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Citation Details

Stotz, S. A., Brega, A. G., Gonzales, K., Hebert, L. E., Moore, K. R., & AI/AN WCIE Study Group. (2021). Facilitators and Barriers to Healthy Eating Among American Indian and Alaska Native Adults with Type 2 Diabetes: Stakeholder Perspectives. *Current Developments in Nutrition*.

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Facilitators and Barriers to Healthy Eating Among American Indian and Alaska Native Adults with Type 2 Diabetes: Stakeholder Perspectives

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ABSTRACT

Background: American Indian and Alaska Native (AI/AN) adults have a higher prevalence of type 2 diabetes (T2D) and related complications than non-AI/AN adults. As healthy eating is a cornerstone of diabetes self-management, nutrition education plays an important role in diabetes self-management education.

Objective: To understand stakeholder perspectives on facilitators and barriers to healthy eating for AI/AN adults with T2D in order to inform the cultural adaptation of an existing diabetes nutrition education curriculum.

Methods: Individual interviews were conducted with 9 national content experts in diabetes nutrition education (e.g. registered dietitians, diabetes educators, experts on AI/AN food insecurity) and 10 community-based key informants, including tribal health administrators, nutrition/diabetes educators, Native elders, and tribal leaders. Four focus groups were conducted with AI/AN adults with T2D ($n = 29$) and 4 focus groups were conducted with their family members ($n = 22$). Focus groups and community-based key informant interviews were conducted at 4 urban and reservation sites in the USA. Focus groups and interviews were recorded and transcribed verbatim. We employed the constant comparison method for data analysis and used Atlas.ti (Mac version 8.0) to digitalize the analytic process.

Results: Three key themes emerged. First, a diabetes nutrition education program for AI/ANs should accommodate diversity across AI/AN communities. Second, it is important to build on AI/AN strengths and facilitators to healthy eating (e.g. strong community and family support systems, traditional foods, and food acquisition and preparation practices). Third, it is important to address barriers to healthy eating (e.g. food insecurity, challenges to preparation of home-cooked meals, excessive access to processed and fast food, competing priorities and stressors, loss of access to traditional foods, and traditional food-acquisition practices and preparation) and provide resources and strategies for mitigating these barriers.

Conclusions: Findings were used to inform the cultural adaptation of a nutrition education program for AI/AN adults with T2D. *Curr Dev Nutr* 2021;5:nzaa114.

Keywords: American Indian and Alaska Native, qualitative methods, diabetes nutrition education, type 2 diabetes, cultural adaptation

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Manuscript received December 2, 2019. Initial review completed March 14, 2020. Revision accepted July 2, 2020. Published online May 14, 2021.

This study was supported by the American Diabetes Association grant #4-18-SMC-01 (Principal Investigator: KRM).

Author disclosures: The authors report no conflicts of interest. As a member of the 2019 conference planning committee, KRM received travel funding support (i.e. waiver of registration fee and 2 night's lodging at the conference hotel) to attend the 2019 Seeds of Native Health conference.

This article appears as part of the supplement "Proceedings of the Fourth Annual Conference on Native American Nutrition," sponsored by the Shakopee Mdewakanton Sioux Community's Seeds of Native Health campaign through a gift to the University of Minnesota. The guest editor of the supplement is Mindy S Kurzer. MSK is supported by the Shakopee Mdewakanton Sioux Community for her role as chair of the conference planning committee and editing the proceedings. The opinions expressed in this publication are those of the authors and are not attributable to the sponsors or the publisher, Editor, or Editorial Board of *Current Developments in Nutrition*.

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Abbreviations used: ADA, American Diabetes Association; AI/AN, American Indian and Alaska Native; DSME/S, diabetes self-management education and support; T2D, type 2 diabetes mellitus; SCT, Social Cognitive Theory; SMSC, Shakopee Mdewakanton Sioux Community; WCIE, "What Can I Eat?"

Introduction

American Indians and Alaska Natives (AI/ANs) have the highest prevalence of type 2 diabetes mellitus (T2D) among all racial/ethnic groups in the USA and experience a significant burden of comorbidities (1). In a study comparing the prevalence of comorbidities among American Indians with T2D with that of a commercially insured US population

with diabetes, American Indians had significantly higher rates of hypertension, cerebrovascular disease, renal failure, and lower-extremity amputations (2). Further, the poverty rate among AI/ANs, which is among the highest in the USA (3), may also contribute to poor T2D outcomes. Poverty is strongly associated with poorer T2D outcomes, such as, challenges with affording medications, transportation to medical appointments, affording healthy food, and other competing stressors such

as housing insecurity (4–8). In addition, for AI/ANs, stress from historical trauma, colonization, and adverse childhood experiences compounds health disparities and contributes to poorer outcomes specific to nutrition-related chronic diseases (9).

