

Research Article

Determinants of Diet Quality in a Pacific Islander Community

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ABSTRACT

Objectives: Obesity and obesity related diseases such as hypertension and type 2 diabetes (diabetes) are a global health epidemic, and are especially severe in Pacific Islander populations. The objective of this study is to identify the beliefs, experiences and influences related to diet quality within a Marshallese Pacific Islander community in Arkansas.

Methods: A mixed methods design was chosen to obtain a more comprehensive view of participant's diet quality beliefs, experiences and influences and overcome the limitations of a single design. From November 2017 to February 2018, a purposive sample of 40 participants took part in the mixed methods study via focus groups.

Results: As we sought to understand beliefs, experiences and influences related to diet quality, four *a priori* qualitative themes were identified: (1) Socio-cultural determinants of diet quality;

(2) Preferential determinants of diet quality; (3) Economic determinants of diet quality; and (4) Nutritional knowledge of diet quality.

Conclusion: Similar to other studies of Pacific Islander communities in Hawaii and the United States affiliated Pacific Islands, Marshallese participants discussed numerous socio-cultural, preferential, economic and nutritional knowledge determinants to diet quality. Understanding the beliefs, experiences and influences related to diet quality will fill an important gap in the literature for Marshallese in Arkansas and help inform interventions, practices and policies that can reduce obesity, hypertension, and diabetes.

Keywords: Pacific Islander; Marshallese; Diet Quality; Community-based participatory research; Obesity; Diabetes; Mixed-methods

Introduction

Obesity and obesity related diseases such as hypertension and type 2 diabetes (diabetes) are a global health epidemic, and are especially severe in Pacific Islander populations [1]. The Center for Disease and Control and Prevention's (CDC) National Health Interview Survey documented that 44% of Pacific Islanders surveyed in 2017 were obese, compared to 37% of African Americans and 32% of Hispanic/Latino. Nationally, only 19% of Pacific Islanders reported healthy body mass indexes (BMI). The 2010 CDC survey showed that high percentages of Pacific Islander respondents had experienced heart disease (20%), hypertension (41%), stroke (16%), and diabetes (24%) - higher than any other racial/ethnic group [1].

Diet quality plays a critical role in mitigating and preventing obesity, hypertension, and diabetes health disparities. However, the limited studies with Pacific Islander populations in Hawaii and the United States (US) affiliated Pacific Islands show that Pacific Islanders experience barriers to proper diet quality such as economic, taste preferences, availability of healthy food choices, and a lack of culturally appropriate dietary modifications [2-4].

From 2000 to 2010, the Pacific Islander population in the US increased by 40%, making it the second-fastest growing population in the US. The fastest growth occurred in the South

(66%), especially in Arkansas (252%), where the majority of Pacific Islanders are Marshallese [5-10]. Arkansas has the largest population of Marshallese living in the continental US (~14,000 people) [6-10]. Local preliminary needs assessment with Marshallese residing in Arkansas demonstrated that 90% of the participants were overweight or obese (n=401). Furthermore, 41% had blood pressure measures indicating hypertension, and 16% had prehypertension; 38% had HbA1c levels indicative of diabetes, and 32.6% had levels indicative of pre-diabetes [11].

Health disparities among the Marshallese are rooted in a complex history between the US and the Marshallese. The US military conducted nuclear testing in the Marshall Islands between 1946 and 1958, detonating 67 fission and thermonuclear devices equivalent to 7,200 Hiroshima- sized bombs [12]. As a result, areas of the Marshall Islands were contaminated, disrupting their dominant food sources of fish and locally grown plants [13]. The Marshallese diet and lifestyle in the Republic of the Marshall Islands (RMI) shifted to a Western diet high in fat and simple carbohydrates, and a more sedentary lifestyle after the nuclear testing [14]. The majority of food is now imported from outside of the country. Rice is the primary staple food in addition to simple carbohydrate foods such as ramen noodles, doughnuts and pancakes while consumption of fruits and vegetables are highly limited [2,14]. The limited research available shows that these food choices may continue after Marshallese migrate to the

US where additional food choices are available [13]. However, there is currently no peer-reviewed literature documenting diet quality beliefs, experiences, and influences of Marshallese after Marshallese migrate to the US.

After the nuclear testing, the US conducted research on Marshallese to evaluate the effects of nuclear radiation on humans. The research was conducted without informed consent or information translated into the native language. As a result, the Marshallese community demonstrates distrust of research due to this historical trauma [15-20]. To overcome the challenges of the historical trauma experienced by the Marshallese, the University of Arkansas for Medical Science (UAMS) established a community-based participatory research (CBPR) partnership with the Marshallese community. CBPR is a research approach seeking to involve community partners in all aspects of the research process [21]. This type of research is uniquely suited for engaging indigenous and immigrant populations to overcome historical trauma. As part of the CBPR collaborative, the research team has spent the past five years meeting with the Marshallese community members to determine and prioritize the community's primary health concerns.

