materials in appreciation. Reading glasses were provided for those who needed them to read the materials themselves. Because of difficulties with reading or writing, some elderly participants had family members read questionnaire items aloud and write down the responses; this was done beyond hearing distance of other participants.

Assessments

Participants filled out a custom questionnaire that was used to collect demographic information, including tribal affiliation, age, sex, education, income, marital status and household size. Additionally they completed a number of assessments; those pertinent to this report are described below.

Food Security. The *Core Food Security Module (CFSM)* was used to assess household food security (Bickel, Nord, Price, Hamilton, & Cook, Updated 2000). The 18-item version (10-item version was used for households without children) was administered in questionnaire rather than traditional interview format. Questions in this version reference the past 12-month period. Both categorical (food secure, low food security, and very low food security) and continuous (0 – 10, where 0 represents food secure) scores were determined to represent the severity of food insecurity.

Mental health. Mental health, with an emphasis on depression, was assessed with three different questionnaires: the *Symptom Checklist-90-Revised (SCL-90-R)*, the *Center for Epidemiological Studies-Depression Scale (CES-D)*, and *Beck Depression Inventory-II (BDI-II)*. The *SCL-90-R* is a 90-item measure of mental health symptoms rated on a 5-point scale of distress (Derogatis, Lipman, & Covi, 1973; Derogatis, Rickels, & Rock, 1976; Derogatis & Lazarus, 1999). The *CES-D is* a 20-item measure of depressive symptoms (Roberts &

Vernon, 1983). The *BDI-II* is a 21-item measure of depression considered the most widely used self-report instrument for measuring depressive symptom severity in both research and clinical settings (Beck et al., 1996).

Quality of life. Overall quality of life was assessed by the use of the *Quality of Life Inventory (QOLI)*, a measure of the importance and satisfaction of 16 areas of life, including health, self-esteem, goals and values, money, work, play, learning, creativity, helping, love, friends, children, relatives, home, neighborhood, and community (Frisch, Cornell, Villanueva, & Retzlaff, 1992; Frisch, 1999; Grant et al., 1995).

After questionnaires were completed at the events the data was entered into SPSS in the office and analyzed at the completion of the project.

Results

Results across all tribal affiliations are presented here and were provided in written and verbal form to the tribes and colleges hosting the powwows and health fairs. To protect tribal confidentiality, results unique to each tribe and college were provided to the respective tribal councils and colleges, and only aggregate data was shared between tribes or colleges.

Food Security and Demographic Variables

The overall incidence of food insecurity is show in **Table 2**. The prevalence of food insecurity in this group of NPI, was in excess of 26%, which was well above the reported rates for the state of North Dakota and the nation as a whole at that time the data were collected, which were 8.1% and 11% respectively (Nord, Andrews, & Carlson, 2002). The prevalence of food insecurity with hunger in this group of NPI, in excess of 10%, was also well above the reported rates for the state of North Dakota and the nation as a whole at the time of the study, which were 2% and 3.5% respectively (Nord et al., 2002).

Food Security and Mental Health

Tables 3 and 4 summarize participant mental health and quality of life. Using traditional cutoff scores of 14 for the BDI-II and 16 for the CES-D, both measures showed a high incidence (19%) of depressed mood and risk for clinical depression. This finding is in sharp contrast to the recently reported national average that 6.9% of adults 18 and over dealt with a major depressive episode in the last year (Substance Abuse and Mental Health Services Administration, 2013).

Statistical analysis showed food insecurity was positively associated with many SCL-90-R subscales and global scales. Scales for Somatization, Obsessive-Compulsive, Interpersonal-Sensitivity, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation, Psychoticism Global Stress Index, Positive Symptom Distress

Index and Positive Symptom Total all had coefficients ranging from .158 to .309, with *p* values ranging from .0001 to .0424.

When population was grouped according to the four CFSM categories (Food Secure, Food Insecure without Hunger, Food Insecure with Moderate Hunger, Food Insecure with Severe Hunger), and their scores on the SCL-90-R Depression subscale, the CESD and the BDI-II were compared, it was found that all food insecure groups scored higher than the food secure group. When similar analysis was done with the QOLI it was found the more food insecure a group was, the lower the reported quality of life. Results of this analysis are presented in **Table 5**. The results of a series of one-way ANOVAs revealed all scores measured had means that were significantly different ($p < .001$). Subsequent t-tests revealed that for the BDI-II the food secure group scored significantly lower depression than all food insecure groups, but the food insecure groups did not score significantly different from one another. Similar analysis revealed that for the CES-D the food secure group scored significantly lower than all food insecure groups and food insecure without hunger scored significantly lower than food insecure with severe hunger. For the SCL-90-R- Depression subscale it was found that the food secure group scored significantly lower than all food insecure groups, but the food insecure groups did not score significantly different from one another. The QOLI score was significantly higher in the food secure group than all food insecure groups, and the food insecurity without hunger group scored significantly higher than the food insecurity with severe hunger group.

