

The Navajo Nation Healthy Diné Nation Act: Community Support of a 2% Tax on Unhealthy Foods

Caleigh Curley, MPH; Regina Eddie, PhD; Kristen Tallis, MPH; Taylor S. Lane, PhD; Del Yazzie, MPH; Priscilla R. Sanderson, PhD; Cori Lorts, PhD; Sonya Shin, MD; Timothy K. Behrens, PhD; Carmen George, MS; Ramona Antone-Nez, MPH; Christine Ashley; Hendrik D. de Heer, PhD

ABSTRACT

Context: The Healthy Diné Nation Act (HDNA) of 2014 included a 2% tax on foods of little-to-no-nutritious value ("junk foods") on the Navajo Nation. The law was the first ever in the United States and any Indigenous nation worldwide with a population at a high risk for common nutrition-related conditions. To date, research on community support for food tax legislation among Indigenous nations is entirely lacking.

Objective: To assess the extent of support for the HDNA and factors associated with support including sociodemographic variables, knowledge of the HDNA, nutrition intake, and pricing preferences.

Design: Cross-sectional survey.

Setting: The Navajo Nation.

Participants: A total of 234 Navajo Nation community members across 21 communities.

Outcome Measures: The percentage of participants who were supportive of the HDNA.

Results: Participants were 97% Navajo, on average middle-aged, 67% reported an income below \$25 000 annually, and 69.7% were female. Half of the respondents said they "support" (37.4%) or "strongly support" (13.0%) the tax, while another 35% of people said they were neutral or somewhat supportive; 15% did not support the tax. Participants with higher income ($P = .025$) and education ($P = .026$) and understanding of the legislation ($P < .001$ for "very well" vs "not at all") had increased odds of greater support, as did people who believed that the HDNA would make Navajo people healthier (vs not, $P < .001$). Age, gender, language, and reported nutrition intake (healthy or unhealthy) were not associated with HDNA support, but participants willing to pay 5% or 12%-15% higher prices for fast food and soda had increased odds of greater support (P values range from .023 to $< .001$).

Conclusions: The majority of Navajo community members surveyed were moderately supportive of the Navajo Nation tax on unhealthy foods. Higher income and education and understanding of the law were associated with greater support, but nutrition intake was not.

KEY WORDS: Chapter, HDNA, junk food, Navajo Nation, tax

Author Affiliations: Department of Health Sciences (Ms Curley and Drs Lane, Sanderson, Lorts, and de Heer) and College of Nursing (Dr Eddie), Northern Arizona University, Flagstaff, Arizona; Mel and Enid Zuckerman College of Public Health, University of Arizona, Tucson, Arizona (Ms Curley); Johns Hopkins School of Public Health, Chinle, Arizona (Ms Tallis); Navajo Epidemiology Center (Mr Yazzie and Ms Antone-Nez), Navajo Department of Health (Ms Ashley), Window Rock, Arizona; Brigham and Women's Hospital, Boston, Massachusetts (Dr Shin and Ms George) College of Health Sciences, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin (Dr Behrens).

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With nearly 400 000 enrolled Tribal members and spanning an area of more than 27 000 square miles, the Navajo Nation is one of the largest Tribal nations in the world.¹⁻³ Traditionally, the Navajo culture is characterized by physical and spiritual health promoted by an active

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Correspondence: Caleigh Curley, MPH, Department of Health Sciences, Northern Arizona University, 1100 S Beaver St, PO Box 15095, Flagstaff, AZ 86011 (caleigh.curley@nau.edu).

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lifestyle and consumption of healthy traditional foods. As with many Indigenous nations, the Navajo people's diet and activity patterns changed since the arrival of Western culture.⁴⁻⁷ Over time, these changes have led to an increased risk for many common chronic metabolic and cardiovascular conditions, including diabetes,⁷⁻¹⁰ at an increasingly younger onset.¹¹

To promote the health of the Navajo people, the Navajo Nation Tribal Council (NNTC) passed the Healthy Diné Nation Act (HDNA) in November 2014 (Navajo Nation Council CN-54-14).¹² The law enforced a 2% tax applied to Navajo Nation businesses on all unhealthy or "minimal-to-no-nutritional" foods, such as baked goods, sugary drinks, and prepackaged and processed foods high in saturated fats, salt, and sugar, with tax revenue allocated for self-determined local wellness projects in each of the 110 Navajo Chapter communities. A lesser-known legislation was passed earlier in the same year, authorizing a waiver of the 5% (now 6%) sales tax on healthy foods.¹³ Research has since documented the HDNA was implemented relatively accurately,¹⁴ with HDNA tax revenue decreasing by about 3% per year.¹⁵ In terms of impact, nearly all funds were successfully disbursed for local wellness projects¹⁶ and the food store environment showed improvements in availability and pricing of healthy items.¹⁷

While countries including Hungary, Denmark, and Mexico¹⁸⁻²⁰ passed taxes on unhealthy foods, this is the first example of such a tax in a rural remote area and developed by a Tribal nation with a population at a high risk for common chronic conditions. Large metropolitan areas in the United States such as Berkeley,²¹⁻²³ Philadelphia,^{24,25} and Oakland^{26,27} assessed a tax focused only on sugar-sweetened beverages (SSBs). While several states including Maine, Maryland, Minnesota, Vermont, and New York have proposed a tax on snack foods, foods with high sugar content, or foods of minimal-to-no-nutritious value, the HDNA is the only "junk food tax" signed into law to date in the United States.²⁸ This unique policy paired with the removal of the 6% sales tax on healthy foods discourages unhealthy food purchases and incentivizes the Navajo community to buy fresh fruits and vegetables.