Diabetes self-management education and support (DSME/S) is a critical element in meeting standards of care for people with T2D (10). Indeed, nutrition education is one of the cornerstones of a comprehensive DSME/S program (11). The literature suggests that nutrition education is associated with positive outcomes for people with diabetes, including improved dietary self-efficacy (i.e. confidence that one can follow a healthy diet), intake of healthy foods, and glycemic control (12–14). Research in Native populations corroborates such findings, showing that nutrition education is associated with improved glycemic control among AI/ANs with diabetes (2).

Evidence suggests that nutrition education interventions are particularly effective when tailored to the needs of specific communities. For instance, nutrition education tailored to patients who experience low/limited income has been shown to improve the intake of healthy foods and to mitigate the negative effects of barriers, such as food insecurity (15–19). Among the many challenges AI/ANs face in managing their T2D is a significant shortage of nutrition education resources. When available, nutrition education is often not culturally tailored for AI/ANs nor does it build upon AI/AN community strengths and facilitators to support healthful eating behaviors (20–22).

The American Diabetes Association (ADA) and the Shakopee Mde-wakanton Sioux Community (SMSC) collaborated to provide financial resources to culturally tailor and adapt an existing diabetes nutrition education program for the unique needs of AI/AN communities. Together, the ADA and SMSC identified that culturally tailored approaches are particularly important to address regional and tribal differences pertaining to food choices, social/environmental determinants of health, and health beliefs. The program was initially developed by the ADA and is entitled “*What Can I Eat?*” *Healthy Choices for People with Type 2 Diabetes* (ADA WCIE). The program includes five 90-min, classroom-based lessons delivered by registered dietitians. The curriculum focuses on diabetes nutrition education topics such as portion control using the Diabetes Plate method, decreasing consumption of sugar-sweetened beverages, decreasing intake of saturated fat and sodium, and cooking and shopping strategies for healthful eating at home. Education strategies include hands-on, interactive learning activities, peer-to-peer support, goal-setting, and didactic education. Additionally, the ADA WCIE classes incorporate problem-solving for barriers to healthy eating and physical activity, as well as mindful stress-relieving practices. The ADA WCIE classes are currently available to the public, and the ADA has a “master trainer” program available to train facilitators/educators to teach the classes. Participants in the “master trainer” program are registered dietitians and/or certified diabetes educators (23).

Given the scarcity of updated diabetes nutrition education resources for Native peoples, a culturally tailored WCIE program with wide appeal across diverse AI/AN tribes may have the potential to improve management of T2D, lower the rates of diabetes-related complications, and improve the overall quality of life for AI/AN people with T2D. Further, the unique hands-on learning, peer-to-peer discussion opportunities, and mindful eating principles included in WCIE can be added to available diabetes nutrition education resources for AI/AN people. Such a curriculum must also take into consideration the great variation in AI/AN

cultures and populations. Currently, there are over 573 federally recognized tribes throughout the USA, (24) who speak more than 200 languages (25). Further, significant variations in family structure, religious orientation, cultural practice, land-based histories and experiences exist across these communities (25). Also, although many AI/ANs live on reservations, most of which are located in rural parts of the USA, the majority (70%) now live in urban settings (26). Aware of the cultural diversity among tribes, we sought to ensure geographic and dietary diversity to support future scalability of the adapted program.

Our project team conducted formative research to inform the cultural adaptation of the ADA WCIE curriculum for AI/ANs. Our research efforts included a qualitative needs assessment, designed to solicit the perspectives and recommendations of key stakeholders regarding diabetes nutrition education in AI/AN communities. The objective of this article is to share facilitators and barriers to healthy eating from the needs assessment and to describe the process of using these findings to support the cultural adaptation and development of the culturally tailored curriculum, entitled “*What Can I Eat? Healthy Choices For American Indians and Alaska Natives with Type 2 Diabetes*” (AI/AN WCIE).

Methods

Study design

The study design was largely influenced by the funding announcement, which was developed by the ADA and SMSC. In an attempt to accommodate the diversity of Native populations across the USA, we included several AI/AN communities in our needs assessment. We sought to include representation of both rural and urban AI/AN communities as well as geographic variation in populations across the USA. We established partnerships with health care organizations that serve AI/AN adults in 4 AI/AN communities in northern California, New York, the Southern Plains, and the Midwest. We collaborated with site coordinators at each of these sites, 2 of whom are AI/AN, 1 serving as a registered dietitian and certified diabetes educator, and 1 serving AI/ANs in a health care leadership capacity for over 30 y. These site coordinators were involved in the study design through their help developing the moderator guide(s) and by selecting the community-based key informant interviewees at their respective sites.

In each of these partner communities, we utilized 2 different qualitative data collection methods: individual in-depth interviews and focus groups. We conducted interviews with 2 categories of people: community-based key informants from our partner communities (e.g. Tribal Elders, nutrition/diabetes educators, health program administrators) and national content experts (e.g. diabetes educators from other AI/AN communities, academic researchers with expertise in food insecurity and obesity among AI/ANs). To reach saturation, we anticipated that 4 groups of each type of focus group (1 AI/AN with T2D and 1 family member group at each collaborating site) (27), and 10 of each type of key informant would provide adequate sample size (28).