Discussion

The hypothesis of this study was that food insecurity was positively related to depression and negatively related to quality of life. For this to be true we would expect positive relationships to exist between food insecurity and measurements for depression, as well as a negative relationship between food insecurity and QOLI score. This hypothesis was supported because the food secure group scored significantly lower than food insecure groups across all depression measures. On the QOLI measure participants score significantly higher on the food secure group than on the food insecure groups. Overall, the results suggest the experience of food insecurity is directly related to the experience of depression and inversely related to quality of life.

Strengths and Limitations

One strength of this study was the use of multiple measures of depression or depressed mood. In addition, all three of the measures used in this study to assess for depression have been previously validated with the NPI subpopulation (Gray, Gonzaga, & Petros, In Press).

An additional strength was the presence of investigators and researcher staff at traditional community events, and their participation in those events when appropriate, as it provides an excellent opportunity to increase interaction between researchers and community members, improve communication, and for all parties to gain valuable understanding into the unique needs and cultures of both research and individual AI communities.

An additional strength was that while interacting with the participants, researchers were able to reinforce positive health care behaviors for the participants. Taking blood pressures of elders that did not choose to participate, discussing the need to take medications as prescribed, and other issues resulted in a positive relationship with community members while giving back to the community whether they were part of the research or not.

One limitation of this study was the use of a community sample as it limits the generalizability of any significant findings. However, it is reasonable to assume that individuals suffering significant health problems, including depression and chronic diseases, would be less likely to attend powwows, which often involve travel and significant walking, dance and other physical activities over several days. Therefore, it can be argued that results from this study, particularly those relating to physical activity, BMI, depressed mood, and possibly food security, actually underestimate the true incidence of these health problems in the sampled communities. The fact that these events were times of positive social interaction, music, and dance would also make the depression scores tend to be lower in participants. The urgency of addressing health problems in this population is underscored if the high incidences of obesity, depression and food insecurity found in this study are conservative.

Another limitation was the heterogeneous nature of the AI/AN population. There are 566 federally recognized tribes and over 400 additional state recognized and other tribes and villages (Federal Register, 2013). Cultural differences between tribal groups makes generalizing findings done with one subpopulation to all others inappropriate.

Conclusions and Future Research

The study reported here is part of the preliminary phase for subsequent intervention studies designed to characterize the complex relationships among food security, dietary intakes, physical activity, and physical and mental health in NPI, with the long-term goal of improving health and quality of life of this population. In this study there was a high incidence of both food insecurity and depression, both of which appear to be directly related. The apparent interrelationships between these factors suggest that effective future interventions

in AI/AN communities to study, prevent and treat these problems must be designed to address both.

Further research with random sampling of all households in participating AI communities is needed to validate and extend the current findings. Research in other AI/AN subpopulations is also needed to be pursued in order to determine if similar results can be found in other communities.

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TABLE 1 – Demographics of the Community Sample of Northern Plains Indians *

		Gender	
	All	**Male**	**Female**
Participants, % (N)	100 (458)	38.2 (175)	61.8 (283)
Participant Age, years	38.2 ± 14.1	37.3 ± 13.6	38.7 ± 14.4
Age Mean ± SD	37.0 (458)	34.0 (175)	38.0 (283)
Age Median (N)	18 – 78	18 – 78	18 – 74
Age Range			
Education, % (N)			
< High School	8.4 (38)	9.8 (17)	7.6 (21)
High School/GED	31.1 (140)	40.5 (70)	25.3 (70)
Some College	45.8 (206)	38.7 (67)	50.2 (139)
Bachelor's	8.9 (40)	5.8 (10)	10.8 (30)
Graduate Degree	5.8 (26)	5.2 (9)	6.1 (17)
Employment, % (N)			
Full-Time	43.4 (197)	44.8 (78)	42.5 (119)
Part-Time	9.9 (45)	12.1 (21)	8.6 (24)
Home/Vol/Student†	22.0 (100)	13.8 (24)	27.1 (76)
Unemployed	17.0 (77)	20.7 (36)	14.6 (41)
Retired	7.7 (35)	8.6 (15)	7.1 (20)
Household Income, Income/year			
< $12,000 / year	33.0 (135)	30.7 (47)	34.4 (88)
$12 – 20,000 / year	20.1 (82)	22.2 (34)	18.8 (48)
$20 – 30,000 / year	18.3 (75)	17.7 (27)	18.8 (48)
$30 – 50,000 / year	16.9 (69)	17.6 (27)	16.4 (42)
> $50,000 / year	11.7 (48)	11.8 (18)	11.7 (30)