The passage of the HDNA law required an extensive grassroots effort to help gain support of the NNTC. In 2013, the NNTC initially voted 12-7 to pass the law but was vetoed by the Navajo Nation president who requested further clarification.²⁹ A slightly modified version was passed in 2014 with a 10-4 vote.³⁰ Research has demonstrated taxation of unhealthy items is a controversial topic and mirrors

the debate about taxes levied on tobacco products. A recent meta-analysis of 37 studies found that 42% of the public supported an SSB tax and even greater support (66%) if revenue was used for health initiatives.³¹ Similarly, a large multicountry survey indicated an average support of 43% for SSB taxation, with lowest support in the United States (30%) but higher support if funds were used for subsidizing healthy foods.³² Support in selected municipalities in the United States has shown higher levels of support.³³⁻³⁵ For example, in a recent study in Seattle, 59% of survey respondents supported an SSB tax³³ and 57% of residents in Philadelphia supported SSB taxes if they funded early childhood initiatives.³⁴ In France, taxing unhealthy foods had greater support if funds were used for improvement of health services or to make other foods cheaper.³⁶ Among young Australians, 48% supported an SSB tax, which increased to more than 70% if tax revenue was allocated to subsidizing fruits and vegetables or funding community exercise facilities.³⁷

Several individual characteristics have been associated with support.³⁵⁻³⁹ For example, in Seattle, lower-income participants were less likely to perceive the tax would improve public health and more likely to perceive a negative effect on their finances.³³ In France, support for taxing unhealthy foods was higher among older adults and those with higher levels of education.³⁶ A small number of studies found that higher consumption of SSBs was associated with less support.^{37,39} Notably, most of these studies were speculative in that surveys were conducted in communities where legislation was either under consideration, but not yet enacted, or very recently enacted.

To date, research on community support for food tax legislation among Indigenous nations is entirely lacking. Although the passage of the HDNA was initiated by grassroots efforts and received support from local communities, no research has directly assessed the extent of support for the HDNA since its passage into law. This is particularly important, given the rural setting within a sovereign Tribal nation and the high prevalence of common chronic diseases such as diabetes. Therefore, this study aimed to assess the extent of community support for the HDNA and factors associated with sociodemographic variables, awareness, and understanding of the HDNA, nutrition intake, and pricing preferences. On the basis of prior research, we hypothesized that older participants with higher income and education levels, and reported lower consumption of unhealthy foods, would be significantly more supportive of the HDNA. Finally, we hypothesized that participants who report a greater willingness to pay more for unhealthy foods would be more supportive of the HDNA.

Methods

Setting and procedures

The Navajo Nation is divided into 5 regions (“Agencies”). Each Agency contains communities (“Chapters”) that serve as local government entities (Figure 1). Surveys were conducted in 21 different Navajo Nation Chapters. The average population of the surveyed communities was 1056 ± 594 people.² Anyone 18 years and older affiliated with the selected Chapters were eligible to participate. Trained bilingual (Navajo/English) interviewers recorded informed consent and administered the survey in person between January and April 2018. Recruitment occurred by approaching every third person at the local community government and gathering sites (Chapter houses, community centers, grocery, and convenience stores) until the number of participants was reached. The survey took about 30 minutes,

and a \$10 gas card was provided as an incentive for participation. All procedures were approved by the Navajo Nation Human Research Review Board (protocol #NNR-17.284T).

Measures

Overview and main outcome variable

A 62-item survey was developed including questions about demographic characteristics, awareness, understanding and support for the tax, consumption, and purchasing behaviors including pricing preferences. The primary outcome variable was whether participants supported the HDNA. Adapted from prior research on the assessment of the public’s attitudes of support for SSB taxation in a rural setting,³⁵ support was assessed using a 5-point Likert scale including “do not support,” “somewhat support,” “neutral,” and “strongly support.”