Conceptual framework

This research was guided by a constructivist epistemological approach to qualitative data collection and analysis (29). This approach privileges the perspectives of unique individual voices by recognizing that there

is no universal “truth” (or 1 correct answer) to multifaceted, complex phenomena (30), such as nutrition education needs for AI/AN adults with T2D. This conceptual approach allowed our research team to consider multiple vantage points to a focused phenomenon of interest and guided our study design as well as data collection and analytic methods (30).

This needs assessment, moderator guide, and analysis was also guided by Social Cognitive Theory (SCT) (31). According to SCT, constructs that affect the likelihood a person will change a health behavior include self-efficacy and outcome expectancies (i.e. one’s perceptions of the likely outcome of engaging in recommended behavior). Additionally, barriers and self-efficacy to overcome these barriers are of central importance to behavior change, according to SCT. The constructs are mediated by personal, behavioral, and environmental factors (31). Constructs from SCT guided data collection (e.g. SCT constructs informed questions in the moderator guide) and analysis, which used a deductive coding approach (32).

Recruitment and sample selection

Focus group recruitment and sample selection.

Focus group participants were AI/AN adults (≥ 18 y) with T2D and adult family members/close friends who play a significant supportive role in the lives of the participants with diabetes. Study coordinators at each partner site recruited focus group participants. Using convenience sampling, we recruited focus group participants primarily through interpersonal communication, posted flyers, and social media (33).

Community-based key informant recruitment and sample selection.

The community-based key informants were selected by the partner site study coordinators. These community-based key informants were recruited for their expertise in AI/AN health program administration, nutrition/diabetes education, and/or traditional culture. Researchers employed a maximum variation sampling approach (34) to ensure that participants had a range of vantage points on the topic of diabetes nutrition education for AI/AN adults with T2D. Characteristics on which we sought variation included type of professional (i.e. health care administrators compared with nutrition educators) and years of experience (35).

National content expert recruitment and sample selection.

Recruitment of the national content experts was initiated through the project’s Principal Investigator (PI) (KRM) via a personalized email invitation. KRM relied on her contacts in AI/AN diabetes education and research to serve as national content experts and to recommend additional potential interviewees, using a snowball sample technique (33).

Participants.

Four types of individuals participated, including AI/AN adults with T2D, family members, community-based key informants, and national content experts.

Focus group participants.

Twenty-nine AI/AN adults with T2D participated in focus groups at each of our 4 collaborating sites. Our inclusion criteria for focus group participants with T2D required that participants be aged ≥ 18 y, be AI/AN, and have a diagnosis of T2D. Participants in the “family” focus

groups were required to be aged ≥ 18 y and be a significant support person for a person with T2D. Twenty-two family members participated, including 16 who were AI/AN themselves. These family members included parents, significant others, aunts/uncles, and close friends. The 2 types of focus groups allowed us to understand the lived experience of AI/AN adults with T2D as well as the perspectives of members of the intimate support network of AI/AN adults who have T2D.

Community-based key informant participants.

We interviewed 10 community-based key informants across the 4 sites. Community-based key informants included: Tribal Elders, elected tribal leaders, registered dietitians, certified diabetes educators, mid-level health care providers, health education administrators, and health center leaders. The perspectives of the community-based key informants were important to understand diabetes/nutrition education programs, program administration, and logistics of diabetes/nutrition education programs in the participating communities. Eight of the 10 community-based key informants were AI/AN.

National content expert participants.

Finally, we interviewed 9 national content experts from academic or clinical AI/AN settings other than our 4 sites. Their expertise encompassed nutrition/diabetes education for AI/AN adults, development and evaluation of health education programs for AI/AN adults, and obesity and food security among AI/AN adults and their families. Five of the 9 national content experts were AI/AN.

Data collection

Three moderator guides were developed, with each guide addressing the key topics of healthy eating for diabetes, diabetes nutrition education, barriers and facilitators to healthy eating, and recommendations to culturally tailor the ADA WCIE curriculum. All interviews and focus groups were conducted between August and October 2018. We developed separate moderator guides for interviews with the community-based key informants and the national content experts, with questions tailored to these 2 types of interviewees. One qualitative researcher collected all qualitative data. To address subjectivity bias, the researcher wrote a subjectivity statement and added addendums and memos to this statement as it evolved throughout data collection and analysis (36, 37).

Focus group data collection

Although focus groups for people with T2D and family members were conducted separately, we developed a single moderator guide that was used in all focus groups. The moderator guides were based on findings from the literature review, program goals, and the prior experience of the investigative team, and were reviewed by the team for content validity, readability, and appropriateness (33). The focus groups were all moderated by one co-investigator (SAS). Interviews lasted approximately 90 min.