This study was developed based on a CBPR partnership with the Marshallese community focused on dietary quality and reducing health disparities related to obesity, hypertension, and diabetes. The research question guiding this study was: What are the beliefs, experiences and influences related to diet quality within the Marshallese community in Arkansas? Understanding the beliefs, experiences and influences related to diet quality will fill an important gap in the literature for Marshallese in Arkansas and help inform interventions, practices and policies that can reduce obesity, hypertension, and diabetes.

What is Known about the Topic?

- Obesity and obesity related diseases such as hypertension and type 2 diabetes are especially severe in Pacific Islander populations.
- Diet quality plays a critical role in mitigating and preventing obesity, hypertension, and diabetes health disparities.
- Limited studies with Pacific Islander populations in Hawaii and the United States affiliated Pacific Islands show that Pacific Islanders experience barriers to proper diet quality such as economic, taste preferences, availability of healthy food choices, and a lack of culturally appropriate dietary modifications.
- The 2010 CDC survey showed that high percentages of Pacific Islander respondents had experienced heart disease (20%), hypertension (41%), stroke (16%), and diabetes (24%) - higher than any other racial/ethnic group.

What the Paper Adds?

- Socio-cultural determinants of diet quality included a propensity for eating together as a family, talk story, and challenges with time and family size.
- Preferential determinants of diet quality included a

preference for sugar-sweetened beverages and rice.

- Economic determinants of diet quality included perceived economic constraints to healthy food and economic constraints on eating out.
- Nutritional knowledge of diet quality included obtaining nutritional knowledge from food and nutrition programs, how that knowledge was utilized, and overall lack of nutritional knowledge.

Methods

Recruitment and sampling

The inclusion criteria specified participants be at least 25 years of age. To accommodate cultural preferences of the Marshallese community who prefer to participate in interviews with close friends and family members, interviews/discussion groups were conducted with up to four participants at a time. Discussion groups are a means of collecting data at one time point from several people (who usually share common experiences) and which concentrate their shared meanings [22]. Discussion groups were chosen to facilitate collective diet quality beliefs, experiences and influences among the participants. Participants were recruited from Marshallese serving community-based organizations including service organizations, churches, and health care providers by bilingual (English and Marshallese) community co-investigators who described the study to participants in the language of their choice.

Participants who agreed to be in the study were provided the opportunity to join the study by providing oral consent. Bilingual Marshallese study staff went over the consent information orally and participants were provided the opportunity to have their questions answered. The consent information was provided in the participants' language of choice (English or Marshallese). All study procedures and materials were approved by the UAMS IRB (#206487).

Research design

A mixed methods design was chosen to obtain a more comprehensive view of participant's diet quality beliefs, experiences and influences, and overcome the limitations of a single design. This process aids in establishing reliability, validity, and overall confidence in the analysis of the results [23]. The study implements the triangulation of methods by using methods from both quantitative and qualitative methodological positions. In order to implement this process, we conducted analyses of both qualitative discussion groups and quantitative survey data.

The purpose of the quantitative portion of the study was to characterize participants' demographic characteristics and experiences and influences related to diet quality. The CBPR partnership developed items to describe socio-cultural and preferential factors that might influence diet quality. Specifically, items focused on places and events where group members ate, beverages they consumed, and whether or not they read nutrition labels. In addition, participants completed the Six-Item Short Form of the US Household Food Security Survey Module [24].

The CBPR partnership developed the survey and semi-structured discussion group guide through extensive fieldwork.

The discussion groups allowed Marshallese participants to use their own words to describe beliefs, experiences and influences related to diet quality. A semi-structured discussion group guide with open ended questions was used to encourage participants to speak openly while maintaining consistent inquiries across the discussion groups. Broad questions were designed to encourage participants to speak openly and probes were used to clarify nuances.

Data collection

From November 2017 to February 2018, a purposive sample of 40 participants took part in the mixed methods study. The discussion group size ranged from 1 to 4 with an average discussion group size of 1.44 participants. Participants were given a survey and participated in a semi-structured discussion group. Two female bilingual community co-investigators, trained in research methods, facilitated each discussion group. Discussion groups took approximately one hour and were conducted at UAMS offices and the Arkansas Coalition of Marshallese. Participants were provided a \$20 gift card for their participation.