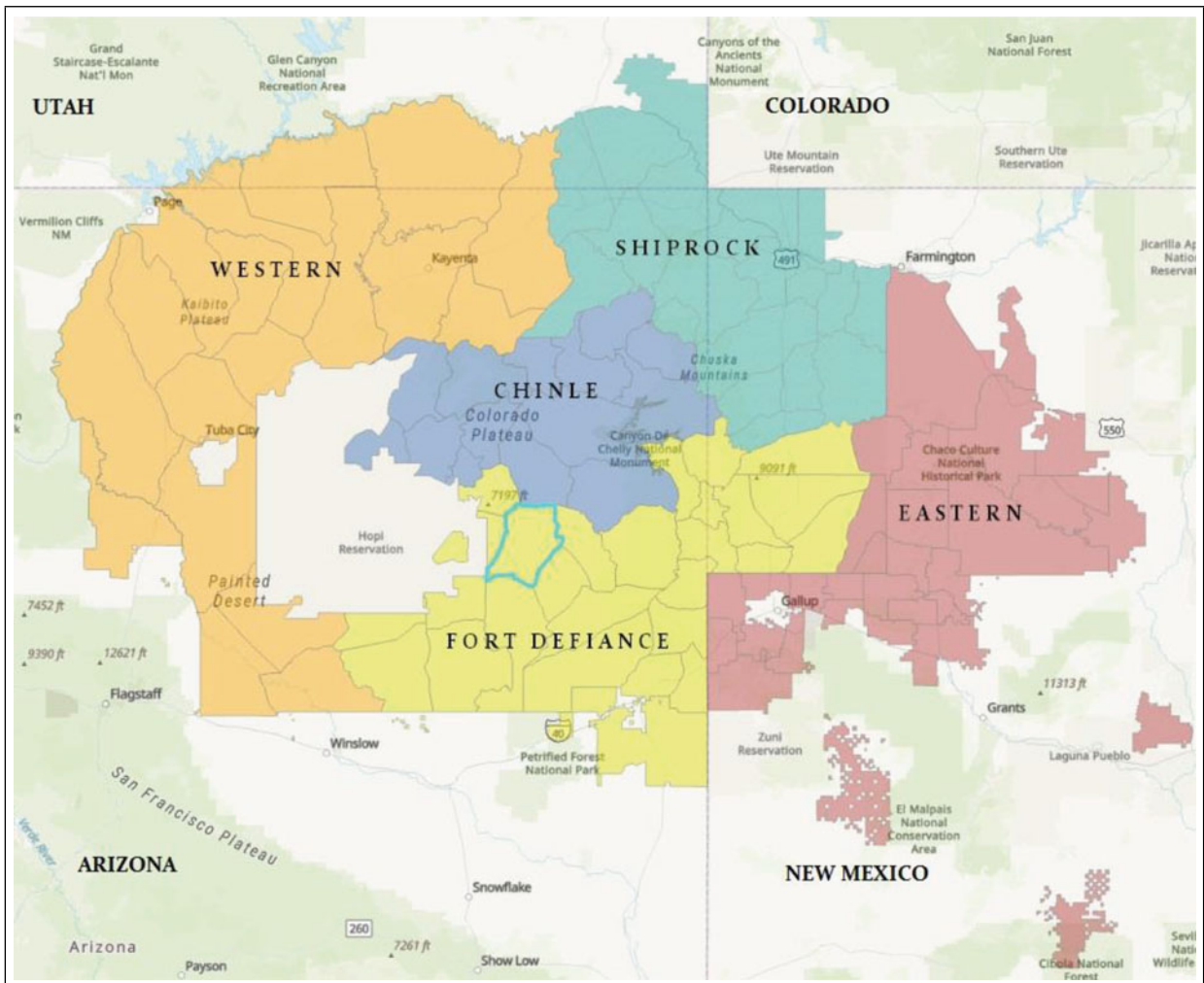


FIGURE 1 The Navajo Nation With Regional Agencies and State Boundaries
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Sociodemographic variables

Variables included participant age (in decades), gender, Tribal membership, language spoken (Navajo, English, both, other), household income (ranging from <\$10 000 to >\$100 000 annually), educational attainment (dichotomized in high school or less), and receipt of food stamps. In addition, a series of yes/no questions asked about having access to reliable transportation, whether the household had running water and refrigeration, whether the household had a garden or fruit trees, and whether participants generally shopped on or off the reservation. These questions were adapted from the Navajo Nation Health Survey (NNHS), which, in turn, is based on the Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS).^{40,41}

Understanding and beliefs about HDNA impact

Participants were asked whether they had heard of the HDNA. If not, the legislation was explained. They were then asked for their level of understanding of the HDNA and whether they thought the Navajo people would become healthier by taxing foods of little-to-no-nutritious value using ordinal Likert scales ranging from “not at all” to “very well.” These items were modeled after prior research on attitudes and knowledge of food taxes.^{35,38,39,42}

Nutrition consumption and purchasing

A series of questions asked about consumption and purchasing habits. Participants were asked whether they regularly shopped on the reservation (yes/no) and how many meals they consumed away from home in the past 7 days. In addition, participants were asked to estimate the number of times per day/week/month of fast food, processed foods, fresh fruits, soda, and traditional foods, with examples provided for each category. These items were adapted from the NNHS, CDC BRFSS, and the National Health and Nutrition Examination Survey (NHANES).^{40,43} Variables were recoded into number of purchases per week and tested for association with support for the HDNA.

Finally, pricing preferences included 4 questions providing a range of prices for 2 unhealthy items (a fast-food meal and a 16-oz can of soda) and 2 healthier items (a 5-lb bag of apples and an avocado). Question presentation included a graphical presentation of the food and asked participants what they would be willing to pay for the item, with options ranging from 2% to an additional 15% tax for unhealthy foods and discount for healthier foods, similar to willingness to pay surveys.⁴⁴ For example, for a

16-oz can of soda, the average regular price at the time of the study (assessed by averaging local grocery and convenience store pricing from print advertisements on the Navajo Nation around the Window Rock, Arizona, area) was \$1.98, and participants were asked whether they would pay \$2.02 (2% extra tax), \$2.08 (5% extra), \$2.14 (8%), \$2.22 (12%), or \$2.28 (15%).

Analyses

Data were entered in an Excel spreadsheet. All data were entered and fully checked by a second person, and any errors or disagreements were reconciled. Analyses were conducted using the Statistical Package for the Social Sciences v.27.0 (SPSS Inc, Chicago, Illinois). Descriptive statistics and frequency distributions were used to summarize participant characteristics and variability. To test the primary hypotheses (whether sociodemographic variables, beliefs, and nutrition behaviors were associated with HDNA tax support), ordinal logistic regression (ORL) analyses were conducted with the 5-point Likert HDNA tax support variables as the outcome. To account for the clustered nature of the data (participants nested in 21 communities), the ORL analyses used Generalized Estimating Equations (GEE) with an exchangeable working correlation matrix. Ninety-five percent confidence intervals (95% CIs) of adjusted odds ratios (ORs) were reported, and a *P* value of .05 was used to test for statistical significance for all associations. Missing data for the primary outcome variable (Chicago, Illinois, answer “refused/don’t know” regarding HDNA support) were excluded from analysis. To test the association of HDNA knowledge and belief in the HDNA’s positive benefit on support for the HDNA, models only included sociodemographic covariates that were significant predictors of support, based on a *P*-value of $\leq .05$, to maintain model parsimony.

Results

Sociodemographic variables

The total number of surveys conducted was 234. The average number of participants was 11.2 ± 7.1 per community, representing approximately 1% of the entire population in those communities. Response rates were not systematically recorded, although surveyors indicated few people (<10) declined to participate. No survey was stopped once initiated. Approximately 70% of the respondents were female, and most respondents were middle-aged. Almost all participants were Navajo (97.0%), more than two-thirds spoke Navajo in their homes, and more

TABLE 1
Participant Demographic Characteristics in Community Survey

Variable/Category	%
Gender	
Female	69.70%
Male	29.40%
Missing/other	0.90%
Age group	
≥ 68 y	21.10%
68-59 y	20.30%
58-49 y	24.90%
48-39 y	11.00%
≤ 38 y	21.30%
Missing/refused	2.60%
Tribal affiliation	
Navajo	97.00%
Navajo and Hopi/other	1.70%
Missing/refused	1.20%
Income level	
< \$10 000	40.80%
\$10 000-\$24 999	26.90%
\$25 000-\$34 999	13.00%
\$35 000-\$49 999	6.30%
> \$50 000	8.00%
Missing/refused	5.00%
Language spoken	
Navajo	11.40%
English	30.80%
Navajo and English	56.90%
Other/missing	0.90%
Education	
< 12th grade	18.00%
High school/GED	29.40%
Some college or trade school	32.00%
College degree or higher	19.70%
Refused/missing	0.80%
Access to	
Running water	89.10%
Transportation	89.80%
A refrigerator	91.10%
A garden or fruit trees	43.00%

than half (56%) were bilingual (Table 1). About 55% of participants had attained a high school degree or less, and 20% attained an associate’s degree or higher (5% MS/doctorate). About two-thirds of participants reported an annual income of less than \$25 000. Nearly 90% of respondents reported having access