Each focus group participant completed a short survey after providing informed consent and before the start of the focus group interview. The survey contained items to assess demographic characteristics. Focus groups were held at health education centers and clinics, all of which were familiar to the participants and housed the office of the partner site co-ordinator. Focus group participants each received a \$25.00

TABLE 1 Details about focus groups and interviews

	Focus groups with AI/AN adults with T2D	Focus groups with adult family members of AI/ANs with T2D	Interviews community-based key informants	Interviews national content experts
Total sample size	29	22	10	9
Number of focus groups	4	4	n/a	n/a
Size of focus groups	5–10	5–6	n/a	n/a
Length of interview, min	62–74	65–75	30–65	45–68

AI/AN, American Indian and Alaska Native; n/a, not applicable; T2D, type 2 diabetes mellitus.

gift card for his/her time and a healthy meal during the focus group interview.

Community-based key informant data collection

Community-based key informant interviews were conducted in person and facilitated by one co-investigator (SAS). Based on the preferences of the interviewee, interviews occurred in the interviewee's home, clinic offices, clinic conference rooms, and a local café. Community-based key informant participants received a \$40.00 gift card for their time.

National content expert data collection

Interviews with national content experts were conducted using Zoom technology (www.zoom.com). This allowed web-based video and audio recording and screen sharing between the interviewer and the interviewee. All national content expert interviews were conducted by one co-investigator (SAS). **Table 1** provides a summary of details of the focus groups and interviews.

All focus groups, in-person interviews, and Zoom interviews were digitally recorded. The study protocol was approved by the Colorado Multiple Institutional Review Board and the National Indian Health Service Institutional Review Board. Approval was also received from the Saint Regis Akwesasne Task Force on the Environment.

Data analysis

Qualitative data analysis.

All recordings were professionally transcribed verbatim and checked for accuracy by the lead qualitative researcher (SAS). Qualitative data from the interviews and focus groups were analyzed using a note-based constant comparison method (38). This method allowed the researcher to compare and contrast across all transcriptions for common themes. A combination of inductive and deductive coding approaches was employed. To decrease potential for researcher bias (39), 2 researchers reviewed the transcripts and worked closely to establish a codebook that included both deductive a priori codes (i.e. codes based on the moderator guides and supporting theoretical frameworks) and inductive codes (i.e. codes that emerged directly from the data). The constant comparison coding approach included coding the data, categorizing the codes, and reorganizing the categories into thematic representation through a series of assertions and interpretations (33, 38). Twenty percent of the transcripts were coded by 2 researchers, who met twice a month to ensure coding concordance (32). After concordance was achieved, the remaining transcripts were coded by 1 researcher each. The researchers used Atlas.ti (Version 8.0) to organize, sort, code, and store data, which helped to facilitate a transparent analytical process (40).

Both researchers used the “memo” feature in Atlas.ti to memo throughout analysis, and the lead qualitative researcher also included relevant field notes from data collection in her memos (39). Additionally, we conducted a Zoom webinar to present preliminary analysis findings as a means to member check (39). We are confident we reached saturation with this sample as new data became redundant with data already collected, and researchers began to hear similar comments with the last few interviews and last focus groups (41). We invited all community-based key informants, national content experts, and site coordinators to attend. Notes from this webinar were included as memos in the analysis.

Quantitative data analysis.

Data collected from the surveys were used to describe the focus group participants. We used Stata 15 to calculate means, SDs, and frequency distributions of participants' demographic characteristics, namely age, gender, and racial and ethnic backgrounds.

Results

Characteristics of focus group participants

As shown in **Table 2**, participants were aged 59 y, on average, with a range from 23 to 80 y. Nearly two-thirds of participants were women (63%). Ninety percent of participants identified as AI/AN, with 10% identifying only with non-Native racial backgrounds. These individuals were family members or friends of participating adults with T2D.

TABLE 2 Demographic characteristics of focus group participants ($n = 48$)¹

	Mean ± SD or %	n
Age	59 ± 15	48
Gender: female	63%	30
Race		
American Indian/Alaska Native	90%	43
American Indian/Alaska Native only	74%	32
American Indian/Alaska Native and another race	26%	11
White	64%	7
African American	18%	2
Native Hawaiian/Pacific Islander	9%	1
Other	27%	3
Not American Indian/Alaska Native	10%	5
Ethnicity: Hispanic or Latino	4%	2

¹Three focus group participants did not complete the demographic characteristic survey.

Twenty-three percent of participants identified with multiple racial categories.

Qualitative findings

Through this analysis, we identified 3 overarching themes across the interview and focus group transcripts. First, in developing a diabetes nutrition education curriculum for Native people, participants recommended that we accommodate the considerable diversity seen across AI/AN families and communities nationwide. Second, the adapted diabetes nutrition education program should build on AI/AN cultural strengths and traditional food practices, which can serve as facilitators to healthy eating. Third, the participants emphasized the importance of addressing barriers to healthful eating and providing educational strategies and resources to mitigate these barriers. Next, we elaborate on each of these themes.

Theme #1: Participants recommended that we accommodate the diversity of AI/AN communities nationwide.

