



Native American Weight Loss Movement: Pilot Test of a Culturally Tailored Weight Loss Program for American Indians

Journal of Health Disparities Research and Practice

Volume 12 | Issue 1

Article 1

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2018

Native American Weight Loss Movement: Pilot Test of a Culturally Tailored Weight Loss Program for American Indians

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Recommended Citation

Daley, Christine M.; Hale, Jason W.; Bointy, Shelley; Berryhill, Kelly; LeMaster, Joseph; and Gajewski, Byron J. (2018) "Native American Weight Loss Movement: Pilot Test of a Culturally Tailored Weight Loss Program for American Indians," *Journal of Health Disparities Research and Practice*: Vol. 12: Iss. 1, Article 1.

Available at: <https://digitalscholarship.unlv.edu/jhdrp/vol12/iss1/1>

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Abstract

American Indians (AIs) have higher rates of obesity than other racial/ethnic groups, placing them at heightened risk for cardiovascular diseases, diabetes, and certain cancers. Culturally appropriate weight loss interventions may be the key to reducing risk. The most successful program used in AI communities has been the Diabetes Prevention Program (DPP), which limits enrollment to individuals with a clinical diagnosis of pre-diabetes. The purpose of this pilot project was to modify and culturally tailor a weight loss intervention to AI communities in Kansas to improve weight loss related behaviors among those who do not qualify for the DPP. The Native American Weight Loss Movement (NAWLM) was developed from 2012-2014 using an iterative process with 4 sequential modifications to the program. Group 1 received a slightly modified version of the DPP that was originally tailored to African Americans. Each group received an improved program based on modifications from the previous group. Our analysis shows 36.1% (95% CI: 25.7, 47.5) of all participants (n=72) lost weight; a majority (63.9%, 95% CI: 52.8-75.0) maintained weight, gained weight, or dropped out. Among individuals who completed the program (n=34), 76.5% lost weight (95% CI: 61.4, 91.5). These individuals lost an average of 2.98% body weight (95% CI: 1.58, 4.37), with 6 participants losing >7% body weight. While most participants who completed the program lost weight, more research is needed to determine factors that discourage drop-out and promote behavioral changes. NAWLM shows promise as a weight loss program for AIs who do not qualify for the DPP.

Keywords

American Indians; weight loss; community-based participatory research; pilot study

Cover Page Footnote

The study described in this manuscript was funded by the University of Kansas Cancer Center. Portions of the authors' time were funded by the National Institute on Minority Health and Health Disparities (P20MD002708; PI: Daley). The authors wish to thank Christie Befort, PhD, and Julia Soap, MPH, for their work on the NAWLM project. The authors would also like to thank the American Indian community members who helped in the design and implementation of this research, as well as the tribal communities involved. The funding agency was not involved in the work reported in the manuscript or in the composition of the submission.

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Journal of Health Disparities Research and Practice
Volume 12, Issue 1, Spring 2019, pp. 1-18

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ABSTRACT

American Indians (AIs) have higher rates of obesity than other racial/ethnic groups, placing them at heightened risk for cardiovascular diseases, diabetes, and certain cancers. Culturally appropriate weight loss interventions may be the key to reducing risk. The most successful program used in AI communities has been the Diabetes Prevention Program (DPP), which limits enrollment to individuals with a clinical diagnosis of pre-diabetes. The purpose of this pilot project was to modify and culturally tailor a weight loss intervention to AI communities in Kansas to improve weight loss related behaviors among those who do not qualify for the DPP. The Native American Weight Loss Movement (NAWLM) was developed from 2012-2014 using an iterative process with 4 sequential modifications to the program. Group 1 received a slightly modified version of the DPP that was originally tailored to African Americans. Each group received an improved program based on modifications from the previous group. Our analysis shows 36.1% (95% CI: 25.7, 47.5) of all participants (n=72) lost weight; a majority (63.9%, 95% CI: 52.8-75.0) maintained weight, gained weight, or dropped out. Among individuals who completed the program (n=34), 76.5% lost weight (95% CI: 61.4, 91.5). These individuals lost an average of 2.98% body weight (95% CI: 1.58, 4.37), with 6 participants losing >7% body weight. While most participants who completed the program lost weight, more research is needed to determine factors that discourage drop-out and promote behavioral changes. NAWLM shows promise as a weight loss program for AIs who do not qualify for the DPP.

Keywords: Native American, American Indian, weight loss, cultural tailoring, community-based participatory research

Journal of Health Disparities Research and Practice Volume 12, Issue 1, Spring 2019

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INTRODUCTION

American Indians (AIs) have higher obesity rates and associated health problems than other racial/ethnic groups. The Indian Health Service Reports 54% of AIs aged 20-74 are obese and 81% are overweight or obese (Indian Health Service, 2011), compared to 34.5% of white adults (Ogden and Flegal, 2015). Obesity is a significant risk factor for multiple diseases, including cardiovascular diseases, diabetes, and multiple cancers. Cardiovascular diseases among AIs have become more prevalent over the past 3 decades and prevalence rates are now double that of the general US population (Welty, et al., 2002). The rates of heart disease (12.7%), coronary heart disease (7.2%), hypertension (25%), and stroke (4.6%), continue to increase (American Heart Association, 2013). High obesity rates are linked to the highest rates of diabetes of all races within the U.S., with the AI rate of 17.6% more than double the 7.3% rate for non-Hispanic Whites (Centers for Disease Control and Prevention, 2016). Overall cancer rates among AIs compared to non-Hispanic Whites vary by region (among AI men, from 316.6 in the Southwest to 655.4 in the Southern Plains per 100,000 vs. White men, and among AI women, from 257.5 in the Southwest to 530.5 in Alaska per 100,000 vs. White women; White, et al., 2014). Incidence of colorectal cancer is 21% higher and mortality 39% higher among AI than Whites (Perdue, et al., 2014). These outcomes can, at least partially, be attributed to obesity (Steele, et al. 2008, Holm, et al., 2010).

Multiple factors likely contribute to high obesity prevalence among AIs, such as limited access to nutritious food and physical activity amenities in isolated communities, high rates of depression, and adverse social environments (Jiang, et al., 2008, Edwards and Patchell, 2009). Despite these disparities, few obesity treatment programs have been developed targeting AI adults. Though several studies have addressed obesity among AI through physical activity interventions, few target lowering obesity rates among AI adults (Teufel-Shone, et al. 2009). Even fewer randomized studies among adults have been conducted. Most published research on obesity in AI is dedicated to prevention among schoolchildren (Sherwood, et al., 2000, Carrel, et al., 2005, Teufel-Shone, 2006, Adams, et al., 2008, Ho, et al., 2008, Adams and Prince, 2010, Jernigan, et al., 2010, Fleischhacker, et al., 2011, Gittelsohn and Rowan, 2011, Adams, et al., 2012). Efforts to address obesity among AI adults exist at the tribal level, yet dissemination is often limited to word-of-mouth and conferences (Teufel-Shone, 2006). These programs target communities, families, and coworkers to modify behavior through social support, collective efficacy, and friendly competition (Teufel-Shone, 2006).