Data analysis

Quantitative data analysis focused on descriptive statistics, including frequencies, percentages, and means. Descriptive statistics were calculated for participant demographics; determinants of diet quality, perceptions and experiences; and food security. Qualitative analyses were the primary focus of the study. Qualitative interviews/discussion groups were audio recorded and transcribed verbatim by a bilingual community co-investigator. Transcripts were then translated from Marshallese to English and checked for accuracy by two female bilingual research staff. The CBPR team coded transcripts for emergent themes. All themes were collaboratively discussed in order to ensure scientific rigor, intercoder agreement, and develop the most salient themes within the data. There were two primary coders and one confirmation coder. Codes were classified in a codebook. The qualitative results revealed four primary themes that emerged regarding beliefs, experiences and influences related to diet quality within the Marshallese community. Only the most representative quotes are being presented.

Quantitative Results

Table 1 shows participants' demographic characteristics. Participants' mean age was 50.1 ± 12.7 . Seventy percent of the participants were female, and 30% were male. Majority of the participants had a high school education or lower (77.5%), and 66.6% had an income of \$30,000 or below. Fifty-five percent of the participants had no health insurance, and 52.5% of participants said they did not use Supplemental Nutrition Assistance Program (SNAP) or Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Qualitative Results

As we sought to understand beliefs, experiences and influences related to diet quality, four a priori qualitative themes were identified: (1) Socio-cultural determinants of diet quality; (2) Preferential determinants of diet quality; (3) Economic determinants of diet quality; and (4) Nutritional knowledge of diet quality. Subthemes emerged within the a priori themes.

Table 1: Participant demographics, n=40.

Characteristic	n (%)
Age [†]	50.1 \pm 12.7
Sex	
Female	28 (70.0)
Male	12 (30.0)
Education	
Elementary	2 (5.0)
Some HS	5 (12.5)
HS grad	24 (60.0)
Some college	6 (15.0)
College grad	2 (5.0)
Grad degree	1 (2.5)
Income	
<\$10,000	3 (8.3)
\$10,001-20,000	9 (25.0)
\$20,001-30,000	12 (33.3)
\$30,001-40,000	6 (16.7)
>\$40,000	6 (16.7)
Health Insurance	
No	22 (55.0)
Yes	18 (45.0)
Do you use SNAP or WIC?	
Yes	19 (47.5)
No	21 (52.5)
Note: only valid responses shown.	
[†] Mean \pm standard deviation.	

Socio-cultural determinants of diet quality

Participants discussed the Marshallese socio-cultural norms of eating together. Within this a priori theme there were three subthemes: 1) Family; 2) Communal meals; and 3) Talk story and prayer.

Family

Majority of participants (85%) said they ate together as a family (Table 2). Participants discussed Marshallese collectivist norms on how meals are prepared and shared within the home. Some participants described collectively preparing meals and eating together as a family when time allowed. One participant said *"We all help each other with the cooking every time (DG25:11)."* Another participant stated:

"My family usually has meals together during breakfast and dinner. We usually get up early in the morning and prepare breakfast for the children before they go to school and this is when we have time together to have the first meal together during the day. And during dinner we have a family meal together because everyone is back from work and school (DG4:1)."

Participants described eating almost all meals together as a family during the weekend. For example, one participant said:

"My family usually eats together during dinner time during the week days. This is the only time that my family has more time during the day. And during the weekends we would have breakfast, lunch, and dinner together (DG2:2)."

Another participant said:

"During the week it is just my spouse and myself. So, we

Table 2: Socio-Cultural Determinants of Diet Quality, n=40.

Communal Eating	n (%)
Does your family usually eat together?	
Yes	34 (85.0)
No	6 (15.0)
Do you eat at church?	
Yes	36 (90.0)
No	4 (10.0)
Do you eat at a relative's house?	
Yes	34 (85.0)
No	6 (15.0)
Do you eat at social events like birthday parties?	
Yes	38 (95.0)
No	2 (5.0)
Do you eat at other gatherings?	
Yes	34 (89.5)
No	4 (10.5)
Do you eat at fast food restaurants?	
Yes	33 (82.5)
No	7 (17.5)
Do you eat at sit-down restaurants?	
Yes	31 (77.5)

Note: only valid responses shown.

usually have the time to eat as a family throughout the day. And during the weekend we have time to eat with our grandchildren throughout the day too (DG3:1)."

In addition, participants described sharing meals as a family as an opportunity to pray together. One participant stated:

"We usually eat together during dinner. During this time, we have our family pray together. So, I have made a schedule for the members of the family to lead our evening devotion. This is only time we eat together because the kids have different schedules to go to school and people who work too (DG9:2)."

Communal meals

In addition to eating together as a family, communal meals were identified as an important part of the Marshallese culture. Majority of participants stated that they ate communally at their churches (90%), relatives' houses (85%) and at birthday parties (95%). Qualitatively, communal meals were typically described as happening as part of birthday parties or at church (Table 2).

