

Formative Research to Inform Intervention Development for Diabetes Prevention in the Republic of the Marshall Islands

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Formative research was conducted in the Republic of the Marshall Islands to help develop a diabetes prevention intervention. Methods included in-depth interviews, semistructured interviews, and direct observation of household behaviors in urban and remote settings. Foods were classified into two main conceptual spheres: foods from the islands/Marshallese foods and imported/American foods. Diabetes (*nanimij in tonal*) is a highly salient illness and is believed to be caused by foods high in fat and sugar, consumption of imported/American foods, family background, and the atomic bomb testing. Physical activity and eating a traditional diet were viewed as important for preventing diabetes. The traditional belief system links a large body with health, and a thin body with illness; however, perceptions are changing with increased acculturation and education about the health risks of obesity. These findings were used to develop a diabetes prevention home visit intervention currently being implemented and evaluated in Marshallese households.

This article presents formative research on the prevention of non-insulin-dependent diabetes mellitus (NIDDM) in the Republic of the Marshall Islands. NIDDM is a major cause of debilitating morbidity and mortality in industrialized countries and increasingly in nonindustrialized countries. As the onset of diabetes in the nonindustrialized world is linked with lifestyle changes associated with the globalization of the world economy and acculturative Western influence, effective primary prevention strategies are desperately needed.^{1,2} Unfortunately, interventions aimed at the primary prevention of obesity and

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diabetes tend to have a low rate of success.³ Attempts to intervene often do not succeed due to a lack of understanding about the cultural context in which they take place.⁴

DIABETES IN INDIGENOUS PEOPLES

Diabetes has reached alarming proportions among indigenous peoples, especially Native American, Native Canadian, and Pacific Island populations during the past 40 to 50 years.⁵⁻¹⁷ The diabetes "epidemic" in indigenous peoples has been linked to lifestyle changes associated with Western contact acting on a susceptible genotype. The phenotypic expression of NIDDM is in part determined by more proximate factors, such as obesity, increased dietary fat intake, reduced fiber intake, and reduced physical activity.¹⁸ Other more distal factors such as socioeconomic status, degree of urbanization, and access to health care have been shown to affect the health status and prevalence of NIDDM in various populations.¹⁹

Obesity is perhaps the strongest single risk factor for diabetes. Numerous studies have shown that indigenous peoples such as the Pima Indians, Ojibwa-Cree, Nauruans, Samoans, Native Hawaiians, Chomorros, and the Marshallese have high rates of obesity.^{10,11,13,20-22} Like diabetes, increasing rates of obesity in these populations are due to acculturative changes in diet and activity^{10,23-25} and to the stresses of modernization.²⁶⁻²⁹ Studies of factors predisposing individuals and populations to diabetes have focused on more proximate and quantifiable measures but have generally neglected to consider cultural factors such as food classification systems, cultural concepts of health and illness, valuation of fatness, ideal body shape, and the symbolic meaning of fatness.

PERCEPTIONS AND THE MEANING OF FOOD IN PACIFIC ISLAND SOCIETIES

Considerable literature exists on food practices, food classification, and the meaning of food in Pacific Island societies.³⁰⁻³⁴ In most traditional systems, foods are divided into starchy main foods versus accompaniments, and other foods may be consumed as snacks. In the Marshall Islands, Carruci³⁵ describes the importance of food quality and status during feasts and identifies several food characteristics to be most admired: size, purity, sweetness, and greasiest or richest foods (pertaining especially to complementary foods). Marshallese food classification systems have the potential for differentially influencing the intakes of individuals. However, to our knowledge, no studies have sought to identify and link these beliefs directly to chronic disease prevention.

PERCEPTIONS OF IDEAL BODY SIZE

The value placed on body fatness or thinness is culturally and socially constructed. While in some societies a large body size may be stigmatized, in others a large body size may be viewed as esthetically pleasing, desirable, and/or a symbol of economic success and positive birth outcomes.^{36,37} In the Pacific Island Nations, a great deal of evidence supports the traditional valuation of a larger body size, which potentially creates a barrier for interventions seeking to prevent diabetes by addressing its primary risk factor, obesity.