TABLE 2
Understanding of and Support for HDNA/Unhealthy Food Tax

Variable/Category	%
How would you rate your understanding of the HDNA (tax on junk foods)?	
Not at all	12.20%
Slightly	18.10%
Somewhat	26.90%
Fairly well	19.70%
Very well	19.70%
Refused/don’t know	3.30%
Do you support taxation of unhealthy (“junk”) foods?	
No, I do not support it	15.10%
I somewhat support it	19.30%
I am neutral	14.70%
I support it	37.40%
I strongly support it	13.00%
Missing/refused	0.40%
Do you think Navajo people would become healthier by taxing junk foods?	
Yes	51.70%
No	29.80%
Don’t know	18.10%
Missing/refused	0.40%

Abbreviation: HDNA, Healthy Diné Nation Act.

to running water, a refrigerator, and transportation, and 43% reported having a garden or fruit trees.

Understanding of and support for the tax

Most respondents felt that they knew the HDNA moderately well. About two-thirds of respondents indicated that they knew about the tax at least moderately well (“moderately well” 26.9%, “fairly well” 19.7%, or “very well” 19.7%). Most people were at least somewhat supportive of taxing junk foods. About 50% of people said they “support” or “strongly support” taxing foods of little-to-no-nutritious value, and another 35% of people said they were neutral or somewhat supportive (Table 2). Only 15% of respondents indicated they did not support the tax. More than 50% believed the Navajo people would become healthier as a result of the tax, less than 30% said they would not, and 20% indicated they did not know.

Nutrition consumption and purchasing

The majority of people (63.8%) reported eating outside the house at least twice in the past 7 days, and

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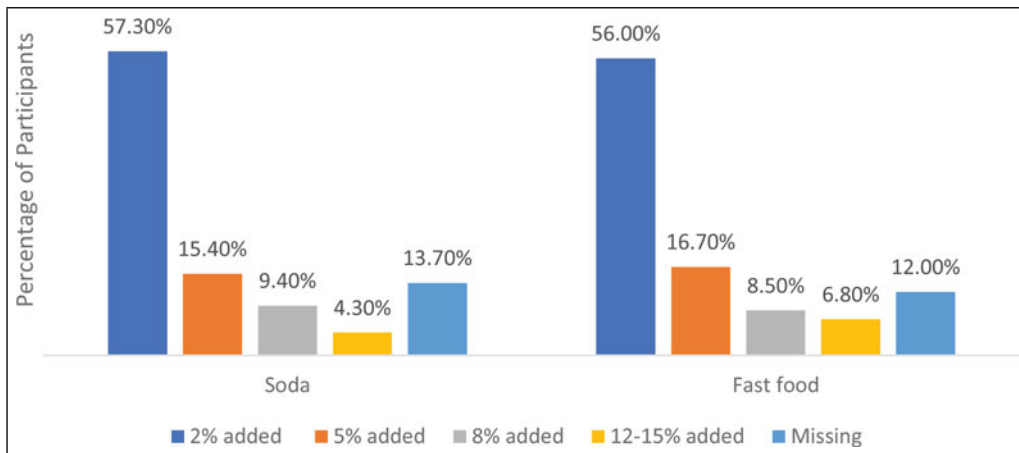


FIGURE 2 Highest Acceptable Price for Less Healthy Foods
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54.5% reported eating in restaurants or fast food at least weekly. A total of 28.6% of participants reported drinking soda at least daily, and 20% reported drinking daily energy drinks. Almost half (45.1%) of respondents reported consuming traditional foods every week, and 60.4% reported eating fruits daily. Almost 6 out of 10 participants reported generally shopping on the Navajo Nation.

Four questions asked about the price participants would be willing to pay for a fast-food meal, with price options ranging from the current 2% tax to a 12%-15% added tax. The majority of individuals indicated they would be willing to pay only the lowest price point for less healthy foods (57.3% for soda, 56.0% for fast food) (Figure 2). In contrast, higher price points were more commonly acceptable for

healthier foods: for apples and avocados, only 20.5% and 17.9%, respectively, reported being willing to only pay the lowest price (15%-12% discount), and 38.5% and 40.6% reported a willingness to pay the highest amount presented (no discount) for apples and avocados, respectively (Figure 3).

Factors associated with HDNA support

Greater educational attainment (more than high school vs less than high school) was significantly associated with a 56% increase in odds of moving up to the next level of HDNA support (ie, do not support to somewhat support, somewhat support to neutral, neutral to support it, support it to strongly support it; OR = 1.558; 95% CI, 1.055-2.300; P = .026)