One participant said:

"We don't eat out [of the house] except for when we go to the birthday parties or events (DG16:4)."

Another participant agreed and said:

"Most weekends we usually eat different foods when we attend birthday party, weddings, church events, and family gatherings. We would have Marshallese local foods and combination of other American foods (DG4:1)."

Another participant stated:

"They usually eat differently at birthday parties because 'that's where they have a variety of foods (DG25:3)."

Eating differently on the weekends appeared to be contingent on attending functions such as "birthday parties, family gathering,

church functions, and community events. These are the only occasion during the weekend that we would have different foods (DG6:1)."

Eating at church was described as an important customary routine. When asked about whether families eat outside of the home one participant said *"Aside from our churches? Hmmm, because those are the usual places that we eat at almost every Sunday (DG25:6)".* In addition to church meals, participants discussed purchasing meals from church fundraisers on the weekends. Participants said *"During the weekends, the kids usually buy food from the [church] fundraisers (DG24:4)".* Another participant stated that *"usually during the weekends we buy from the [church] fundraisers (DG22:6)".*

The discussion of eating communal meals at church and birthday parties was described as an opportunity to eat varying foods that are not eaten throughout the week. Some participants described eating healthier on the weekends or incorporating Marshallese dishes. For example, one participant said *"We eat mostly vegetable during the weekend because we eat at our church (DG27:4)."*

Talk story

Participants described weekend communal meals as an opportunity to participate in Marshallese cultural norms such as talk story. Participants discussed the importance of eating together in order to talk story. Pacific Islanders, including Marshallese, follow an oral tradition that values face-to-face discussions. One participant said *"the parties are also important because we not only eat but we socialize and talk story with others (DG17:16)".* Other participants said

"We usually sit and talk story while we eat together, (DG20:5)" and *"we sit together and talk story. (DG27:33)."*

Time and family size

Participants also described the challenges of eating together as a family such as conflicting schedules and lack of time. For example, one participant stated:

"We have a table, but whoever gets hungry will come and eat. We don't have a time that we sit to eat. We don't usually eat together. Whenever the food is ready whoever is hungry will come and self-serve and eat (DG7:4)."

Another participant said: *"Because most of the people at the house have different times to go to work so we don't really have time to eat together. Even on weekends we don't really have time to eat together (DG7:4)."*

Additionally, one participant said *"Those who work will eat first and go to work and then us, the family comes after to eat (DG24:6)."*

Another challenge to communal eating identified was size and the inability to eat together in one room or at one table. One participant said *"Whoever eats first will eat. There's too many people so some will eat first and then some after when they come late (DG16:1)."* Another participant stated: *"We have time to eat together and we do occasionally. Some of the family when they wake up its really late and they don't have their breakfast. There are only a few of us that eat together. During dinner time we eat*

together. The table in the house is small so some of us will sit on the floor and eat (DG7:4)."

Preferential Determinants of Diet Quality

Participants described preferential determinants of diet quality with much discussion around preferred beverages and an engrained desire for rice. Within this a priori theme there were two subthemes: 1) Beverages and 2) Rice.

Beverages

Majority of participants (82.5%) said they drink sugar-sweetened beverages (Table 3). Qualitatively, participants discussed a myriad of preferred beverages ranging from "Ice tea, orange juice, V8 juices like tomato juice (DG8:2)," "fruit punches (DG2:1)," "sweet tea (DG3:1)," "Kool-Aid (DG7:4)," and "sometimes coffee (DG7:2)." Almost all of the participants stated that they drink soda (85%). Drinking soda was described as something everyone in the household did when one participant said "The children and the adults are drinking soda (DG8:2)." Another participant agreed and described soda as the only element to quench their thirst when they said "We usually drink soda. Some of them don't really drink water. When they drink water, it doesn't satisfy their thirst (DG7:2)."

Although soda was discussed as the preferred beverage among majority of participants some participants described soda as something they only had on special occasions. For example, one participant said "We rarely drink soda, only if we are at a party (DG9:1)." Additionally, some participants described a divide within the household with regard to soda when one participant said "my spouse and I are drinking soda and not the kids (DG7:2)", whereas another participant said "The people at the house drink soda but I drink water (DG21:3)."