An investigation of preferred body size in Cook Islanders found large body size to be perceived as healthy and attractive but found this is changing with increasing Westernization. Research in Fiji³⁷ and among Samoan women³⁸ both concluded that in the Pacific context, women perceive themselves to have a large body shape, and this does not seem to be associated with negative feelings. Samoan women perceive themselves "fitter, stronger and more attractive" than matched Australian controls who do have negative perceptions of their bodies.³⁸ However, despite tracking trends in perception, little work has been done to incorporate this information into disease prevention programs.

INDIGENOUS CONCEPTS OF DIABETES

Diabetes is a relatively new illness in the Pacific Island Nations; hence it is appropriate and necessary to understand the sociocultural context and local belief system surrounding sickness and healing in general, as well as people's understandings of diabetes specifically. Key gaps in the current body of knowledge are people's perceptions of the salience of diabetes, its perceived causes, symptoms, progression, and treatment-seeking behaviors associated with these perceptions. Interventions will only begin to achieve success after these gaps are better understood and formative research is integrated into the intervention development process. In other settings, understanding the ethnomedical model of diabetes has been critical in developing culturally appropriate interventions.³⁹⁻⁴²

THE REPUBLIC OF THE MARSHALL ISLANDS

The work described in this article took place in the Republic of the Marshall Islands (RMI), a group of 2,000 islands and islets grouped into 29 atolls and 5 islands approximately 2,000 miles southwest of Hawaii. Estimates projected the population to reach 70,000 by the year 2000, and more than 60% of those people will be concentrated in one of two small urban centers (Majuro and Ebeye).⁴³ World Bank development indicators place the Marshall Islands in the third quintile of countries with an income of \$1,840 per capita. However, this income is based primarily on U.S. economic inputs. Another source of income for those whose family members were exposed to radiation during atomic bomb testing in the 1950s comes from a federal agency that disburses monetary compensation.

The vast majority of the food consumed in the urban areas and much of the food consumed in the remote outlying atolls is imported via container ships. The main exports of the country are copra and tuna. Trees with root systems above soil or near to the surface grow well: coconut, bananas, pandanus, papaya, and breadfruit. Access to imported foods is considerably greater in the two urban centers when compared with the remote outer islands. In addition, U.S. Department of Agriculture food relief programs have led to dependency in some Marshallese subpopulations, particularly those displaced from their home atolls due to the U.S. nuclear weapons testing program and because of natural disaster relief.

The RMI exemplifies a transitional (Pattern 3 or Pattern 4) country using Popkin's nutrition transition model.^{44,45} This model refers to shifts in the composition of the diet from local, more traditional foods to foods high in total fat, saturated fat, sugar, refined foods, and foods low in fiber. Associated with these dietary changes, degenerative chronic diseases, such as diabetes, coronary heart disease, and cancer, have replaced

infectious disease as the leading causes of morbidity and mortality and stress the country's limited resources.

Existing data on health status in the Marshall Islands support this assessment. In her study of nutritional status in one Marshallese atoll, it was found that 42% of men were overweight (body mass index or BMI 25-30) and 21% of men were obese (BMI > 30); for women, 29% were overweight and 27% obese.⁴⁶ The 1991 National Nutrition Survey looked at 1,144 women aged 15 to 49 years and found 30% overweight and 31% obese.⁴⁷ In 1986, 25.1% of deaths were related to some condition for which obesity is a predisposing factor, including heart disease and diabetes, breast and gastrointestinal cancers.⁴⁸

Primary prevention aimed at diabetes is desperately needed in the Republic of the Marshall Islands. The existing health infrastructure is poorly equipped and financed to deal with the high costs of chronic disease, such as diabetes. Patients in need of dialysis must permanently separate from their families and fly to Hawaii to receive care, as no dialysis unit is available in the country. Unfortunately, the vast majority of Marshallese do not possess the financial resources for this level of treatment, and the onset of kidney problems usually leads to death. The primary emphasis is on treatment of diabetes with insulin, oral medication, foot care, and amputation in later stages.

RESEARCH QUESTIONS

The primary goal of the formative research was to collect information that could be used to develop an intervention to prevent diabetes in the Republic of the Marshall Islands. We focused on answering the following questions:

1. What are local patterns of food consumption? How do perceptions of food consumption and cultural norms influence dietary patterns?
2. What are Marshallese perceptions of preferred body size? What value is placed on fatness?
3. What are the local concepts about diabetes, its causes, and how it should be treated?
4. How can this information be used to develop culturally appropriate and effective interventions to prevent diabetes in this setting?