* Some participants did not respond to all demographic items.
†Homemaker/Volunteer/Student

TABLE 2 – Food Insecurity Among the Community Sample of Northern Plains Indians as Measured by the Core Food Security Module

		Gender	
	All	**Male**	**Female**
Food Security Category, % (N)			
Food Secure	73.7 (327)	75.1 (130)	72.7 (197)
Food Insecure -			
No Hunger	16.0 (71)	14.5 (25)	17.0 (46)
Moderate Hunger	7.0 (31)	7.5 (13)	6.6 (18)
Severe Hunger	3.4 (15)	2.9 (5)	3.7 (10)
Food Security, Score			
Mean ± SD	1.51 ± 2.07	1.43 ± 2.04	1.55 ± 2.1
Median (N)	0 (444)	0 (173)	0 (271)
Range	0 – 7.9	0 – 7.9	0 – 7.9
Food Desert,* % (N)	31.1 (99)	25.9 (29)	34.0 (70)

* Closest grocery store > 5 miles away.

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TABLE 3 - Mental Health of the Community Sample of Northern Plains Indians: Stress Indicators from Symptom Checklist-90-Revised

		Gender	
Measure, unit	**All**	**Male**	**Female**
Global Stress Index	0.44 ± 0.54	0.34 ± 0.47	0.50 ± 0.57
Mean ± SD	0.24 (437)	0.18 (170)	0.27 (267)
Median (N)	0 – 3.02	0 – 3.02	0 – 2.66
Range			
Positive Symptoms Index			
Mean ± SD	22.9 ± 23.4	19.9 ± 21.6	24.8 ± 24.3
Median (N)	15 (458)	13 (176)	16 (282)
Range	0 – 90	0 – 90	0 – 90
Positive Symptom Distress Index			
Mean ± SD	1.45 ± 0.51	1.37 ± 0.47	1.50 ± 0.52
Median (N)	1.27 (399)	1.22 (145)	1.30 (254)
Range	1 – 4.00	1 – 3.64	1 – 4.00

TABLE 4 - Mental Health Depression Indicators Among the Community Sample of Northern Plains Indians

		Gender	
Measure, unit	**All**	**Male**	**Female**
BDI-II, Total			
Mean ± SD	8.35 ± 8.56	7.38 ± 8.19	9.00 ± 8.75
Median (N)	6 (398)	5 (160)	7 (238)
Range	0 – 51	0 – 39	0 – 51
BDI-II, Depressed (score ≥ 14), % (N)	19.4 (77)	14.4 (23)	22.7 (54)
CES-D, Total			
Mean ± SD	9.94 ± 8.5	9.09 ± 7.66	10.5 ± 9
Median (N)	8 (432)	8 (170)	8 (262)
Range	0 – 48	0 – 43	0 – 48
CES-D, Depressed (score ≥ 16), % (N)	19.0 (82)	12.9 (22)	22.9 (60)
CES-D, "I Feel Depressed", % (N)			
<1 day / week	78.4 (349)	84.6 (148)	74.4 (201)
1 – 2 days / week	13.7 (61)	9.7 (17)	16.3 (44)
3 – 4 days / week	5.2 (23)	2.9 (5)	6.7 (18)
5 – 7 days / week	2.7 (12)	2.9 (5)	2.6 (7)
SCL-90-R Depression			
Mean ± SD	0.49 ± 0.66	0.35 ± 0.56	0.57 ± 0.7
Median (N)	0.23 (437)	0.15 (170)	0.31 (267)
Range	0 – 3.23	0 – 3.23	0 – 3.23

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Table 5: Depression Measurement Scores Among a Community Sample of Northern Plains Indians Grouped According to CFSM Category

	Food Secure	Food Insecure (w/o Hunger)	Food Insecure (w/ Moderate Hunger)	Food Insecure (w/ Severe Hunger)
BDI-II				
Mean ± SD	6.84 ± 7.22	11.68 ± 10.31	13.38 ± 10.50	11.75 ± 10.32
Median (N)	5.00	9.00	9.00	9.00
Range	47	51	38	35
CES-D				
Mean ± SD	8.66 ± 7.42	11.19 ± 10.30	13.03 ± 10.480	17.00 ± 10.32
Median (N)	7.00	8.00	12.00	16.00
Range	43	48	36	35
SCL-90-R Dep				
Mean ± SD	.35 ± .53	.73 ± .79	.87 ± .87	.86 ± .85
Median (N)	.15	.38	.46	.46
Range	3.23	3.15	3.23	2.46
QOLI				
Mean ± SD	59.52 ± 32.83	40.16 ± 32.12	39.64 ± 6.01	20.44 ± 26.93
Median (N)	61.00	34.00	28.00	8.00
Range	98	98	98	98