Although fifty-five percent of participants responded that they drank tap water, majority of participants said they drank bottled water (97.5%). The qualitative results echoed these results wherein majority of participants described a ubiquitous preference

for bottled water versus water from the faucet. For example, one participant said "We don't drink from the faucet because of the smell and the taste (DG7:4)." Another participant stated that "in my refrigerator it's just water (DG32:4)." Participants agreed and said "We don't drink from the faucet we usually buy water from the store (DG9:1)" and another stated "the household always buys water from Wal-mart (DG26:4)." Further, drinking water from the faucet was described as making participants ill. One participant said:

"We don't drink water from the faucet. There was a time when I drink from the faucet and I encounter with diarrhea at once. We only buy water from the store. Except that we use it to boil water to make coffee (DG7:3)."

Rice

Participants described continuing to eat the preferred foods that they ate in the RMI after migrating. One participant said "The foods that we are consuming are the foods that we have the habit of eating. We bring this lifestyle of eating these foods from where we come from (DG7:5)." The primary food discussed by all participants was rice. Rice was described as a staple for every meal. For example, participants stated "rice is a must (DG26:4)", "rice is very important to us (DG25:10)", and "rice, that's the main food, we always have to have it (DG24:4)." Participants also described purchasing rice in very large quantities because it is cheap. One participant said: "There are times when we have not had enough food. So, when I get a pay check, I usually buy the 50 pounds of rice (DG9:2)."

Rice was sometimes described beyond a cultural and affordable staple and was discussed as a means of survival. For example, one participant stated "we usually cook the pot of rice and this is a must because if there is no rice then the people won't survive (DG9:3)." Another participant said:

"Sometimes when there is no rice we think we don't have food. . . and we think we are starving because there is no rice (DG8:3)."

Some participants described not eating unless there was rice. One participant said "so rice is number one so much that if they don't eat rice, we won't eat until there is rice then we will eat (DG18:2)."

Although participants described rice as a cultural staple that was affordable and necessary for survival, some participants articulated a belief that rice was not good for them and that the Marshallese community had challenges with regard to how much rice they eat. One participant said "We'll try not to eat rice, but it's not easy (DG29:11)."

Nutritional Knowledge and Diet Quality

In addition to preferential determinants of diet quality, participants discussed how they accessed their nutritional knowledge to better understand healthy diet quality, utilization of that knowledge, and barriers to nutritional knowledge. Within this a priori theme there were three subthemes: 1) Physicians, Nutrition Programs, and Nutrition Labels; 2) Nutritional Knowledge Utilization; and 3) Lack of Knowledge.

Physicians, nutrition programs, and nutrition labels

Participants discussed attaining majority of their nutritional

Table 3: Preferential Determinants of Diet Quality, n=40.

Beverages	n (%)
Do you drink soda?	
Yes	34 (85.0)
No	6 (15.0)
Do you keep soda in the house?	
Yes	26 (65.0)
No	14 (35.0)
Do you drink tap water?	
Yes	22 (55.0)
No	18 (45.0)
Do you drink bottled water?	
Yes	39 (97.5)
No	1 (2.5)
Do you drink Kool-Aid or punch?	
Yes	35 (87.5)
No	5 (12.5)
Do you drink other sweet drinks (like Luau)?	
Yes	33 (82.5)
No	7 (17.5)
Note: only valid responses shown.	

knowledge from either physicians or food and nutrition programs like WIC. Participants said *"We learn things when I visit my doctor and my dietitian then they shows me the nutritious foods and the non-nutritious foods (DG32:8)."* Another participant stated *"we get our nutrition information from our nutritionist and doctors (DG3:2)."* Participants also described getting their nutritional knowledge from literature and health classes taught through health clinics. One participant said *"We read the papers at the clinics when we go to the doctors (DG30:5)."* Participants said that they learned about nutrition from their diabetes classes. *"We take diabetes classes and learn about the foods for diabetics (DG16:5)."*

Majority of participants said they did not use SNAP or WIC (52.5%). However, for the participants who did access WIC described obtaining nutritional knowledge from these programs. One participant stated *"my family gets their nutrition information from the WIC program (DG5:2)."* Participants discussed the influence of WIC throughout the community as participants shared information with each other. *"For the Marshallese, the Nutritionist for the WIC program, that's how we learn about nutrition (DG29:8)."* Another participant stated *"My grandkids are using the WIC program so they gave us a book that gives information on nutritious foods, and the book give us information on how the group of foods work (DG9:2)."*

Majority of participants (62.5%) stated they read nutrition labels before purchasing food. The responses were similar in the discussion focus group. Participants described getting their health information from reading the nutrition labels on the back of food packages to assess levels of sodium, cholesterol, calories and fat. One participant said *"We always check for the sodium, cholesterol, fat, and calories (DG1:2)."* Participants agreed and stated *"We use the information to check if the food product contains a lot of sodium, cholesterol, fat, and calories. We also check if the food product is good for our health (DG1:2)."* Another participant said: *"I look at the sodium and look at the protein of the product. If it is meat I check the protein. I usually check the sodium because I don't like foods that are too salty. If I see that the food has a lot of sodium I don't take it (DG8:4)."*