METHOD

Previous studies have described the importance of exploratory methods for primary prevention research and the importance of combining qualitative and quantitative approaches.⁴⁹⁻⁵¹ This study employed qualitative methods to understand the sociocultural, economic, and environmental context of people's experiences of diabetes and obesity, and to assess the specific beliefs and perceptions that influence their behaviors. Particular topics and methods were selected through an "iterative process," meaning decisions about next steps were based on information most recently gathered and analyzed. Topics explored using qualitative methods included food classification systems, typical meals, typical way of eating, infant and child feeding, taste of foods, access to foods (importing and growing), typical activities, common illnesses, cultural valuation of fatness, traditional healing, kinship and family, and knowledge and attitudes surrounding diabetes.

We used quantitative methods to obtain baseline anthropometric measurements and to assess patterns of food intake; methods of food preparation; perceived and preferred body sizes; and knowledge, attitudes, and beliefs surrounding food and activity. Selected results from both the qualitative and quantitative work are presented in this article. A detailed analysis of quantitative risk factors has been presented elsewhere.⁵²

All research was collected in collaboration with the local communities and the Ministry of Health and Environment (MOHE) Health Education Unit staff. Data were collected by Marshallese-speaking research assistants. Training was done on-site by a nutritional anthropologist and a master's level international health student. Interviews were conducted in either Marshallese or English based on the preference of the respondent. Many people, especially in the urban area, are fluent English speakers. When interviews were collected in Marshallese, they were translated into English. The research project was approved by the Johns Hopkins University School of Public Health Committee on Human Research. Informed consent was obtained from participants.

Phase 1: Household Survey

A quantitative survey was initially conducted in 150 households from August 1996 through November 1997, varying in degree of remoteness. Study sites included the urban area of Majuro atoll ($n = 75$ households), a periurban area of Majuro, known as Laura ($n = 25$), semiremote Arno atoll ($n = 25$), and remote Ebon atoll ($n = 25$). Within each household, data were collected at the individual (demographic, anthropometry) and household (monthly food frequency, economic status) levels.

Anthropometric measurements were conducted on all household members 1 year or older. Height (cm) was measured using a Shorr Board. Weight (kg) was measured on an electronic scale accurate to the nearest 0.2 kg. The household food frequency, administered on the main food preparer of each house (usually the female head of household), included more than 100 different indigenous and store-bought foods. Respondents were requested to state how often in the last month each food had been consumed (never, 1 to 3 times in the last month, 1 to 2 times per week, 3 to 6 times per week, and daily or more). Respondents were then requested to describe the most common forms of preparation for each food consumed in the past month (e.g., boiled, fried in oil, consumed raw, etc.).

Phase 2: Qualitative Data Collection on Beliefs and Perceptions

From July 1997 to November 1998, qualitative data were gathered using a variety of methods focusing on beliefs and perceptions relating to food, activity, illness, and the valuation of body size.

In-depth interviewing. More than 30 in-depth interviews were conducted with local leaders, mothers, health care professionals, elders, and store owners. The interviews focused on food, concepts of illness and diabetes, changes in lifestyle during the past 40 to 50 years, patterns of physical activity, child rearing and feeding, ideal body size, kinship, household decision making, and traditional healing.

Free lists of foods and illnesses. Free listing is a semistructured interviewing method aimed at eliciting the salient items in a domain (a culturally defined category of meaning) from the perspective of a particular group.⁵³ Twenty-five respondents in urban and 25 in remote locales were asked to list all the different foods they could think of. The process

was then repeated for all the different illnesses affecting people in the Marshall Islands ($n = 29$ urban, $n = 8$ remote).

Pile sorts of foods. Thirty-three urban respondents were asked to freely sort the most salient food items (drawn on cards) into whatever number of piles they desired, using whatever system they desired. The respondents were then asked to explain why they had sorted the foods into particular piles.

Ranking of foods in terms of fattiness. Ten urban and 10 remote respondents ranked the most salient foods from their free lists in terms of most to least fatty, using the quick-sort method.⁵³ In the method, items are divided into "greater" and "lesser" piles when compared with a randomly selected "standard" item, and then each subpile is further divided against a new "standard," until all items have been sorted along a single dimension.