The Diabetes Prevention Program (DPP) has proven to be the most successful weight loss program in American Indian communities. The original program was a large scale clinical trial that found that participants who lost weight through dietary changes while also increasing physical activity significantly reduced chances for developing diabetes by 58% (U.S. Department of Health and Human Services, 2008). Participants from 27 clinical centers throughout the United States were randomized to three arms, including a lifestyle intervention arm consisting of intensive training in diet, physical activity, and behavior modification; a second arm who were given 850 mg of metformin twice per day; and a third arm who received placebo pills instead of metformin. Both the metformin and placebo groups received information about diet and exercise. Lifestyle intervention group participants reduced their risk of developing diabetes by 58% with weight loss and physical activity (U.S. Department of Health and Human Services, 2008). Metformin group participants reduced risk by 31% (U.S. Department of Health and

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Human Services, 2008). The DPP team determined that weight loss was the main predictor for reduced risk for type II diabetes (U.S. Department of Health and Human Services, 2008). The DPP intervention arm included 5.7% AI, was individually delivered, and included a toolbox approach for individually tailored strategies. The program was not culturally targeted to AI and weight outcomes were lower among AI than non-Hispanic whites, with 30% of AI achieving the 7% weight loss goal compared to 55% of non-Hispanic whites (Jiang, et al. 2013).

In 2004, the Indian Health Service launched a Diabetes Prevention Demonstration Project and funded 36 programs to implement the DPP to prevent diabetes among high-risk AI (The Diabetes Prevention Program, 2002, Teufel-Shone, 2006). Implementation sites were given DPP materials and guidelines; one site targeting AI adults focused on program adaptability in terms of acceptability, feasibility, and outcomes (Manson, et al., 2011, Brega, et al., 2012, Jiang, et al. 2013). Class attendance was strongly correlated with newly incident diabetes (3.5% each year among those who completed all 16 classes and 7.5% among participants who did not finish all classes; Jiang, Manson et al. 2013) On average, a 4.4% weight loss was achieved by participants who completed the 16 week lifestyle intervention classes. (Jiang, et al., 2013). Over one-fifth (22.5%) of participants completing the post-curriculum assessment (within a month of completion of the last lifestyle class) met a 7% weight loss goal by the end of the Lifestyle Balance classes (Jiang, et al., 2013).

The success of an AI obesity treatment program may rely on its cultural appropriateness. Components need to account for the distinct histories of AIs and issues common to communities facing poverty, as most AI communities do. The highest rate of poverty within the U.S. is among AIs (28.3% compared to the nation as a whole, 15.5%; United States Census Bureau, 2014) and has been shown to be associated with higher rates of obesity among American Indians (Marley and Metzger, 2015). Dill et al. (2016) examined the association between psychosocial predictors of weight loss among AIs; psychological distress and negative family support were predictive of less weight loss. Positive family support predicted greater weight loss in this Diabetes Prevention Translational Project (Dill, et al., 2016). Hodge et al. (2014) found support for a link among AIs between high blood pressure and a history of verbal abuse in childhood with a higher BMI (Hodge, et al., 2014). Issues such as these can be important when creating an appropriate weight loss program.

Given the scope and seriousness of obesity, the paucity of interventions for AI adults highlights the need for research to develop and examine the impact of a culturally targeted intervention for AI. The Center for American Indian Community Health (CAICH) at the University of Kansas Medical Center has successfully used community-based participatory research methods for over 12 years to develop and implement programs in American Indian communities in Kansas. Community partners requested the development of a culturally tailored weight-loss program that was not specifically for clinically diagnosed pre-diabetics as the DPP is. They requested a program for any AI who wished to lose weight and wanted to modify the DPP to be more culturally appropriate. CAICH team members, along with American Indian community partners, worked together to modify the DPP for local communities. The team began with a modified version of the DPP tested among African American women (Befort, et al., 2008) and created the *Native American Weight Loss Movement or NAWLM*. Here we present the main outcomes of this pilot program.

METHODS

The primary goal when developing NAWLM was to culturally tailor an existing 16-week weight loss intervention to local AI communities using the principles of community-based participatory research. We initially planned for four sequential NAWLM groups, with eight participants per group (N=64), to allow for modifications to the program between groups. Due to high interest in the program, we exceeded our recruitment goal (N=84 consented into the study, 72 of whom completed intake). Group sessions were held in 4 different Native communities, including urban AI communities in Lawrence, Kansas, and Kansas City, Kansas, and rural communities from two federally recognized reservations in Kansas, from 2012-2014. All study protocols were approved by the University of Kansas Human Subjects Committee and both tribal councils prior to use in the study.

Participants were recruited by AI members of the research team and community advisors through posters, interest forms collected at tribal and community health fairs, AI cultural events such as powwows, and via word-of-mouth. Inclusion criteria included: 1) 18-70 years of age; 2) self-identified AI or Alaska Native; 3) currently overweight or obese (BMI equal or greater than 25); 4) interested in losing weight; 5) weight stable (have not gained or lost less than 10 lbs. in the last 3 months); 6) have a home address and a functioning home or cell telephone number; 7) able to attend group meetings; and 8) physician clearance to participate. Exclusion criteria included: 1) current pregnancy, lactation, or intention to become pregnant in the next 6 months; 2) other current weight loss treatment including behavioral and pharmacologic interventions; and 3) plan to move out of the area of study within the next 6 months. Potential participants were screened by telephone or in-person. Written and verbal informed consent was obtained prior to baseline data collection.

We used a community-based participatory research model throughout program development, involving community members in all aspects of program development. We worked closely with community members to determine the best time and place to hold groups, giving consideration in scheduling to cultural events and traditional ceremonial time periods. Participants from each successive group, in conjunction with AI members of the research team, were provided an opportunity to assist in modifying the program after completing participation. Study participants provided feedback and input during each stage of the intervention in order to tailor the program to better meet the needs of AI individuals and communities. Feedback included culturally specific topics, such as social and behavioral issues relevant to AI culture (e.g. eating at cultural events, perceptions of body image, etc.), the dynamics of the AI communities and families, and how this affected weight loss efforts. Historical trauma and food insecurity discussions were initiated by study participants and added to NAWLM over the later versions of the program.