Participants were particularly focused on nutrition labels if they had hypertension or diabetes. One participant said *"I usually read the back of the label of the food. I check how much fat and calories are in the food to see if the food has good nutrition for a person who has hypertension and diabetes (DG7:5)."* Another participant agreed and stated *"I usually read the label of the product too because my family has diabetes problem (DG9:2)."*

Nutritional knowledge utilization

Participants discussed how they utilized their nutritional knowledge within their families and in the community. One participant stated *"I share with my family first and those that I have control over since I cook their food (DG29:9)."* Another participant agreed and said *"We use the information to give the right foods to our children, grandchildren, and those who are having health issues (DG4:2)."* Participants consistently described utilizing their nutritional knowledge to improve health. One participant said *"I use it for the health of my family and myself (DG2:2),"* while another participant said *"we share to those that we know that are sick (DG25:8)."* Additionally, one

participant said *"As for me I discontinued buying ramen for my house because I see the amount of sodium on its label that it's too much. And the kids really like it but I tell them no, they don't eat ramen because you take care of your health you also take care of your family's" (DG22:10-11)."*

However, participants also described having nutritional knowledge but not utilizing it.

One participant stated *"Sometimes we eat what we want to eat but they're not good for us to eat, we don't follow rules sometimes (DG16:5)."* Another participant said *"There are times we just do what we want to do (DG7:5)."* Participants agreed when one stated *"We read it [referring to nutrition labels] but don't follow the nutrition facts. Even though it not good to eat, we buy and eat it anyway (DG7:5)."*

Participants' healthy choice behaviors appeared to be predicated on taste. For example, one participant said *"There are some foods I look at their nutrition facts and there are some foods that I don't look at it. I know that the tuna has a lot of fat, but I like the oil in the tuna (DG7:5)."* Another participant stated:

"Just like the spam, we know that spam have a lot of fat, but we fry it even though we know that it already has fat in it. We could have cooked it differently, so it doesn't have much fat in it" (DG7:5)."

Lack of knowledge

Some participants described having little to no nutritional knowledge. One participant said *"As for me I just, I never learned about nutrition (DG29:7)."* Another participant agreed and explained *"I don't really understand about nutrition (DG29:8)."* This lack of nutritional knowledge was described as a communal experience when participants used a collective voice. For example, one participant said *"Something that we never learned about is the nutrition in the food we eat (DG23:7)."* When another participant was asked about nutritional knowledge they said they knew *"Nothing, we eat whatever we have (DG26:8)."* Additionally, this lack of nutritional knowledge also appeared to be driven by individual choice. One participant stated *"I don't really look at the label. If I am craving for that food I would take it. And, I have the habit of eating the food I like (DG8:4)."* Another participant said *"Sometimes I look at it and read it but if I like it then I buy it. I get to use it anyway (DG8:4)."*

Participants also described a lack of cooking knowledge to prepare certain healthy foods. One participant said *"There are so many foods I see at the grocery store and I know that they are healthy, but I don't know how to cook them. Some of them are lentil beans, brown rice, squash, avocado, and eggplant (DG4:2)."* Another participant said *"I've always seen the cauliflower, mushroom, sprouts, asparagus, eggplant, and bitter melon as healthy food but I don't know how to cook them (DG2:3)."* The desire to cook healthy food was consistent across discussion groups. Another participant said *"The taro leaves, seaweed, fern shoots, mushrooms, bamboo shoots, lentil beans. These are some of the veggies that I see that are healthy however I don't know how to prepare them (DG3:3)."* Participants also discussed a desire for certain healthy foods but a lack of cooking knowledge because they were not culturally known to the Marshallese community. One participant stated:

“There are so many foods that are healthy such as pastas, some other vegetables like squash, asparagus, lentil beans, and many other vegetables that never grow in the islands. The only thing that prevents me from cooking is I don’t know any healthy recipes to cook them. (DG6:2)”

Another participant agreed and said:

“There are some root vegetables that I never see grow in the Marshall Islands like okra, fennel, beets, radish, cauliflower, brussel sprouts, kale, and mushrooms. These foods that I listed above are the foods I would like to cook but I don’t know how because these foods never grew in the Marshall Islands (DG5:3).”

Participants consistently discussed a desire to cook beans but a lack of knowledge on how to prepare them. One participant said *“The pinto beans. Well, we really want to eat them like the ones we eat at the Mexican places are the ones we want to eat. You know the dry, refried bean (DG22:22).”* Another participant agreed and stated:

“Beans, I have a lot of beans at the house but I don’t know how to cook beans yet so my family is not eating beans. We don’t know how to eat beans, but I know they’re good because we eat them at the restaurants when we eat out (DG29:17).”