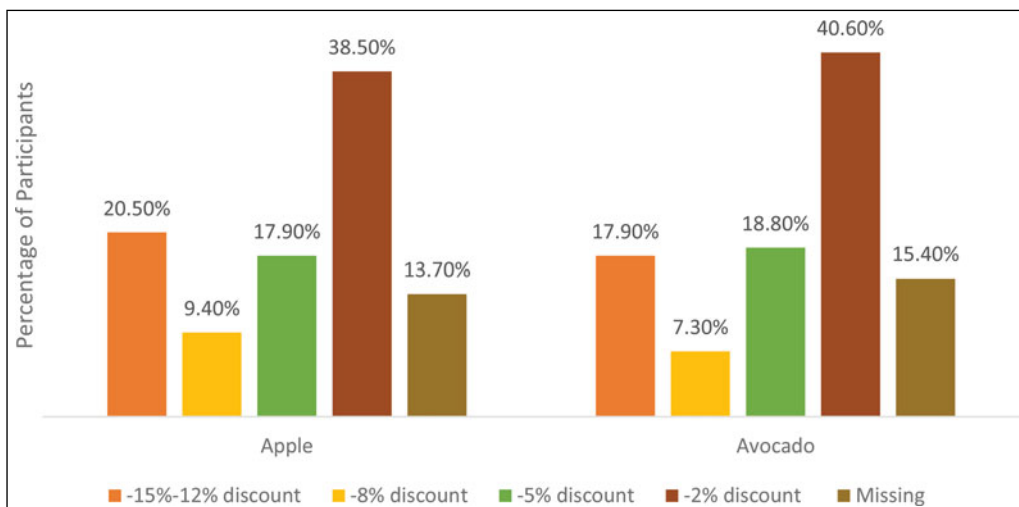


FIGURE 3 Highest Acceptable Price for Healthy Foods
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TABLE 3
Level of Support for the HDNA of 2014 by Demographic Variables, Awareness, and Understanding^a

Variable	<i>b</i>	OR (95% CI)	<i>P</i>
Sociodemographic variables^b			
Age >50 y (vs <50 y)	0.02	1.02 (0.64-1.63)	.94
Gender female (vs male)	0.03	0.97 (0.67-1.40)	.86
Language Navajo or both (vs English)	0.14	1.15 (0.66-2.01)	.63
Education more than high school (vs less than high school)	0.44	1.56 (1.06-2.30)	.03^c
Income >10 000 (vs <10 000)	0.55	1.73 (1.07-2.79)	.03^c
Access to transportation (vs not)	0.61	1.83 (0.77-4.34)	.17
Access to running water and refrigerator (vs not)	-0.38	0.69 (0.37-1.29)	.24
Having a garden or fruit trees (vs not)	0.29	1.34 (0.82-2.19)	.25
Understanding of the HDNA^d			
Reference: Not at all	0		
Slightly	0.93	2.54 (1.06-6.10)	.04^c
Somewhat	0.20	1.22 (0.58-2.54)	.60
Fairly well	1.00	2.72 (1.36-5.42)	.005^e
Very well	1.76	5.79 (2.23-15.03)	<.001^e
HDNA will make Navajo people healthier^d			
Reference: No	0		
Don't know	0.73	2.07 (1.02-4.19)	.04^c
Yes	1.35	3.84 (2.48-5.95)	<.001^e

Abbreviations: CI, confidence interval; HDNA, Healthy Diné Nation Act; OR, odds ratio.

^aThe bold numbers indicate that the value is significant (.05 or lower).

^bUnadjusted *P* value.

^c*P* < .05.

^dModels adjusted for education and income.

^e*P* < .01.

(Table 3). Higher income (>\$10 000 vs <\$10 000) was associated with a 73% increase in odds of moving up to the next level of HDNA support (OR = 1.729; 95% CI, 1.071-2.791; *P* = .025). Age, geographic location, gender (male or female), language spoken (Navajo vs English), having a fruit/vegetable garden, a refrigerator, and access to running water were not associated with support for the HDNA tax. Adjusting for both income and education, which were both significant predictors of support and only modestly associated (*r* = 0.20), reporting a better understanding of the HDNA was significantly associated with greater support, except for those who reported they “somewhat” understood the HDNA. The strongest effects were for people who reported understanding the HDNA “very well” versus “not at all,” which was associated with a 123% increase in odds of moving up to the next level of HDNA support (OR = 5.789; 95% CI, 2.230-15.028; *P* < .001). The belief that taxing unhealthy foods would make the Navajo people healthier was also significantly associated with greater support. Compared with those who answered “no” to HDNA

making Navajo people healthier, those who answered “yes” had a 284% increase in odds of moving up to the next level of HDNA support (OR = 3.837; 95% CI, 2.475-5.950; *P* < .001), with a smaller, but significant, effect for “don’t know” versus “no.”

Dietary patterns (healthy or unhealthy) variables were largely not associated with support for the HDNA (Table 4), but willingness to pay a higher price for a fast-food meal or soda was. Greater price elasticity was also associated with HDNA support: participants who were willing to pay a 5% or 12% or more tax on fast food and soda, compared with those only willing to pay a 2% tax, had significant increases in odds of moving up to the next level of HDNA support. Those who were willing to pay a 12% or more tax had 166% (OR = 2.664; 95% CI, 1.113-6.261; *P* = .025) and 285% (OR = 3.855; 95% CI, 1.335-11.134; *P* = .013) increased odds of moving up to the next level of HDNA support. In terms of healthy foods, HDNA support was not consistently associated with being amenable to higher prices for avocados or apples.

TABLE 4

Level of Support for the Healthy Diné Nation Act of 2014 by Nutrition Intake and Pricing Preferences^a

Variable	<i>b</i>	OR (95% CI)	Adjusted P Value ^b
<i>Diet and purchasing patterns</i>			
Normally shop on reservation (vs not)	0.04	1.04 (0.61-1.79)	.88
Eat outside of house 2+ times last 7 d (vs less)	− 0.03	0.974 (0.68-1.40)	.89
<i>Number of times consumed per week in past 30 d</i>			
Fast foods	0.00	1.00 (0.91-1.10)	.99
Processed foods	0.08	1.09 (1.01-1.18)	.04^c
Soda	0.03	1.03 (0.98-1.08)	.22
Fresh fruit	− 0.002	1.00 (0.97-1.03)	.91
Traditional foods	− 0.004	1.00 (0.90-1.10)	.94
<i>Pricing preferences</i>			
Pay for fast-food meal (reference: 2% tax)	0		
5% tax	0.88	2.42 (1.35-4.35)	.003^d
8% tax	0.69	2.00 (0.91-4.42)	.09
≥ 12% tax	0.98	2.66 (1.13-6.26)	.03^c
Pay for 12-oz soda (reference: 2% tax)	0		
5% tax	1.11	3.04 (1.65-5.60)	<.001^d
8% tax	0.81	2.24 (0.99-5.03)	.05
≥ 12% tax	1.35	3.86 (1.34-11.13)	.013^c
Pay for 5-lb apples (reference: No discount)	0		
5% discount	0.45	1.57 (0.84-2.93)	.16
8% discount	0.16	1.17 (0.41-3.37)	.77
≥ 12% discount	0.24	1.27 (0.62-2.62)	.51
Pay for avocado (reference: No discount)	0		
5% discount	− 0.69	0.50 (0.27-0.93)	.03^c
8% discount	− 0.16	0.85 (0.45-1.62)	.63
≥ 12% discount	− 0.34	0.71 (0.34-1.49)	.37

Abbreviations: CI, confidence interval; OR, odds ratio.