Participants attended groups according to their choice of location. The groups were run in succession, with breaks in between versions of the program to allow for modifications. Each group was facilitated by a Native facilitator with prior experience in health promotion/disease prevention programs such as the DPP. Data collection occurred at baseline and week 16 and included: 1) demographic information (e.g. sex, marital status, where a participant grew up); 2) medical and weight history (e.g. any previous or current chronic disease diagnoses, current or recent attempts to lose weight); 3) process measures (e.g. satisfaction with the program, level of

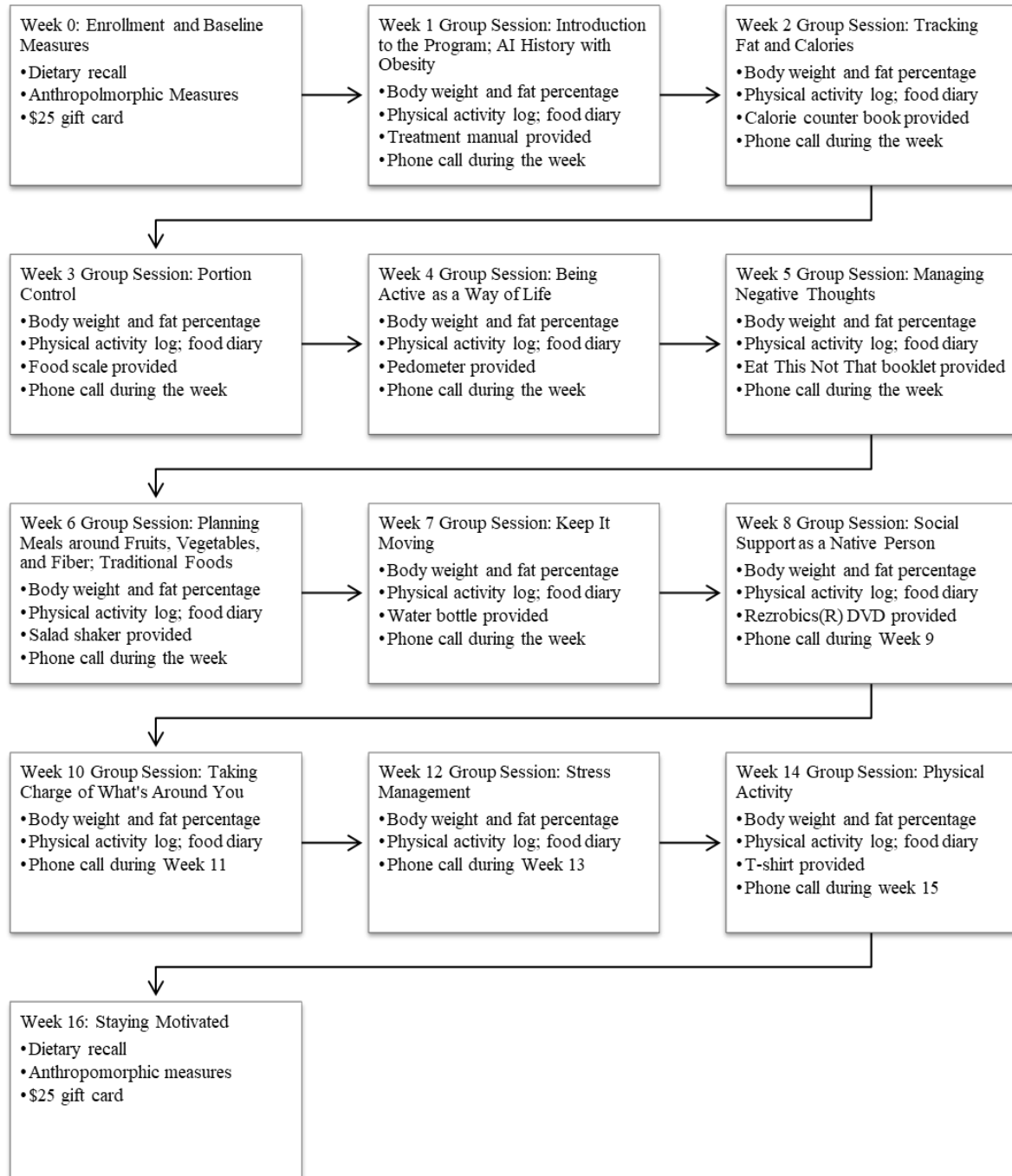
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motivation and confidence to lose weight on a scale of 1 to 10); 4) dietary patterns (using questions from the Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention, 2011)); 5) physical activity (using the Paffenbarger Physical Activity Questionnaire (Paffenbarger, et al., 1993) and the Godin Physical Activity Questionnaire (Godin and Shephard, 1985)); 6) psychological mediators (including the PHQ-9 for depression, (Kroenke, et al., 2001) the 10 item Perceived Stress Scale, (Cohen, et al., 1983) and the SF-12 Quality of Life Screener (Gandek, et al., 1998)); and 7) anthropomorphic measures (height, weight, blood pressure, waist circumference, BMI, HbA1c, blood glucose, total cholesterol, 6 minute walk test). Adherence data were collected throughout the intervention, calculated as number of group sessions attended and the number of dietary/activity logs completed and turned in for review at group meetings. Process evaluations were performed each week, with participants completing a one-page survey that included Likert-scale questions and three open-ended questions to assess and improve the program's cultural-appropriateness (results of these will be reported elsewhere). All participants received a small incentive in the form of a \$25 gift card for each assessment time at baseline and completion. All participants also received calorie counter books, pedometers, food scale, and an educational curriculum based on the DPP's Lifestyle Balance Curriculum (Knowler, et al., 2002) and modified to be culturally appropriate over the course of the pilot intervention.

Participants in the program were given the following goals: 1) lose 5% of their total body weight; 2) gradually increase to 225 minutes per week of moderate physical activity (primarily walking); 3) keep a weekly food log following a diet that is reduced by 300 to 1000 kcal below maintenance requirements; and 4) eat 5 or more servings of fruit and vegetable servings per day. Participants met in-person for weekly group sessions for 16 weeks. (For program timeline and topics, see Figure 1.) Facilitators presented a weight loss curriculum that was based on the DPP "Lifestyle Balance" program, each meeting covering a different area of nutrition, physical activity and behavior modification.

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Figure 1. NAWLM program timeline, Kansas, 2011-2013.