Economic Determinants of Diet Quality

In addition to describing dietary preferences participants

also discussed the economic determinants of dietary constraints. Within this a priori theme there were two subthemes: 1) Perceived Economic Constraints to Healthy Foods; and 2) Economic Constraints to Eating outside the Home.

Perceived economic constraints to healthy foods

Eighty percent of participants reported low or very low food security at some point during the past 12 months (Table 4). Although majority of participants (77.5%) said they did not go hungry due to a lack of money for food, qualitative results conveyed that participants consistently discussed desiring healthy foods but encountering economic constraints in obtaining it. For example, one participant said they wanted to eat *“Vegetables and things like that, we need to eat them all the time. Plus the meat is also expensive. Steak and things like that are expensive (DG29:25).”* Participants stated they wanted *“vegetables like lettuce, broccoli, and fruits like avocado. I like to buy but there is not enough money to buy (DG8:9).”* Another participant agreed and said *“Me too, that’s the reason why I usually don’t buy [referring to healthy foods] because I don’t have the budget and the foods that are healthy are very expensive (DG22:33).”*

In addition, participants described economic constraints in purchasing healthier dietary options due to their large family size. For example, one participant stated they wanted *“The lean meats, the organic fruits, organic vegetables, and organic crops. I can’t buy these because I have a big family and these organic foods*

Table 4: Economic Determinants of Diet Quality, n=40.

U.S. Household Food Security Survey Module: Six-item Short Form (Blumberg et al.)	n (%)
The food that we bought just didn’t last and we didn’t have money to get more.	
Often true	13 (32.5)
Sometimes true	22 (55.0)
Never true	5 (12.5)
We couldn’t afford to eat balanced meals.	
Often true	7 (17.5)
Sometimes true	24 (60.0)
Never true	9 (22.5)
In the last 12 months did you or other adults in your household ever cut the size of your meals or skip meals because there wasn’t enough money for food?	
Yes	13 (32.5)
No	27 (67.5)
(If yes to above) How often did this happen?	
Almost every month	0 (0.0)
Some months, but not every month	7 (53.8)
Only 1 or 2 months	6 (46.2)
In the last 12 months did you ever eat less than you felt you should because there wasn’t enough money for food?	
Yes	12 (30.0)
No	28 (70.0)
In the last 12 months were you ever hungry but didn’t eat because there wasn’t enough money for food?	
Yes	9 (22.5)
No	31 (77.5)
Food Security Status (Summative Scale Score)	
Food secure (0-1)	8 (20.0)
Low food security (2-4)	23 (57.5)
Very low food security (5-6)	9 (22.5)
Are there times when you want to have healthy food, but cannot afford it?	
Yes	30 (75.0)
No	10 (25.0)

Note: only valid responses shown. †n=13.

are expensive (DG4:3).” Seafood was consistently described as a desired food but one that participants were not able to afford. Participants said they wanted “*Seafood like lobster, salmon fish, tuna fish, soft crab shell, and shrimp but it’s very expensive to buy them (DG5:4).*” One participant said “*When I see the big tuna fish I really want to buy the whole thing, but I can’t because I don’t have enough money. So, I ended up buying the small pieces of the fish (DG8:9).*” Economic constraints also limited participants from buying culturally specific foods. One participant said “*There is no money to buy Marshallese foods (DG9:4).*”

Economic constraints to eating out

Participants discussed economic constraints to eating outside the home. While 82.5% and 77.5% of the participants stated that they ate at fast food and sit-down restaurants respectively, in the qualitative discussion groups, participants described rarely eating out due to a lack of monetary means. “*We never eat outside at the restaurant, at the fast-foods take out, and any other place that you spend money at (DG5:2).*” Participant said “*I don’t eat out since I don’t have any job, and unless there are people to take me out, I don’t really eat out because I don’t have a job (DG7:5).*” Participants agreed and stated “*we’re too broke to eat at restaurants (DG16:1).*” Participants consistently discussed only eating out when there was enough money and directly after getting paid, stating “*when there’s enough money then we eat out,*” and (DG26:7) “*Yes, once a month after we get paid we eat out at the restaurants (DG27:7).*”

However, participants discussed relying on “*the free meal services (DG18:5),*” in the community and at their churches to overcome economic challenges, stating: “*My family usually eat at places that they give out free meal (DG4:2).*”

Discussion

This pilot study sought to understand the beliefs, experiences and influences related to diet quality in a Marshallese community in Arkansas. The study has several key findings that fills a gap in the current literature and will be used to inform interventions, practices and policies that can reduce obesity, hypertension, and diabetes.