Cultural valuation of body size. To better understand local perceptions of body size, health, and beauty, we developed a scale of nine male and nine female figures, ranging from *extremely thin* to *extremely obese*, modified by a local artist from Stunkard et al.⁵⁴ for use in the Marshallese context. Twenty-five urban and 25 remote adult respondents of both genders were asked six questions about the range of figures: (1) Which figure is most like you? (2) Which figure would you most like to be in the future? (3) Which male figure appears most healthy? (4) Which female figure appears most healthy? (5) Which male figure appears most attractive/beautiful (just right)? (6) Which female figure appears most attractive/beautiful (just right)?

Phase 3: Qualitative Data Collection on Behavior

From October 1997 to November 1998, additional qualitative data collection focused on exploring behavior, both observed and reported.

Unstructured observations of eating behavior. Twenty households in urban and remote locales permitted us to informally observe during mealtimes. We used this opportunity to identify key behaviors that placed individuals at risk of increased energy intake, such as sources of fat added during meal preparation, order of serving and eating, portion size, amount consumed, amount remaining on the plate, sharing of foods, sharing of plates, and feeding of children.

Knowledge, Attitudes, and Beliefs (KAB) Survey. This instrument required respondents to agree or disagree with a series of statements about beliefs and behavior regarding food, diabetes, activity, and the cultural valuation of fatness. Respondents were from urban and remote settings. Development of this instrument was based on prior formative research. The instrument was performed on the male and female head of household in 81 households ($n = 161$), a subsample of the original 150 households from urban and remote locales.

Data Analysis

Textual data were accessed during data analysis to examine patterns, domain analysis, and ethnomedical modeling of key concepts. Systematic data (free lists, pile sorts, and rankings) were analyzed using the Anthropac software program (version 3.2).⁵⁵ Pile sort

data were analyzed using a multidimensional scaling (MDS) procedure, which produces a two-dimensional map with items placed in approximate proximity to other items based on how people grouped them into piles. Hierarchical clustering analysis provided a refined picture of which items were more likely to be grouped together by respondents. A score for fattiness of foods was developed by taking a mean rank of each food item across all respondents by locale.

RESULTS

Using Centers for Disease Control and Prevention (CDC) BMI cutoffs of the 95th percentile, approximately 10% of children are at risk for obesity in the study sample. Between the ages of 18 and 50, 19.8% of men and 32.8% of women are obese. After the age of 50, the rates of obesity are 31.4% and 33.3%, respectively. More important, a substantial proportion of children in the study households were undernourished. About one-third of men and female children 1 to 10 years are stunted (< -2 standard deviation height for age of the National Health and Nutrition Examination Survey II [NHANES II] reference standards), and a substantial proportion have low weight for age (< -2 standard deviation weight for age of NHANES II reference standards) (boys: 21.4% 0 to 4.9 years, 13.4% 5 to 10 years; girls: 33.3% 0 to 4.9 yrs, 12.0% 5 to 10 years).⁵²

Local Classification of Foods

Our respondents primarily differentiated between *mona in ailin kein/mona in Majol* (foods from our islands/Marshallese foods) and *mona in bele* (imported foods/American foods). Woven throughout their discourse was the perception that traditional Marshallese foods are more healthy than imported foods, tied to a recognition of dietary change. "In the olden days people never ate canned goods. They only ate what came from the sea. We were very healthy then" (woman, age 40, urban).

From the free lists, we found that the most salient items in the *mona in ailin kein* were breadfruit (100%), pandanus (91%), banana (91%), papaya (83%), taro (74%), fish (74%), pumpkin (65%), drinking coconut (*ni*) (57%), coconut crab (52%), fermented breadfruit (48%), coconut embryo (43%), pig (35%), clams (30%), local chicken (26%), arrowroot (26%), sea turtle (26%), sweet potato (17%), lime (17%), and two types of shellfish (small clams and snails) (17%). The most salient items from the *mona in bele* category were rice (75%), flour (55%), oranges (50%), chicken (50%), corned beef (50%), apples (50%), ramen (40%), Spam (30%), egg (25%), steak (25%), cabbage (25%), tuna (25%), beef (25%), cola (25%), carrot (20%), and bread (20%).