^aThe bold numbers indicate that the value is significant (.05 or lower).

^bModels adjust for education and income.

^cP < .05.

^dP < .01.

Discussion

In general, there appeared to be fairly strong support for the tax among 234 community members across 21 communities on the Navajo Nation, with only 15% of people opposing the tax and 50% reporting they supported or strongly supported the tax. Higher levels of education and income were significantly associated with increased odds of support for the tax, as were a greater understanding of the tax and the belief that the policy had a positive health impact on Navajo people. Age, gender, access to running water, a refrigerator, garden or fruit trees, and dietary patterns were not associated with support level, while a willingness to pay more for unhealthy foods was associated with greater support.

The findings of the current study contribute to a clear gap in the literature regarding community-level support for taxation of unhealthy foods among rural and Tribal populations. Because of elevated risks for diet-related conditions in many Indigenous nations including the Navajo Nation,⁶⁻¹¹ a greater insight into the perceptions of Indigenous people affected by food tax policies is urgently needed. A very small number of studies have assessed support for unhealthy food and beverage consumption in rural settings. One study in Kansas, where 35% of respondents were residents of rural areas, found that overall support for SSB taxes was about 40%.³⁴ In Mexico, research on an unhealthy food and beverage tax documented that effects on consumption were less pronounced in rural areas^{45,46} and that taxes were not fully passed through

to the consumer.⁴⁵ However, recent research found the accuracy of implementation of the 2% HDNA tax on the Navajo Nation was high and similar to the accuracy of implementation in Berkeley and Cook County, Illinois.^{14,47,48}

Prior research has found that several factors including older age, being female, higher income and education, as well as a greater awareness and lower SSB consumption are associated with greater support.³⁵⁻³⁹

In contrast, age, gender, and consumption were not associated with level of support in our study. However, similar to other studies,^{33,36} income and education were associated with increased odds of support. In addition, understanding of the legislation was associated with increased odds of support, consistent with prior research showing that greater knowledge of an unhealthy food tax was associated with reduced consumption.³⁸

It has to be noted that overall support levels on the Navajo Nation were similar to other settings. Prior research has assessed national-level support for taxation of food as a public health strategy and found support estimates ranging from 30% to 45% and up to 70% if funding supported health or social programming.³¹⁻³⁹

In the current study, 50% of people were supportive, with another 19% expressing “somewhat support” and 15% “neutral.” Since on the Navajo Nation, revenue from the 2% tax was allocated directly to local communities as a source of self-determined wellness programming,¹⁶ these findings are consistent with surveys asking about support for taxation that allocates revenue to health or social programming. Notably, although the original passage of the legislation by the NNTC was 12-7, the legislation was unanimously reauthorized in December 2020 by the NNTC, suggesting generally strong support for the legislation and its structure of funding local wellness projects.⁴⁹

Finally, questions about price elasticity found that about one-third of participants would be willing to pay more for a fast-food meal or soda, while only 15% to 20% of participants reported a willingness to pay 8% tax or more. Greater elasticity, that is, a willingness to pay more for unhealthy foods, was also significantly associated with greater support for the HDNA. The current HDNA tax of 2% is lower than other SSB and junk food taxes, which have typically ranged from 7% to 18%.⁵⁰ Our data suggest a 5% tax could be considered on Navajo Nation, whereas exceeding 8% would be less acceptable.⁵⁰ In terms of healthy foods, survey findings suggest that greater subsidies could potentially increase affordable access for many community members. For instance, approximately 20% of individuals surveyed identified a 15% discount as a realistic and acceptable price point. Using revenue from junk food taxes to subsidize

healthy foods has been explored in other settings^{32,37} and could be an equitable strategy for consideration on Navajo Nation. Taken together, these findings point toward possible avenues for future policy consideration.

Study strengths and limitations

This was the first study to assess community-level support for the first-ever tax on unhealthy foods in the United States or any Indigenous nation worldwide. The survey sample size was moderate. Although we

Implications for Policy & Practice

The findings from this study have important implications for the taxation of unhealthy foods and SSBs among a sovereign Tribal nation.

- This was the first study to assess community-level support for the taxation of unhealthy foods among rural and Tribal populations, which have some of the highest rates of food insecurity. Therefore, understanding community support for the taxation of unhealthy foods is important, especially when considering the burdens these taxes could have on people living in obesogenic environments with more fast-food restaurants and convenience stores than grocery stores. The results from this study can be used to amplify the voices of the community and help Tribal leaders make informed decisions on how to improve the HDNA and address community-level concerns.
- Support for the HDNA was moderately high among those surveyed. Higher income and education and understanding of the HDNA were associated with greater support. Since a majority of the Navajo people are low income and have low education levels, there is a need to increase awareness and understanding of the HDNA among this population. The results from this study could be used to create a culturally tailored community education campaign regarding the HDNA.
- Findings from this study provide insight for policy makers to make evidence-based decisions regarding the future of the HDNA and similar food policies. Given the level of support for the HDNA and the price elasticity among those surveyed, policy makers could consider increasing the current HDNA tax from 2% to 5%. This would increase funding for local wellness projects and could provide funding to support food subsidy programs.
- Further research should focus on gaining a better understanding of underlying support for unhealthy food taxes, the role of Tribal sovereignty, and the impact of tax-funded local wellness projects and participant health status on levels of support.

conducted surveys in 21 different communities on the Navajo Nation, our sample size represented about 1% of the entire population in those communities and the regional agencies represented account for 43% of the Navajo Nation population.² While most demographics were consistent with population characteristics of the Navajo Nation (such as income, ethnicity, language, etc), the proportion of females was higher than the population averages. To assess the impact of gender, we included it as a variable in our analyses, but being male or female was not associated with level of support or any of the other main variables of interest.