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To address our primary aim of estimating the effectiveness of the weight control intervention, we compared percent weight change from baseline to 16 weeks with 0% weight change using a one-sample two-sided t-test. We also estimated the effect for completers only (those who attend 70% of treatment sessions and return for data collection). We performed a longitudinal analysis of weight lost over time with linear mixed modeling. We chose a model of best fit using Bayesian Information Criterion in which time is a continuous variable and the slope and intercept are random. Similar analyses as for weight were performed for secondary measures: total kcal per day, percent kcal from fat, fruit and vegetable servings per day, frequency of fast food consumption, and minutes of physical activity.

We conducted a program evaluation via telephone after completion of the intervention to identify factors to improve the acceptability and feasibility of the program. Research team members conducting the evaluation were not facilitators for the NAWLM groups, but were all AI. An attempt was made to gather evaluation information from all NAWLM participants, including those who did not complete the program. All participants were called a minimum of five times after completion of the 6 month follow-up (or after they should have completed the follow-up for those who dropped out of the program) and were administered the survey via structured telephone interviews (N=34). No participants refused participation in the evaluation once they answered their phones and spoke to a research team member. Evaluation interviews lasted approximately 10-15 minutes. Data were entered into the secure version of Survey Monkey® by researchers during the phone calls. The survey instrument contained questions about the program itself, the behaviors of the participants during and post intervention, and general feelings towards NAWLM and its components (see Table 1 for sample evaluation questions). Demographic data were not gathered from the participants in the evaluation to maintain confidentiality and encourage participation in the evaluation. Data were summarized by frequency of response.

Table 1: Sample Evaluation Questions

Sample Questions Asked of Participants	Response Options
What was your weight loss goal?	Free response
How much weight did you actually lose?	Free response
Have you lost any additional weight since the program ended? If yes, how much?	Free response
Did you complete the program?	Yes/No
Would you say you participated in:	Almost all of the sessions More than half of the sessions About half of the sessions Less than half of the sessions
Do you think the length of the sessions was:	Too long, Just right, Too short
Do you think the frequency of the in-person sessions (12) were:	Too many, Just right, Too few
Do you think the length of the program (16 weeks) was:	Too long, Just right, Too short
Did you keep a food journal?	Yes, all of the time Yes, most of the time About half of the time Less than half of the time I didn't keep a food journal
Did you change your diet after the program?	Yes/No
After the program, did you reduce, maintain, or increase your fruit and vegetable intake?	Reduced, Maintained, Increased

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After the program, did you reduce, maintain, or increase your fast food consumption?	Reduced, Maintained, Increased
After the program, did you reduce, maintain, or increase your sugar sweetened beverage intake?	Reduced, Maintained, Increased
Since the program ended, have you reduced, maintained, or increased your physical activity level?	Reduced, Maintained, Increased
What changes did you make in your lifestyle that you believe made the most difference for you?	Used a food journal to track food Learned portion sizes and practiced portion control Stopped or reduced fast food consumption Increased intake of fruits and vegetables Stopped or reduced sugar sweetened beverage consumption Increased my physical activity
What was your favorite/least favorite part of the program?	The session materials The food demos The session activities The facilitator Group support Mixed gender groups The supplies/incentives Culturally tailored materials
What do you think are the 3 most important qualities for a facilitator to have?	Good listener Organized Experienced weight loss struggles Physical fitness Encouraging/motivating Knowledgeable in cultural issues related to weight management Skilled in facilitating group discussions
On a scale of 1 to 10, with 1 being not important at all and 10 being extremely important, how important is it to you that your facilitator be American Indian/be the same gender as you?	1 to 10