In developing a diabetes nutrition education curriculum for Native people, participants recommended that we appreciate and accommodate the cultural diversity that characterizes AI/AN communities across the USA. However, almost all interview and focus group participants recognized the challenge of developing one “culturally relevant” diabetes nutrition education program for all AI/AN communities.

One national content expert shared:

Well, of course, it's a great challenge to develop a single curriculum to address American Indians because, as any person of that background will tell you, there are 500 plus federally recognized tribes, many with their own languages, differences, and culture. It's quite a challenge, I would say, to develop a single curriculum that would be targeted enough to American-Indian audiences, but, also, I guess, general enough to be meaningful or to resonate with people from so many different settings and situations.

Participants also shared that specific images, colors, designs, and motifs as well as reference to particular foods are likely to resonate with some communities but not others. They recommended including diversity in the images included in the curriculum as “many education programs look like they are only for Plains Indians” or “Southwest Tribes.” Participants also voiced concerns that, for Alaska Natives, images of “corn, beans, and squash” don't resonate and access to fresh produce is very hard for remote-living Alaska Natives.

Community-based key informants at the 2 rural sites pointed out that there are substantial differences in traditional foods and traditional food acquisition and preparation practices among different regions/tribes. They highlighted the fact that foods considered “traditional” are those that were historically available in a tribal community's local region - precolonization. For example, freshwater lake fish were commonly consumed in northern California but would not be considered a traditional food for AI/ANs who live in the desert Southwest areas of the USA. Participants indicated that the “commonality” shared across tribes related to traditional foods is that these foods are local and indigenous to a given geographic region.

Participants discussed the diversity of diabetes nutrition education needs within communities, specific to issues such as stage-of-life. For example, adults who still have young children in the home may have different education needs than those who are retired and

cooking for only 1 or 2 individuals. One older AI/AN adult with T2D shared:

It's all different now. I used to cook for 6 people and now I just have me and him (husband). So, I need to learn how to make smaller portions, so we don't waste food... Then again, the grandkids come by and sometimes they need to eat. For me it's about planning and education. I know how to cook – it's just the amount.

Participants noted that Native populations differ widely in their access to health care services, including diabetes nutrition education, even among the rural-dwelling participants. In 1 geographically confined rural area, participants shared that it was easy to access health care services, such as diabetes nutrition education. In another rural area, however, participants voiced challenges in accessing health care services due to the long distances required to travel and lack of public transit opportunities.

Theme #2: The adapted diabetes nutrition education program should build on AI/AN cultural strengths and traditional food practices that can serve as facilitators to healthy eating.

Participants discussed their tribes' traditional cultural and dietary practices as “much more healthy” than modern diets and “important for mind, body, and spirit.” They recommended inclusion of traditional stories and tying diabetes nutrition education principles to “the way our ancestors worked, played, and ate.”

One AI/AN national content expert shared:

I've noticed that... the people that are closer to their traditional ways... either that is religious beliefs or following more traditions, overall, or... that they're closer to the tribe's history, that are closer to what traditional and Native means... The people that are closer to that, are usually, one, healthier. And... I don't know how you say that in English... they have more... a deeper life philosophy. And I've seen that what helps with people... the ones that are more likely to succeed, let's say... are... really close with their traditions, and we can grab onto that, and build on that.

Participants also shared the importance of including traditional foods in AI/AN diabetes nutrition education, exemplified by one AI/AN focus group participant with T2D:

Traditional food, even if I can't get it all the time, I know that is what made my grandmother and mother healthy, that is where their strength came from all those years, the food they grew and collected, I know that is the source of their health.

One national content expert strongly suggested, however, that “recommendations on how to incorporate traditional foods into the diet be realistic and attainable for urban-living Natives” and those AI/ANs who don't have ready access to many traditional foods. Participants also highlighted the need to provide accurate information about traditional foods, lamenting that the understanding of what foods are traditional is changing in many AI/AN communities. They suggested this may be due to the introduction of fast foods and other “comfort” foods now readily available in many rural and urban Indian communities.

Participants also emphasized the importance of including not only the patient with diabetes in the education experience but also support people, such as spouses, partners, adult children, and close friends. Further, participants highlighted the importance of entire communities

benefitting from diabetes nutrition education. One participant, who was a close friend of an AI/AN with T2D, shared:

We do this together. I mean, all of our choices, (being) healthy and walking and taking care of ourselves – we are in this together. I am here for her and she is here for me. It's just like that and we couldn't do it any other way. No one can. Everyone needs support and community – this isn't easy to do alone. One day she doesn't want to walk and I encourage her, and the next day it's me that doesn't want to go and she holds me accountable. You have got to have that.

Theme #3: It is important to address barriers to healthful eating and provide educational strategies and resources to mitigate these barriers.