The pile-sorting exercise came up with a somewhat different classification system. Urban respondents sorted food into piles by three major groups. The following terms were used to describe these main groupings (clockwise from the top): (1) "meats" or "bodybuilding," (2) "energy foods," and (3) "fruits and vegetables" or "protective foods." These three main groupings represent the current health education model used to teach nutrition in the Marshall Islands, which also uses three groups: bodybuilding, energy giving, and protective. Most respondents also gave secondary classification systems. Within the first grouping of "bodybuilding foods," respondents differentiated between healthy, local foods (to the left) and unhealthy, imported foods (to the right). Within the "energy

foods" grouping, lard and oil were frequently set aside as being "not foods," and soda, chocolate, sugar, ice cream were described as "sweets." In the "vegetables and fruits" grouping, imported foods were again differentiated from local foods.

Local Perceptions of *Kirij* (Fat)

The Marshallese word *kirij* (derived from the English word *grease*) refers to fat in a variety of ways, for example, shortening or lard, body fat, animal fat, drippings of fat, and the fatty, greasy quality certain foods possess. These multiple meanings of *kirij* appear to influence the perception of fat in foods. The quality of *kirij* is associated with a greasy taste of foods identified as complements (*jelele*), typically meats.³⁵ Foods categorized as staples are not generally perceived to possess this quality of fattiness. Thus, a staple such as rice prepared with coconut milk is high in total fat but is not described using the word *kirij*. Foods that are perceived to be extremely fatty are considered complement foods of high status and are common parts of food exchanges.³⁵ Oily foods were highly preferred by many of our informants.

It's the oily taste and the salty taste that is so good . . . when it comes to corned beef I prefer it warmed or fried—a little warm. I can eat it without cooking, but for Spam . . . I just love the way it tastes. (working woman, age 56, urban)

Respondents in urban and remote locales were asked to rank most commonly mentioned foods by the amount of *kirij* they were perceived to contain (Table 1). In the urban setting, shortening, oil, and various forms of meat were perceived to contain the most *kirij*. Interestingly, both canned tuna in water and canned tuna in oil were among the foods considered the most fatty (average rank ≤ 10). Local plant foods were considered the least fatty (average rank > 20), including fermented breadfruit, pumpkin, coconut water, and banana. Interestingly, the very least fatty food was coffee, an imported food. Ice cream and chocolate tended to not be considered fatty foods. In the remote setting, fatty foods are meat, while vegetables tend to be considered the least fatty.

Overall Food Consumption Patterns

Patterns of food consumption reflect locale. Urban households in the Marshalls are much less likely to eat island foods and much more likely to consume store bought foods (Table 2). Of locally produced foods, the most commonly consumed foods across all sites are reef fish, banana, and breadfruit. Local foods such as papaya, banana, breadfruit, and coconut are 2 to 4 times more likely to be consumed in remote areas. A reverse trend is seen in the consumption of store-bought food items. Canned meats, ramen, milk, and pop were 2 to 5 times more likely to be consumed in urban areas than in remote areas.

We examined preparation methods of the most commonly consumed foods. Primary methods of cooking are boiling or frying in oil. When asked to name their primary method of cooking reef fish, 41% of respondents reported boiling, while 26% said roasting and 23% said frying in oil. Frying in oil is the most commonly reported secondary method of cooking reef fish. Deep-sea fish are most commonly eaten raw (50%), followed by frying in oil (14%). Frying in oil is also the most common reported secondary method of cooking deep-sea fish.

Table 1. Ranking of Salient Foods in Order of Fattiness, $n = 10$ Urban and 10 Remote Respondents