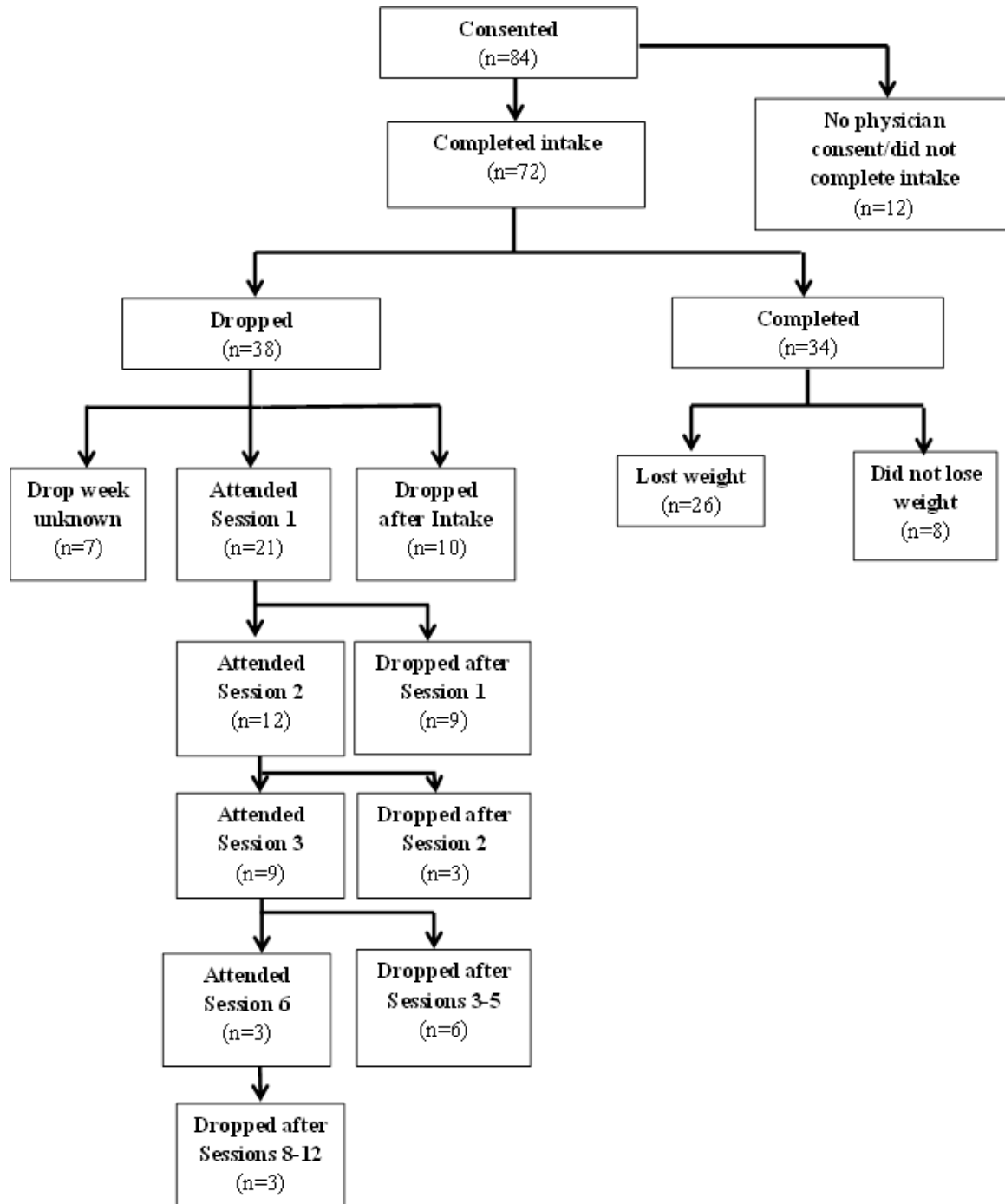
RESULTS

We initially recruited 84 individuals into the program, 72 of whom began the program through completion of baseline measures. The other 12 people consented into the study and did not return for baseline measurement despite multiple attempts at contacting them. Thirty-four individuals completed the program (see Figure 2 for participant drop-out distribution). Completers of the program were defined as those who completed intake measurements (baseline) as well as final anthropomorphic measurements (endpoint). Non-completers were defined as people who completed intake, but never completed final anthropomorphic measurements. A comparison between completers and non-completers shows the two groups did not vary significantly across demographics and baseline measurements (see Table 2). At baseline,

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participants weighed an average of 220 pounds, with a BMI of 36 and waist circumference of 44 inches. Glucose was slightly higher among completers (142.2 mg/dL) than non-completers (125.8 mg/dL), but this difference was not significant and could be due to measurement error among facilitators for the program (see Table 3).

Figure 2. NAWLM participation flow chart, Kansas 2011-2013.



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Table 2. Baseline demographic characteristics of participants, Kansas 2011-2013.

	Completers	Non-Completers	p-value*
	(n=34)	(n=38)	
	n (%)	n (%)	
Sex			
Female	29 (85.29)	33 (86.84)	0.85
Male	5 (14.71)	5 (13.16)	
Living Situation			
Married/With Partner	19 (55.88)	16 (42.11)	0.31
Not Married	14 (41.18)	18 (47.37)	
Not specified	1 (2.94)	4 (10.53)	
Children			
Yes	29 (85.29)	27 (71.05)	0.29
No	4 (11.76)	7 (18.42)	
Not Specified	1 (2.94)	4 (10.53)	
Living Situation and Children			
Married with children	17 (50.00)	14 (36.84)	0.52
Married without children	2 (5.88)	2 (5.26)	
Single with children	12 (35.29)	13 (34.21)	
Single without children	2 (5.88)	5 (13.16)	
Not specified	1 (2.94)	4 (10.53)	
Employment			
Full-time	24 (70.59)	24 (63.16)	0.51
Part-time	2 (5.88)	4 (10.53)	
Other	7 (20.59)	6 (15.79)	
Not specified	1 (2.94)	4 (10.53)	
Education			
High School	4 (11.76)	9 (23.68)	0.12
College	21 (61.76)	20 (52.63)	
Graduate Degree	8 (23.53)	4 (10.53)	
Not specified	1 (2.94)	5 (13.16)	
Grew Up			
Reservation/Rural/Trust	16 (47.06)	19 (50.00)	0.59
Urban/Suburban	10 (29.41)	7 (18.42)	
Combination	6 (17.65)	7 (18.42)	
Not specified	2 (5.88)	5 (13.16)	
Health Care			
Indian Health Service	11 (32.35)	17 (44.74)	0.67
Tribal Clinic	15 (44.12)	12 (31.58)	
Other	5 (14.71)	5 (13.16)	
Not specified	3 (8.82)	4 (10.53)	

*Chi-square probabilities may not be valid due to cell counts less than 5.

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Table 3. Baseline anthropomorphic measures of participants, Kansas 2011-2013.

	Completers (n=34)		Non-Completers (n=38)*		p-value
	Mean	95%CI	Mean	95%CI	
Age	41.5	(36.8, 46.2)	39.2	(33.3, 45.1)	0.55
Weight	220.6	(201.1, 240.1)	219.7	(205.0, 234.4)	0.94
BMI	35.9	(33.2, 38.5)	35.6	(33.5, 37.9)	0.90
Waist	43.9	(41.3, 46.5)	44.3	(42.2, 46.4)	0.80
Glucose	142.2	(115.5, 168.9)	125.8	(111.2, 140.5)	0.27

*Missing data for non-completers waist (n=36) and glucose (n=37) measurements.

Primary Outcomes

Our analysis shows 36.1% (95% CI: 25.7, 47.5) of all participants (n=72) lost weight; a majority of participants (63.9%, 95% CI:52.8-75.0) maintained weight, gained weight, or dropped out. However, among individuals who completed the program (n=34), 76.5% lost weight (95% CI: 61.4, 91.5). Completers lost an average of 2.98% body weight (95% CI: 1.58, 4.37), with 6 participants losing >7% body weight.

In the longitudinal model, each participant’s weight changed at a different rate, but on average, participants lost 0.36 lbs. per week. This analysis was performed using records we kept on weekly weight measurements, although records were incomplete or missing for some participants.

Secondary Outcomes

We assessed secondary outcomes among those who completed the program, including waist circumference, glucose, exercise, fruit and vegetable intake, fast food intake, sugar-sweetened beverage intake, and frybread intake. Non-fasting glucose measurements decreased from intake to final measures from 142.2 mg/dL to 119.3 mg/dL (p<0.05). Measurement error is possible with different facilitators administering the tests. We saw a significant trend among completers; they decreased their fast food intake from weekly to monthly or less (p=0.0117). We also saw trends toward decreased sugar-sweetened beverage intake, from 3 or more times per week to less than monthly, though these were not significant. See Table 4 for comprehensive results of secondary outcomes.

Table 4. Secondary outcomes among completers, Kansas 2011-2013.