Participants shared the myriad challenges to healthful eating for diabetes. They noted the high rate of food insecurity in AI/AN communities, which they identified as a formidable barrier to eating healthfully. Participants noted that access to healthful foods is often limited because of the high cost of fresh foods. Many also highlighted limited access to supermarkets and full-scale grocery stores in food deserts in reservation communities or poor urban neighborhoods. Transportation is also challenging, making long trips to access healthy foods at full-scale supermarkets difficult. Excessive access to fast and processed foods was also highlighted as a barrier to healthful diets.

One family member of an AI/AN participant with T2D said:

I think what's hard, too, is the cost, like healthy food can be expensive, like, fast food, and everything's cheap, like, it's easy access and whatever, but healthy food, I find it's expensive sometimes.

One national content expert who is also AI/AN shared:

As far as the question of what is challenging for people to manage their diabetes, well a lot of issues come up... the major issues of rural (Name of US State)... huge food deserts, lots and lots and lots of very rural areas where you don't have grocery stores. You have to drive 2 h to a Walmart... but what they do have in those small towns, ironically, is they might have a Sonic, or they might have a small-town diner that is country food, so chicken fried steak, mashed potatoes, and gravy. Combined with that lack of access is poverty. I will hear over and over again throughout all of (Name of US State) how people are eating Sonic 5 nights a week, how people are eating anything they can pick up to take to go 5 nights a week. It's very, very common in these rural areas for people to also not cook. It's the combination of very high rates of poverty, not enough time, desire for convenience, or you could say need for convenience, and food deserts.

When asked to describe typical community members' diets, one AI/AN community-based diabetes educator shared the challenges poverty brings in an environment of high access to unhealthy food:

I'd say heavy in carbohydrate diet. A lot of fast food, I see a lot of fast food... convenience store foods... inexpensive foods from the grocery store due to budget concerns. I think people's finances play a big role in what they can afford to buy and eat. People shop sometimes at the Dollar store for groceries.

Participants in both rural and urban areas described the challenges of accessing fresh fruits and vegetables at grocery stores in contrast with the ease of accessing processed foods at convenience and fast-food establishments. In addition to excessive access to fast and processed foods,

participants communicated that there is a general lack of education on affordable cooking and food preparation for busy families with a limited budget. Participants stressed that eating outside of the home instead of eating home-cooked meals was a consequence of several factors including: excessive access to fast and processed foods, lack of time to cook, and lack of cooking knowledge and skills.

An AI/AN diabetes educator shared:

Time, knowing how to cook the healthy food, money... also not being used to eating healthy food, and lack of planning. When we asked participants in our classes what were the challenges for healthy eating they responded: time, buying food, shopping/storing food, emotional eating, snacking, family disagreements, planning ahead, healthy food is expensive, and craving.

Participants discussed loss of traditional foods and food-acquisition habits as a barrier to healthful eating. They discussed the inability to hunt, fish, and gather because of loss of land and excessive pollution or contamination of resources. One AI/AN with T2D shared:

The food our grandparents used to eat, right here from the river – it's polluted now, we can't eat anything from that river anymore.

Participants also shared how the United States Department of Agriculture (USDA) food assistance programs have negatively impacted dietary habits of AI/ANs by providing highly processed food through the commodity food program. Finally, participants shared other factors that make eating healthfully a challenge. Mental health problems, such as depression and stress, were identified as barriers to healthful eating in Native communities. Competing demands such as family issues, substance abuse, and housing and food insecurity were also perceived as making healthy eating with diabetes challenging. One AI/AN nutrition educator shared:

And even though I am a dietitian, sometimes we don't even go there (nutrition education). Sometimes the depression is all we can deal with – and the food isn't going to be discussed.

In a discussion about what makes healthy eating challenging, 2 AI/AN participants with T2D shared:

Speaker A: The 1 thing we didn't really talk about is the stress. You're talking about it now but you're not calling it what it is. It's the stress factor that everybody deals with. Life, every day.

Speaker B: Survival.

Speaker A: Going home to cook dinner is the last thing on your mind because you've got everything else in your head and you're rushing, you're busy, having to work to pay for food, or go to school.

This conversation draws attention to the underlying competing life demands and stressors that many AI/AN adults with T2D face on a daily basis.

Discussion

Taken together, these findings, as supported by literature and theory, have guided our cultural adaptation of the existing ADA WCIE diabetes nutrition education program. In the discussion, we share specific examples of how these findings have informed the adaptation process.

Our first key theme emerged as participants acknowledged the diversity among AI/AN people in the USA. In addition to cultural and

geographic diversity, they spoke to differences in needs for diabetes nutrition education pertaining to stage-of-life, barriers to healthful eating, and how the food environment has changed regarding accessing traditional foods. Research supports cultural tailoring of existing education programs as a means to engage the intended audience (42–44). Indeed, nutrition education is most effective when designed to accommodate and meet the needs of a specific population (2, 45). However, as findings from this study suggest, it is important to account for diversity within intended audiences, as well. In this case, recognizing the heterogeneous nature of AI/AN communities in the USA is crucial for ensuring that the adapted curriculum can address the needs of Native people. A key finding in a large qualitative study with tribal leaders, AI/AN health professionals, and AI/AN community members suggested that the majority of participants felt a strong preference for diabetes education materials that were specific to their tribe or culture (46). To address this, our program development team included: images of Native people from different tribal groups in AI/AN WCIE participant and facilitator guides, language and prompts in facilitator guides to include examples from their community throughout the lessons, placeholders where community-specific dietary recommendations, recipes, music, and resources can be incorporated into the lessons.