Conclusions

Four years after passing the HDNA legislation, we found that support for the 2% tax on unhealthy foods was moderately high among Navajo Nation community members. Increased odds of stronger HDNA endorsement were associated with higher income and education levels, greater understanding, and perceived benefit of the tax, as well as greater price elasticity for unhealthy food items. These data helped inform the Tribal Council's permanent reauthorization of the HDNA in 2020 and highlight potential avenues for future food policies on Navajo Nation.

References

1. US Census Bureau. 2010 Census. *The American Indian and Alaska Native Summary File. DP-1-Profile of General Population and Housing Characteristics: 2010*. Washington, DC: US Census Bureau; 2015.
2. Navajo Epidemiology Center, Navajo Department of Health. *Navajo Population Profile Report*. Window Rock, AZ: Navajo Epidemiology Center, Navajo Department of Health; 2013.
3. Romero S. Navajo Nation becomes largest tribe in U.S. after pandemic enrollment surge. *The New York Times*. <https://www.nytimes.com/2021/05/21/us/navajo-chokeo-population.html> May 21, 2021. Accessed December 5, 2021.
4. Kopp J. Crosscultural contacts: changes in the diet and nutrition of the Navajo Indians. *Am Indian Cult Res J*. 1986;10(4):1-30.
5. Kuhnlein HV, Receveur O. Dietary change and traditional food systems of Indigenous peoples. *Annu Rev Nutr*. 1996;16:417-442.
6. Gilbert TJ, Percy CA, Sugarman JR, Benson L, Percy C. Obesity among Navajo adolescents: relationship to dietary intake and blood pressure. *Am J Dis Child*. 1992;146(3):289-295.
7. Gracey M, King M. Indigenous health, part 1: determinants and disease patterns. *Lancet*. 2009;374(9683):65-75.
8. Navajo Epidemiology Center, Navajo Department of Health. *Navajo Mortality Report, 2006-2009*. Window Rock, AZ: Navajo Epidemiology Center, Navajo Department of Health; 2012.
9. Stephens C, Porter J, Nettleton C, Willis R. Disappearing, displaced, and undervalued: a call to action for Indigenous health worldwide. *Lancet*. 2006;367(9527):2019-2028.
10. Sugarman J, Percy C. Prevalence of diabetes in a Navajo Indian community. *Am J Public Health*. 1989;79(4):511-513.
11. Dabelea D, DeGroat J, Sorrelman C, et al. Diabetes in Navajo youth. *Diabetes Care*. 2009;32(suppl 2):S141-S147.
12. Resolution of the Navajo Nation Council. The Healthy Diné Nation Act (HDNA). 22nd Navajo Nation Council—Fourth Year, 2014. CN54-14. <https://opvp.navajo-nsn.gov/Portals/0/FILES/PRESS%20RELEASES/2020/Dec/Navajo%20Nation%20reauthorizes%20the%20Health%20Dine%20Nation%20Act%20of%202014%20to%20help%20fight%20diabetes%20and%20other%20health%20conditions.pdf>. Accessed December 5, 2021.
13. Navajo Nation Tribal Council. Legislative Summary Sheet Tracking No. 0290-13. https://www.nnols.org/uploads/directory/31a8dd379a5c469a99719cd7848b7f06/0290_13_1.pdf. Accessed December 5, 2021.
14. George C, Bancroft C, Salt S, et al. Successful implementation of the Healthy Diné Nation Act in stores on the Navajo Nation. *Prev Med Rep*. 2021;24:101573.
15. Yazzie D, Tallis K, Curley C, et al. The Navajo Nation Healthy Diné Nation Act: a two percent tax on foods of minimal-to-no nutritious value, 2015-2019. *Prev Chronic Dis*. 2020;17:E100.
16. Yazzie D, Tallis K, Curley C, et al. The Navajo Nation Healthy Diné Nation Act: a description of community wellness projects funded by a 2% tax on minimal-to-no-nutritious-value foods. *J Public Health Manag Pract*. 2022;28(2):E471-E479.
17. George C, Bancroft C, Salt SK, et al. Changes in food pricing and availability on the Navajo Nation following a 2% tax on unhealthy foods: the Healthy Diné Nation Act of 2014. *PLoS One*. 2021;16(9):e0256683.
18. Batis C, Rivera JA, Popkin BM, Taillie LS. First-year evaluation of Mexico's tax on nonessential energy-dense foods: an observational study. *PLoS Med*. 2016;13(7):e1002057.
19. Biró A. Did the junk food tax make the Hungarians eat healthier? *Food Policy*. 2015;54:107-115.
20. Jensen JD, Smed S. The Danish tax on saturated fat—short run effects on consumption, substitution patterns and consumer prices of fats. *Food Policy*. 2013;42:18-31.
21. Falbe J, Rojas N, Grummon AH, Madsen KA. Higher retail prices of sugar-sweetened beverages 3 months after implementation of an excise tax in Berkeley, California. *Am J Public Health*. 2015;105(11):2194-2201.
22. Lee MM, Falbe J, Madsen KA. Secular trends in soda consumption, California, 2011-2016. *Prev Chronic Dis*. 2019;16:E62.
23. Falbe J, Grummon AH, Rojas N, Ryan-Ibarra S, Silver LD, Madsen KA. Implementation of the first US sugar-sweetened beverage tax in Berkeley, CA, 2015-2019. *Am J Public Health*. 2020;110(9):1429-1437.
24. Roberto CA, Lawman HG, LeVasseur MT, et al. Association of a beverage tax on sugar-sweetened and artificially sweetened beverages with changes in beverage prices and sales at Chain retailers in a large urban setting. *JAMA*. 2019;321(18):1799-1810.
25. Cawley J, Frisvold D, Hill A, Jones D. The impact of the Philadelphia beverage tax on purchases and consumption by adults and children. *J Health Econ*. 2019;67:102225.
26. Cawley J, Frisvold D, Hill A, Jones D. Oakland's sugar-sweetened beverage tax: impacts on prices, purchases and consumption by adults and children. *Econ Hum Biol*. 2020;37:100865.
27. Leider J, Powell LM. Longer-term impacts of the Oakland, California, sugar-sweetened beverage tax on prices and volume sold at two years post-tax. *Soc Sci Med*. 2022;292:114537.
28. Pomeranz JL, Wilde P, Huang Y, Micha R, Mozaffarian D. Legal and administrative feasibility of a federal junk food and sugar-sweetened beverage tax to improve diet. *Am J Public Health*. 2018;108(2):203-209.
29. Indian Country Today Staff. Shelly vetoes Navajo junk food tax. Indian Country. <https://icnews.org/2014/02/13/shelly-vetoes-navajo-junk-food-tax-153546>. Published February 13, 2014. Accessed December 5, 2021.
30. Arizona Central. Navajo lawmakers approve junk food tax. <https://www.azcentral.com/story/news/local/arizona/2014/11/15/navajo-lawmakers-approve-junk-food-tax/19086489/>. Published November 15, 2014. Accessed December 5, 2021.
31. Eykelboom M, van Stralen MM, Olthof MR, et al. Political and public acceptability of a sugar-sweetened beverages tax: a mixed-method systematic review and meta-analysis. *Int J Behav Nutr Phys Act*. 2019;16(1):78.
32. Kwon J, Cameron AJ, Hammond D, et al. A multi-country survey of public support for food policies to promote healthy diets: findings from the International Food Policy Study. *BMC Public Health*. 2019;19(1):1205.