Quantitative Variables	Completers (n=34)				Paired t-test	
	Intake Measures		Final Measures		Diff	p
	Mean	95% CI	Mean	95% CI		
Weight (lbs.)	220.6	(201.1, 240.1)	213.3	(195.5, 231.2)	7.2	0.0001
BMI (kg/m ²)	35.9	(33.2, 38.5)	34.7	(32.2, 37.2)	1.1	0.0008
Waist circumference (in.)	43.9	(41.3, 46.5)	43.0	(40.8, 45.1)	0.9	0.1632
Glucose (mg/dL)	142.2	(115.5, 168.9)	119.3	(101.3, 137.3)	22.9	0.0497

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Categorical Variables	Intake n (%)	Final n (%)	McNemar Pr>S
Strenuous Exercise			
None	15 (44.12)	15 (44.12)	0.5143
1-4 times/week	16 (47.06)	13 (38.24)	
5 or more times/week	3 (8.82)	6 (17.65)	
Moderate Exercise			0.2144
None	10 (29.41)	13 (38.24)	
1-4 times/week	23 (67.65)	16 (47.06)	
5 or more times/week	1 (2.94)	5 (14.71)	
Mild Exercise			0.3080
None	10 (29.41)	16 (47.06)	
1-4 times/week	18 (52.94)	14 (41.18)	
5 or more times/week	6 (17.65)	4 (11.76)	
Vegetable Intake*			0.2000
0 – 2 servings	21 (87.50)	20 (83.33)	
3 or more servings	3 (12.50)	4 (16.67)	
Fruit Intake*			0.7630
0 – 2 servings	29 (85.29)	28 (82.35)	
3 or more servings	5 (14.71)	6 (17.65)	
Fast Food Intake*			0.0117
Never to 3 times/month	7 (29.17)	17 (70.83)	
1-2 times/week	9 (37.50)	4 (16.67)	
3 or more times/week	8 (33.33)	3 (12.50)	
Sugar-Sweetened Beverage (SSB) Intake*			0.2173
Never to 3 times/month	7 (29.17)	14 (58.33)	
1-2 times/week	5 (20.83)	2 (8.33)	
3 or more times/week	12 (50.00)	8 (33.33)	
Frybread Intake*			0.0588
Never or rarely	8 (33.33)	13 (54.17)	
1 time/month or more	16 (66.67)	11 (45.83)	

*Missing paired data for Fruit/Vegetable Intake (n=24), Fast Food Intake (n=24), SSB Intake (n=24), Frybread Intake (n=24).

Participation

In the overall pilot program, 34 people completed intake and final measures, while 38 completed intake and then dropped at some point during the program. Most of the completers (n=27) attended a range of 5-12 sessions after intake. However, actual attendance was most likely higher, because these values are based on whether there is a weight recorded for each participant during that week. Some facilitators did not always record weekly weight measurements due to changes in protocol over the course of the pilot. The exact week the

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participant dropped was unknown for 7 individuals. Of those participants who completed the program, 26 lost weight.

Program Evaluation

Forty-one percent of participants who started the program completed the evaluation (33 of 72 participants); this included 26 individuals who completed the program and provided outcome measures and 7 individuals who dropped out of the program at some point. To maintain anonymity of participants, we did not collect demographic information of respondents to the evaluation. Evaluation questions examined personal health outcomes post-intervention, program components, and group facilitators (see Table 5).

The majority of individuals completing the evaluation (76%) indicated that they had participated in almost all of the sessions. The lifestyle changes participants felt made the most difference to them included learning about portion sizes and control (54%), increasing their physical activity (46%), and reducing fast food and sugar sweetened beverage intake (both 33%). Since program completion, many participants lost additional weight (30%) and made additional behavioral changes. Eight-one percent of participants said they changed their diet since program completion, including some positive and some negative changes. The most common positive change to make in diet was additional reduction in sugar sweetened beverage intake, with 50% of respondents making additional reductions. The majority of participants (78%) maintained or increased their fruit and vegetable intake; 71% maintained or reduced fast food intake. The majority of participants either maintained or increased their physical activity (72%).

Evaluation participants also provided feedback on program components. Participants indicated that the program was an appropriate length (79%) and that the sessions themselves were of an appropriate length (60%) and frequency (91%). Participants' favorite part of the program was the group support (50%), followed by the food demonstrations and individual facilitators (27% each), and the culturally tailored educational materials (23%). Only 13 participants named anything as a least favorite part of the program. See Table 5 for full results.

When asked about the program facilitators, evaluation participants wanted them to have some specific characteristics, particularly that they have experience in weight loss struggles (56%), knowledge of cultural issues related to weight management (45%), and the ability to be encouraging or motivating (42%). Participants also felt that having an AI facilitator was important; 65% of participants rated having an AI facilitator 8 or above on a 10-point scale. Gender of facilitator was seen as less important, with importance of having a facilitator of the same gender as the participant given an average rank of 4.58 on a 10-point scale.

Table 5. NAWLM evaluation results.

Evaluation Domains for Participants	Participant Responses N (%)	Evaluation Domains for Program Components	Participant Responses N (%)
Did you complete the program?		Length of the sessions (1 hr)	
Yes	26 (78.79)	Too long	5 (15.15)
No	7 (21.21)	Just right	26 (78.79)
Participation in sessions:		Too short	2 (6.06)
Almost all	25 (75.76)	Length of NAWLM program (16 weeks)	
More than half	2 (6.06)	Too long	8 (26.67)
About half	2 (6.06)	Just right	18 (60.00)
Less than half	4 (12.12)	Too short	4 (13.33)
Have you lost any additional weight since the program ended?		Frequency of the sessions (12)	
Yes	10 (29.41)	Too many	1 (3.03)
No	24 (70.59)	Just right	30 (90.91)
Has your diet changed post-intervention?		Too few	2 (6.06)
Yes	26 (81.25)	Favorite part of the program?	
No	6 (18.75)	Session materials	5 (19.23)
Fruit & Vegetable Intake (Post-Intervention)		Food demonstrations	7 (26.92)
Reduced	6 (22.22)	Session activities	4 (15.38)
Maintained	15 (55.56)	Facilitator	7 (26.92)
Increased	6 (22.22)	Group support	13 (50.00)
Fast Food Consumption (Post-Intervention)		Mixed gender groups	1 (3.85)
Reduced	9 (32.14)	Supplies/incentives	5 (19.23)
Maintained	11 (39.29)	Culturally tailored materials for AI	6 (23.08)
Increased	8 (28.57)	Least favorite part of the program?	
Sugar Sweetened Beverages (Post-Intervention)		Session materials	6 (46.15)
Reduced	14 (50.00)	Food demonstrations	0 (0.00)
Maintained	8 (28.57)	Session activities	3 (23.08)
Increased	6 (21.43)	Facilitator	0 (0.00)
Physical Activity Level (Post-Intervention)		Group support	1 (7.69)
Reduced	7 (28.00)	Mixed gender groups	1 (7.69)
Maintained	12 (48.00)	Supplies/incentives	2 (15.38)
Increased	6 (24.00)	Culturally tailored materials for AI	0 (0.00)

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What lifestyle changes made the most difference to you?