To accommodate diversity regarding stage-of-life or challenges in the food environment related to healthful eating, we included multiple “optional lessons” that may resonate with some communities but not others. For example, there is an optional lesson on “cooking for 1 or 2” and an optional lesson on “healthful eating with commodity foods.” Additionally, we included an interactive activity where participants act out “skits” that depict various “challenges” to healthful eating and recommend the class facilitator choose which skits may fit best with his/her community. For example, 1 skit centers on a busy mother who is trying to eat healthfully while taking her children to their sports practice. This scenario may not be relevant for a class of participants who are older adults without school aged children in the home.

Despite these differences, many commonalities exist across AI/AN cultures and traditions that represent their strengths. Some examples include the use of Talking Circles; the perceived importance of a balance in mind, body, and spirit; strong family and community connections; and a shared history of traditional foods (47). Though the details of these factors may differ, the development team included these key concepts throughout the lessons. For example, each class includes a Talking Circle so that participants can support and learn from one another. Likewise, all classes emphasize the importance of trying to eat at least 1 traditional food each week. The latter recommendation is left intentionally nonspecific so that participants can select traditional foods that are available and relevant to their specific tribal traditional practice (48).

The second key theme from our analyses highlighted the importance of incorporating community strengths and traditions into the adapted curriculum. The literature also supports the importance of integrating traditional culture and values into health education programs for AI/ANs (47, 49). Specifically, nutrition education that is tailored for multicultural audiences is shown to be more effective and accepted than that which is designed for a general audience (50). Evidence also suggests that nutrition education specific to AI/AN audiences is more

effective in promoting behavior change than general nutrition education resources (51, 52). Native pride and connection with Native culture was believed to facilitate healthful behavior in a study with Native Americans with persistent mental illness (53). Additionally, a pilot study of 2 lifestyle interventions was conducted among the Pima of southern Arizona to compare differences in T2D risk factors. Participants were randomly assigned to receive either an intervention with structured nutrition lessons and physical activity or a less structured intervention which included an emphasis on appreciation for Pima culture and history. At 12 mo, participants receiving the less structured intervention or the “Pima Pride” intervention, experienced less weight gain and lower 2-h glucose concentrations than participants receiving a more typical lifestyle intervention (54).

Since dietary behavior change is almost always difficult, a community- and family-based approach should be used to offer support for healthful eating (22). The literature also supports a community- and family-based approach to health education in AI/AN communities (47, 55). Further, the SCT concepts of reciprocal determinism and observational learning indicate the importance of learning from one another and supporting each other through positive role modeling and accountability (56). Supported by this literature, health behavior change theory, and our qualitative findings, our development team took a strengths-based approach to draw on these facilitators to healthful eating for people with diabetes (57, 58). Specifically, we included references to traditional food, the health of AI/AN ancestors related to traditional food, and “placeholders” for educators to emphasize community-specific traditional food-acquisition practices and resources for finding traditional foods.

The original ADA WCIE program guidance recommended that all participants with T2D bring an adult family member or support person with them to classes. Our AI/AN version of the curriculum is congruent with this recommendation. To incorporate Native strengths related to commitment to the family and wider community, we included advocacy “homework assignments,” goal setting opportunities for individuals or families, and advocacy or educational opportunities for community-wide engagement in the adapted curriculum. Examples include teaching a friend or family member about choosing low-sodium foods, setting a goal to eat a healthy meal or snack with a family member, bringing healthy food options to social gatherings, and asking local restaurants to offer discounts on healthier foods. Thinking beyond the health of a single individual by connecting the individual’s health to contributions to his/her family and his/her community aligns strongly with Indigenous values (59).

The literature suggests AI/ANs suffer disproportionately from food insecurity (60–63) and are more likely to live in food deserts than any other racial group (64–66). Map the Meal Gap data from 2014 indicate that counties with American Indian reservations have substantially higher rates of food insecurity than neighboring counties (67, 68). Additionally, there is growing evidence that living in areas with excessive access to processed and fast food, areas known as “food swamps,” is equally predictive of obesity as living in a “food desert” (69). Research from the Special Diabetes Program for Indians suggests that the ubiquitous nature of unhealthy food makes it hard to avoid, especially among AI/ANs who experience poverty (70). Excessive access to fast food, processed food, or ready-to-eat food items serves as an additional barrier to healthful eating at home. Lack of time and lack of cooking skills are also

formidable barriers to healthful eating at home as found in our study. Participants in this study indicated many AI/AN community members are overwhelmed by competing demands and stressors, which may diminish the ability to prioritize time required for grocery shopping, food preparation, and cooking at home, all of which are strategies for healthful eating (9).