33. Oddo VM, Krieger J, Knox M, et al. Perceptions of the possible health and economic impacts of Seattle's sugary beverage tax. *BMC Public Health*. 2019;19(1):910.
34. Shepelavy RP. Yes to soda tax. *The Philadelphia Citizen*. <https://thephiladelphiacitizen.org/beheard-philly-soda-tax-poll/>. May 5, 2016. Accessed January 6, 2022.
35. Curry LE, Rogers T, Williams P, Homs G, Willett J, Schmitt CL. Public attitudes and support for a sugar-sweetened beverage tax in America's heartland. *Health Promot Pract*. 2018;19(3):418-426.
36. Julia C, Méjean C, Vicari F, Péneau S, Hercberg S. Public perception and characteristics related to acceptance of the sugar-sweetened beverage taxation launched in France in 2012. *Public Health Nutr*. 2015;18(14):2679-2688.
37. Richardson TE, Yanada BA, Watters D, Stupart D, Lamichhane P, Bell C. What young Australians think about a tax on sugar-sweetened beverages. *Aust N Z J Public Health*. 2019;43(1):63-67.
38. Álvarez-Sánchez C, Contento I, Jiménez-Aguilar A, et al. Does the Mexican sugar-sweetened beverage tax have a signaling effect? ENSANUT 2016. *PLoS One*. 2018;13(8):e0199337.
39. Bélanger-Gravel A, Desroches S, Janezic I, Paquette MC, De Wals P. Pattern and correlates of public support for public health interventions to reduce the consumption of sugar-sweetened beverages. *Public Health Nutr*. 2019;22(17):3270-3280.
40. Francisco S, Foley D, Antone-Nez R, Kinlacheeny JB, Yazzie D. *Report of the Navajo Behavioral Risk Factor Surveillance Survey, 2013, 2015, 2016*. Window Rock, AZ: Navajo Epidemiology Center, Navajo Department of Health; 2017.
41. Centers for Disease Control and Prevention. *Behavioral Risk Factor Surveillance System Survey Questionnaire*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2017.
42. Rivard C, Smith D, McCann SE, Hyland A. Taxing sugar-sweetened beverages: a survey of knowledge, attitudes and behaviours. *Public Health Nutr*. 2012;15(8):1355-1361.
43. *National Health and Nutrition Examination Survey Questionnaire*. Hyattsville, MD: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2018.
44. Colchero MA, Guerrero-López CM, Barrientos-Gutiérrez TT, Salmerón JJ, Bautista-Arredondo S. Willingness to pay for an intervention that reduces soda consumption among a sample of middle-class adult Mexicans. *PLoS One*. 2021;16(8):e0255100.
45. Colchero MA, Zavala JA, Batis C, Shamah-Levy T, Rivera-Dommarco JA. Changes in prices of taxed sugar-sweetened beverages and nonessential energy dense food in rural and semi-rural areas in Mexico. *Salud Publica Mex*. 2017;59(2):137-146.
46. Colchero MA, Molina M, Guerrero-López CM. After Mexico implemented a tax, purchases of sugar-sweetened beverages decreased and water increased: difference by place of residence, household composition, and income level. *J Nutr*. 2017;147(8):1552-1557.
47. El-Sayed OM, Pipito AA, Leider J, Chriqui JF, Powell LM. An assessment of food store compliance with the Cook County sweetened beverage tax. *J Public Health Manag Pract*. 2020;26(4):E20-E23.
48. Misapplication of the Berkeley soda tax to diet drinks. *The Incidental Economist*. <https://theincidentaleconomist.com/wordpress/misapplication-of-the-berkeley-soda-tax-to-diet-drinks/>. November 8, 2016. Accessed January 3, 2022.
49. Navajo Nation Tribal Council. *CD-96-20. Resolution of the 24th Navajo Nation Council—Second Year 2020*. Window Rock, AZ: Navajo Epidemiology Center, Navajo Department of Health; 2014.
50. Capacci S, Allais O, Bonnet C, Mazzocchi M. The impact of the French soda tax on prices and purchases. An ex post evaluation. *PLoS One*. 2019;14(10):e0223196.