Similar to other studies of Pacific Islander communities in Hawaii and the US affiliated Pacific Islands, Marshallese participants discussed numerous socio-cultural, preferential, economic and nutritional knowledge determinants to diet quality [2-4]. Like other Pacific Islander communities, Marshallese culture is highly collectivist and meal time is an important part of family, community, faith, friendship and an opportunity to talk story [25]. Pacific Islander communities use talk story as a means of sharing information and experiences and this cultural norm is usually tethered to communal meals [26]. Communal meals are important in the Marshallese community and provide both a challenge and an opportunity to changes in diet quality. For example, communal meals were described as taking place at churches and birthday parties wherein there was opportunity to incorporate healthier food options, Marshallese dishes, and purchase healthy fundraiser meals for their families. However, participants also discussed large families and conflicting time schedules as a deterrent to communal eating.

Both the qualitative and quantitative data mirror previous literature with Pacific Islanders and suggest that Marshallese participants have a high preference for sugar-sweetened beverages and soda [27,28]. Further, almost all of the participants responded that they preferred bottled water over water from the faucet whether this was due to the smell, taste, or the potential of getting sick. This research reinforces prior literature that documents bottled water is the most common drinking water source in the RMI among Marshallese [29]. These belief systems may be culturally rooted and carried over after the Marshallese migrates to the US. Future research should compare and contrast drinking water beliefs in the RMI and the US.

Although the quantitative survey did not capture rice preferences the qualitative data demonstrated participants had a very high preference for rice as a staple food in the discussion groups. Previous data suggests that Pacific Islanders communities, including Marshallese residing in the RMI, have a high preference for rice [2,4]. However, participants spoke beyond a high preference for both soda and/or rice and described these items as the sole means to reach a sense of satiety. Further, rice was described as more than a means to satiation but appeared to be a deeply rooted cultural belief that rice is a mode of survival. This belief system could potentially derive from the sense of survival rice may have provided as an imported food after the nuclear fallout.

Another determinant to diet quality identified by participants was their nutritional knowledge. Participants described how they obtained nutritional knowledge, utilization of this knowledge, and gaps in knowledge. Participants discussed accessing most of their nutritional knowledge from either physicians or food and nutrition programs like SNAP or WIC. However, majority of the participants stated they did not have access to these programs. Participants also described obtaining information from nutritional labels but did not always adhere to nutritional guidelines of what they understood as healthy diet quality. Gaps in knowledge emerged in both what comprises a healthy diet and/or how to prepare healthy foods.

Conclusion

Although socio-cultural, preferential and nutritional knowledge determinants of diet quality are the key focus of numerous public health programs to reduce obesity, hypertension, and diabetes this logic negates the persistence of food insecurity and perceived and tangible economic constraints to healthy food access that racial and/or ethnic minority populations experience. Majority of the Marshallese participants in this study reported low or very low food security which affected their access to healthy foods despite a desire for organic fruits and vegetables and lean meats. Additionally, the survey results conveyed that almost all of the participants stated that they eat in restaurants. However, the qualitative responses revealed that although participants do eat in restaurants this was described as rare and typically only after a paycheck was received.

Limitations

The results of this study may or may not be generalizable to other Pacific Islander communities residing outside Arkansas.

The participants in this study were reasonably homogenous in gender with the study sample consisting primarily of women, the perspectives of participants is highly gendered. Future studies should evaluate determinants of diet quality from a more heterogeneous study sample. The survey instrument implemented did not include measures of frequency limiting the ability to measure the extent of the behavior of the participants with regard to determinants to diet quality. Despite these limitations, this study is the first study to explore beliefs, experiences and influences related to diet quality in a Marshallese community residing in the US.

Policy Implications

In addition to expanding scientific knowledge, the insights from this study are important to informing health care policy, practice and interventions. The multiple determinants of diet quality described by participants suggest the value of socio-ecological perspectives for policy implications. Given the focus on family meals, broad family nutrition education as well as more targeted family education for diabetes and hypertension is recommended [25]. Many meals take place at church making church an important venue for nutrition education as well as policy systems and environmental changes within the churches to ensure healthy meals are provided at church. The CDC has emphasized environmental approaches including community gardens and farmers' markets to mitigate these disparities by increasing access to healthy food. Several studies indicate that increasing the number of community gardens is associated with an increase in availability and consumption of fruits and vegetables.

Additionally, participation in community gardens has shown to lower body mass index. Further, churches and food pantries could consider creating healthy recipes or cook books that include inexpensive, healthy foods that incorporate preferred foods. Lastly, given the high rates of food insecurity, additional connections with food pantries, the positive influence of WIC, and lack of access to SNAP needs to be addressed at a federal level.

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