Participants in this study shared many barriers to healthful eating, including that AI/ANs often experience barriers to acquiring healthy traditional foods (71, 72). Older participants in this study, from both rural and urban areas, shared their memories of healthful eating in the past, including traditional food-acquisition practices, such as gathering, fishing, and hunting. Indeed, federal policies, many aimed at assimilation and cultural dissolution, such as, forced relocation and the dispossession of lands, have profoundly impacted AI/AN communities over the generations and resulted in disrupting connection to traditional foods, and often the loss of knowledge of harvesting and preparing these foods (73, 74). Environmental pollution has also disrupted connection to traditional foods and cultural food practices (75, 76). Projects aimed at reclaiming traditional food systems are an important tribal food sovereignty practice meant to combat the adverse health consequences of adopting a typical American diet (72–74). For example, the CDC Native Diabetes Wellness Program conducted a Traditional Foods Project to support traditional, sustainable, and ecological approaches to T2D prevention, with a focus on local efforts to reclaim traditional foods (73). In the AI/AN WCIE curriculum, we included problem-solving strategies through use of vignettes and skits for participants to learn from one another how to eat healthfully in situations where fast or processed food appears to be the “easiest” choice. In addition, we included optional lessons on healthful eating with commodity foods and healthful eating outside of the home. The AI/AN WCIE program also includes a realistic emphasis on eating traditional foods, with a goal of eating 1 traditional food each week. Suggestions include traditional protein foods (fish, game, acorns, walnuts), traditional beverages (unsweetened tea and fruit infused water), and traditional snacks (acorns, walnuts, popcorn).

Our participants also highlighted the impact of stress, mental health, and competing life demands as stressors on diabetes self-management. The literature suggests stress, particularly for AI/ANs who live in poverty or on reservations, is more common for AI/ANs with diabetes than those without (77). Diabetes self-management programs for AI/ANs often incorporate stress management as an important component to successful programs (78). The SCT suggests that scaffolding education to support learners who may feel overwhelmed by the need to “change everything” may enhance self-efficacy and that this is effective in precipitating health behavior change (56). Other studies have found that participants who live in poverty also struggle with finding time to cook (79) and have benefitted from SCT-grounded cooking education (80). To address these challenges to healthful eating, we drew on literature supporting the principles of food resource management and evidence-based nutrition education resources, such as meal planning and food budgeting (13, 81, 82). The adapted program includes multiple opportunities for building support networks among participants through Talking Circles, group and partner activities, as well as stress management techniques such as mindful breathing, visualization, and mindful decision-making techniques. Facilitators are encouraged to share local community-based resources

such as supportive food aid programs to alleviate stress imposed by food insecurity.

One key limitation of this study is that all 4 collaborating AI/AN sites have robust diabetes care/education centers, and it was from these centers that participants were recruited. As with all qualitative studies, findings are not generalizable beyond the experiences of these participants, however, generalizability may be further limited to AI/AN sites that have diabetes care/education centers and clinics. Further, though we strived to include a diverse sample of AI/ANs (from different areas of the USA as well as urban compared with rural settings), it is not feasible to develop a separate version of the WCIE curriculum for each AI/AN tribe and community. This may be considered a limitation for communities and tribes who prefer health education and resources specifically tailored to their own tribe.

In conclusion, the adapted AI/AN WCIE program provides a potentially valuable resource for Native communities seeking to offer diabetes nutrition education programs for their tribal community members. The AI/AN WCIE program was developed with direct recommendations related to the facilitators and barriers of healthy eating for AI/ANs with T2D. To our knowledge, the curriculum is one of the few that is specific to exclusively diabetes nutrition education. Our next step is to pilot test the curriculum in collaboration with our partner communities. The results of that testing will inform refinement and ultimate national dissemination of the curriculum.

Acknowledgments

We thank the participants for their generous time and insight and to our qualitative data analyst, S. Lockhart.

The AI/AN WCIE study group: G. Austin, D. Bellinger, K. Conti, N. Couture, A. Brega, H. Garrow, K. Gonzales, C. Hinchcliff, E. Juarez-Colunga, K. Moore, M. McNulty, N. O'Banion, H. Pontius, and S. Stotz.

The authors' contributions were as follows—SAS: designed research, collected data, analyzed qualitative data, drafted the manuscript, and revised all versions of the manuscript; AGB: designed research, analyzed data, provided substantial critical edits and feedback on all drafts of the full manuscript; LEH: analyzed quantitative data, wrote the quantitative section of the manuscript, provided substantial critical edits and feedback on first draft of the full manuscript; KG: assisted with data collection, provided qualitative methods support, and provided substantial critical feedback on the first draft of the full manuscript; KRM: designed research, oversaw all data collection and analysis, provided substantial critical edits and feedback on all drafts of the manuscript, and has primary responsibility for final content; and all authors: read and approved the final manuscript.

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