Use of food journal	5 (20.83)
Learn portion sizes and practice portion control	13 (54.17)
Stopped or reduced fast food intake	8 (33.33)
Increase in fruit and vegetable intake	10 (41.67)
Stopped or reduced sugar sweetened beverages	8 (33.33)
Increase in physical activity	11 (45.83)

Numbers do not all add to 34 due to missing data and some questions that allowed multiple answers.

CONCLUSION

NAWLM is a promising weight loss program that has been developed and piloted tested with some encouraging success. Thirty-six percent of participants met their weight loss goal of 5% body weight at 16 weeks compared to the original non-culturally tailored DPP program for clinically diagnosed pre-diabetics where 30% of AI participants achieved the 7% weight loss goal (Jiang, et al., 2013). NAWLM retention rates improved from 36% in early groups most similar to the DPP (n=2 groups) to 65% at program completion for the most culturally tailored iterations of the program (n=2). Average weight loss in our pilot was 4.3% across all groups. Program participants requested a longer program, preferably 6 months. If we extrapolate linear weight loss from the 16-week program to a 6-month or 26-week program, participants would on average achieve a 7.0% weight loss among participants, which is the current guideline for clinically meaningful weight loss set by the NHLBI (NHLBI, 1998). We hope to test this extrapolation in a future study.

The NAWLM pilot program excluded those who were pre-diabetic, unlike the original DPP program who only accepted pre-diabetics. We did this because the DPP is currently run in our area for pre-diabetics. Community partners requested that we focus on community members who did not qualify for the DPP. It is possible that participants who are pre-diabetic would have greater motivation for success in a weight loss program compared to participants in our program. A large-scale randomized trial of NAWLM that includes all AI individuals who wish to lose weight should be conducted in the future to determine if status as a pre-diabetic has any influence on weight loss or behavioral change.

Limitations of our pilot study included a small sample size and a small geographic area covered. We consented a total of 84 participants at different sites that included rural tribal communities and urban sites all within Northeast Kansas, but only 72 individuals started the program. Another limitation was the use of multiple facilitators. The delivery of the program likely differed from group to group as a different facilitator was used at each site, though facilitators were monitored for fidelity to the program and all received the same training.

We are now making modifications to the program based on data from the pilot program, as well as participant and facilitator feedback. We hope to test this new and improved program for efficacy in a full-scale randomized trial.

ACKNOWLEDGEMENTS

This study was funded by the University of Kansas Cancer Center. Portions of the authors' time were funded by the National Institute on Minority Health and Health Disparities (P20MD002708; PI: Daley). The authors wish to thank Christie Befort, PhD, and Julia Soap, MPH, for their work on the NAWLM project. The authors would also like to thank the American Indian community members who helped in the design and implementation of this research, as well as the tribal communities involved.

The funding agency was not involved in the work reported in the manuscript or in the composition of the submission.

REFERENCES

- Adams, A. and R. Prince (2010). "Correlates of physical activity in young American Indian children: lessons learned from the Wisconsin Nutrition and Growth Study." *J Public Health Manag Pract* 16(5): 394-400.
- Adams, A.K., H. Harvey and D. Brown (2008). "Constructs of Health and Environment Inform Child Obesity Prevention in American Indian Communities." *Obesity* 16(2): 311-317.
- Adams, A.K., T.L. LaRowe, K.A. Cronin, R.J. Prince, D.P. Wubben, T. Parker and J.B. Jobe (2012). "The Healthy Children, Strong Families intervention: design and community participation." *J Prim Prev* 33(4): 175-185.
- American Heart Association. (2013). "Statistical Fact Sheet 2013 Update American Indian/Alaska Natives & Cardiovascular Disease", from https://www.heart.org/idc/groups/heart-public/@wcm/@sop/@smd/documents/downloadable/ucm_319569.pdf.
- Befort, C.A., N. Nollen, E.F. Ellerbeck, D.K. Sullivan, J.L. Thomas and J.S. Ahluwalia (2008). "Motivational interviewing fails to improve outcomes of a behavioral weight loss program for obese African American women: a pilot randomized trial." *J Behav Med* 31(5): 367-377.
- Brega, A.G., L. Jiang, J. Beals, S.M. Manson, K.J. Acton and Y. Roubideaux (2012). "Special diabetes program for Indians: reliability and validity of brief measures of print literacy and numeracy." *Ethn Dis* 22(2): 207-214.
- Carrel, A., A. Meinen, C. Garry and R. Storandt (2005). "Effects of nutrition education and exercise in obese children: the Ho-Chunk Youth Fitness Program." *Wmj* 104(5): 44-47.
- Centers for Disease Control and Prevention (2011). "Behavioral Risk Factor Surveillance System." from <http://www.cdc.gov/brfss>.
- Centers for Disease Control and Prevention (2016). "Summary Health Statistics: National Health Interview Survey 2014 Table A-4", from <http://www.cdc.gov/nchs/nhis/shs/tables.htm>.
- Cohen, S., T. Kamarck and R. Mermelstein (1983). "A global measure of perceived stress." *J Health Soc Behav* 24(4): 385-396.
- Dill, E.J., S.M. Manson, L. Jiang, K.A. Pratte, M.J. Gutilla, S.L. Knepper, J. Beals, Y. Roubideaux and Special Diabetes Program For Indians Diabetes Prevention Demonstration Project (2016). "Psychosocial Predictors of Weight Loss among American Indian and Alaska Native Participants in a Diabetes Prevention Translational Project." *J Diabetes Res* 2016: 1546939.

17 Native American Weight Loss Movement: Pilot Test of a Culturally Tailored Weight Loss Program for American Indians – Daley et al.

- Edwards, K. and B. Patchell (2009). "State of the science: a cultural view of Native Americans and diabetes prevention." *J Cult Divers* 16(1): 32-35.
- Fleischhacker, S., M. Vu, A. Ries and A. McPhail (2011). "Engaging tribal leaders in an American Indian healthy eating project through modified talking circles." *Fam Community Health* 34(3): 202-210.
- Gandek, B., J.E. Ware, N.K. Aaronson, G. Apolone, J.B. Bjorner, J.E. Brazier, M. Bullinger, S. Kaasa, A. Leplege, L. Prieto and M. Sullivan (1998). "Cross-validation of item selection and scoring for the SF-12 Health Survey in nine countries: results from the IQOLA Project. International Quality of Life Assessment." *J Clin Epidemiol* 51(11): 1171-1178.
- Gittelsohn, J. and M. Rowan (2011). "Preventing diabetes and obesity in American Indian communities: the potential of environmental interventions." *Am J Clin Nutr* 93(5): 1179s-1183s.
- Godin, G. and R.J. Shephard (1985). "A simple method to assess exercise behavior in the community." *Can J Appl Sport Sci* 10(3): 141-146.
- Ho, L., J. Gittelsohn, S. Sharma, X. Cao, M. Treuth, R. Rimal, E. Ford and S. Harris (2008). "Food-related behavior, physical activity, and dietary intake in First Nations - a population at high risk for diabetes." *Ethn Health* 13(4): 335-349.
- Hodge, F., M.S. Stemmler and K. Nandy (2014). "Association between Obesity and History of Abuse among American Indians in Rural California." *J Obes Weight Loss Ther* 4.
- Holm, J.E., N. Vogeltanz-Holm, D. Poltavski and L. McDonald (2010). "Assessing Health Status, Behavioral Risks, and Health Disparities in American Indians Living on the Northern Plains of the U.S." *Public Health Reports (1974-)* 125(1): 68-78.
- Indian Health Service. US Department of Human Services. (2011). "Healthy Weight for Life: Trends and Impact."
- Jernigan, V.B., B. Duran, D. Ahn and M. Winkleby (2010). "Changing patterns in health behaviors and risk factors related to cardiovascular disease among American Indians and Alaska Natives." *Am J Public Health* 100(4): 677-683.
- Jiang, L., J. Beals, N.R. Whitesell, Y. Roubideaux and S.M. Manson (2008). "Stress Burden and Diabetes in Two American Indian Reservation Communities." *Diabetes Care* 31(3): 427-429.
- Jiang, L., S.M. Manson, J. Beals, W.G. Henderson, H. Huang, K.J. Acton and Y. Roubideaux (2013). "Translating the Diabetes Prevention Program Into American Indian and Alaska Native Communities." Results from the Special Diabetes Program for Indians Diabetes Prevention demonstration project 36(7): 2027-2034.
- Jiang, L., S.M. Manson, J. Beals, W.G. Henderson, H. Huang, K.J. Acton and Y. Roubideaux (2013). "Translating the Diabetes Prevention Program into American Indian and Alaska Native communities: results from the Special Diabetes Program for Indians Diabetes Prevention demonstration project." *Diabetes Care* 36(7): 2027-2034.
- Knowler, W.C., E. Barrett-Connor, S.E. Fowler, R.F. Hamman, J.M. Lachin, E.A. Walker and D.M. Nathan (2002). "Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin." *N Engl J Med* 346(6): 393-403.
- Kroenke, K., R.L. Spitzer and J.B. Williams (2001). "The PHQ-9: validity of a brief depression severity measure." *J Gen Intern Med* 16(9): 606-613.

18 Native American Weight Loss Movement: Pilot Test of a Culturally Tailored Weight Loss Program for American Indians – Daley et al.

- Manson, S.M., L. Jiang, L. Zhang, J. Beals, K.J. Acton and Y. Roubideaux (2011). "Special diabetes program for Indians: retention in cardiovascular risk reduction." *Gerontologist* 51 Suppl 1: S21-32.
- Marley, T.L. and M.W. Metzger (2015). "A longitudinal study of structural risk factors for obesity and diabetes among American Indian young adults, 1994-2008." *Prev Chronic Dis* 12: E69.
- NHLBI (1998). "Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: executive summary. Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults." *The American Journal of Clinical Nutrition* 68(4): 899-917.
- Ogden, C.L., M.D. Carroll, H.G. Lawman, C.D. Fryar, D. Kruszon-Moran, B.K. Kit, and K.M. Flegal (2015). "Trends in Obesity Prevalence among Children and Adolescents in the United States, 1988-1994 through 2013-2014." *JAMA* 315(21):2292-2299.
- Paffenbarger, R.S., Jr., S.N. Blair, I.M. Lee and R.T. Hyde (1993). "Measurement of physical activity to assess health effects in free-living populations." *Med Sci Sports Exerc* 25(1): 60-70.
- Perdue, D.G., D. Haverkamp, C. Perkins, C.M. Daley and E. Provost (2014). "Geographic variation in colorectal cancer incidence and mortality, age of onset, and stage at diagnosis among American Indian and Alaska Native people, 1990-2009." *Am J Public Health* 104 Suppl 3: S404-414.
- Sherwood, N.E., L. Harnack and M. Story (2000). "Weight-loss practices, nutrition beliefs, and weight-loss program preferences of urban American Indian women." *J Am Diet Assoc* 100(4): 442-446.
- Steele, C.B., C.J. Cardinez, L.C. Richardson, L. Tom-Orme and K.M. Shaw (2008). "Surveillance for health behaviors of American Indians and Alaska Natives—Findings from the behavioral risk factor surveillance system, 2000–2006." *Cancer* 113(S5): 1131-1141.
- Teufel-Shone, N.I. (2006). "Promising strategies for obesity prevention and treatment within American Indian communities." *J Transcult Nurs* 17(3): 224-229.
- Teufel-Shone, N.I., C. Fitzgerald, L. Teufel-Shone and M. Gamber (2009). "Systematic Review of Physical Activity Interventions Implemented with American Indian and Alaska Native Populations in the United States and Canada." *American Journal of Health Promotion* 23(6 suppl): S8-S32.
- The Diabetes Prevention Program (2002). "Description of Lifestyle Intervention " *Diabetes Care* 25(12).
- U.S. Department of Health and Human Services (2008). *Diabetes Prevention Program National Diabetes Information Clearinghouse*
- United States Census Bureau. (2014). "Selected Population Profile in the United States " American Fact Finder from <http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>.
- Welty, T.K., D.A. Rhoades, F. Yeh, E.T. Lee, L.D. Cowan, R.R. Fabsitz, D.C. Robbins, R.B. Devereux, J.A. Henderson and B.V. Howard (2002). "Changes in Cardiovascular Disease Risk Factors among American Indians: The Strong Heart Study." *Annals of Epidemiology* 12(2): 97-106.

19 Native American Weight Loss Movement: Pilot Test of a Culturally Tailored Weight Loss Program for American Indians – Daley et al.

White, M.C., D.K. Espey, J. Swan, C.L. Wiggins, C. Ehemann and J.S. Kaur (2014). "Disparities in cancer mortality and incidence among American Indians and Alaska Natives in the United States." *Am J Public Health* 104 Suppl 3: S377-387.