Food	Urban		Remote	
	Average Rank	Rank Order	Average Rank	Rank Order
Shortening (<i>kirij-ben</i>)	2	1	2.8	2
Spam	5.1	2	—	—
Oil	5.7	3	2.6	1
Chicken quarter-leg	6.6	4	—	—
Corned beef	7.2	5	3.4	3
Cow	7.5	6	—	—
Tuna in oil	7.6	7	—	—
Turkey drumstick (<i>nen-take</i>)	9.9	8	—	—
Local chicken (<i>baa</i>)	9.9	8	6.9	4
Tuna in water	10.2	9	—	—
Sardine	11.2	10	—	—
Ramen noodles	13.7	11	—	—
Rice	14.3	12	11.5	9
Pancake	14.4	13	—	—
Coconut meat (<i>waini</i>)	16.6	14	9.9	7
Giant clam (<i>mejenwod</i>)	17.5	15	9.3	5
Coconut crab (<i>baru</i>)	18.6	16	—	—
Fresh tuna (<i>iik en berber</i>)	19.4	17	—	—
Ice cream	19.7	18	—	—
Chocolate (<i>jokle</i>)	20.1	19	—	—
Germinated coconut (<i>iu</i>)	20.2	20	11.1	8
Bread	21	21	9.8	6
Egg	22.5	22	—	—
Breadfruit (<i>ma</i>)	23	23	14.5	14
Shellfish (<i>konet</i>)	23.5	24	—	—
Fermented breadfruit (<i>bwiro</i>)	24.1	25	—	—
Coconut water (<i>ni</i>)	24.3	26	14.3	13
Pumpkin (<i>panke</i>)	25.6	27	14.7	15
Banana	25.7	28	14.3	13
Coffee	26.6	29	—	—
Pork (<i>piik</i>)	—	—	2.8	2
Flour	—	—	12.5	10
Pandanus (<i>bob</i>)	—	—	13.1	11
Papaya (<i>keinabbu</i>)	—	—	14.2	12
Sweet potato	—	—	15	16

In general, we found a recognition that not only had the diet changed in the past one to two generations but so had the most common methods of preparing foods—particularly in urban areas.

[People] also like to eat the canned meats, [as opposed to fresh fish, pig, or chicken] lifestyle, you know, nowadays people want to use the rice cooker instead of local ways of cooking. Kind of getting lazy. (woman, age 36, urban)

Our informants mentioned the convenience of processed packaged and prepared foods in comparison to the alternative of hard work gathering food. Canned, preserved foods do

Table 2. Percentage of Times Selected Food Eaten Three Times or More per Week in a Household, Across Locales

Food	Site			
	Urban (n = 75)	Periurban (n = 25)	Semiremote (n = 25)	Remote (n = 25)
Reef fish	57	56	48	76
Clams	5	4	28	0
Coconut crab	0	0	16	16
Pumpkin	16	12	40	4
Papaya	7	24	36	52
Banana	23	24	32	52
Breadfruit	40	64	72	84
Coconut	21	84	64	80
Canned fish	59	52	28	28
Beef	0	0	0	0
Spam/corned beef	41	28	4	0
White bread	87	60	32	4
White rice	95	100	84	80
Ramen/macaroni	61	40	20	32
Biscuit	4	8	4	20
Milk	71	56	16	24
Pop	20	12	8	4
Tea/coffee	67	68	40	64

not need refrigeration and will not spoil on long trips to the remote atolls. Many canned foods are eaten directly from the can without heating.

Typical Meals

In a typical day, a Marshallese family has three meals; a morning meal, a midday meal, and an evening meal. Poorer families may skip a meal. The largest meal is usually the midday or evening meal. Snacking between meals is common. Meals are composed of a staple and a complement (jelele). When an informant was asked about a typical meal, she observed,

A typical meal? Rice, rice with coconut, or rice alone with just salt and pepper. People need to eat rice everyday. . . . We don't have a complete meal all the time. But sometimes it should be breadfruit, fish, sprouted coconut either baked or boiled, and rice. And then bananas with it, too. (woman, age 42, urban)

As illustrated above, the choice of complement can vary. As long as the staple food (rice, breadfruit, pancake) is accompanied by something, it is considered a complete (although perhaps not ideal) meal (Table 3). This variation in complement appears linked to the economic status of the household, with wealthier households eating some form of meat or fish as the jelele and poorer households adding salt, soy sauce, or some other condiment.

Morning meals typically consist of a bun made from white flour with butter, pancakes with butter (common in the outer islands), or donuts with tea or coffee (usually consumed

Table 3. What Constitutes a Meal? Common Food Staples and Their Complements

Staple	Complement	Locale	Socioeconomic Status
Breadfruit, <i>Bwiro</i> ^a	Fish, pork (<i>piik</i>)	Remote	Higher
Breadfruit	Coconut milk	Remote	Lower
Rice	Fish	Remote, urban	Higher
Rice	Soy sauce	Remote, urban	Lower
Rice	Corned beef	Urban	Higher
Pancake	Hot dog	Urban	Higher
Pancake	Coffee	Remote, urban	Lower

a. *Bwiro* is a fermented breadfruit paste.

with evaporated milk and sugar). A child's morning meal is similar, but the child would consume less food. The size of an adult's midday meal typically depends on the schedule of the individual, whether it is a workday or weekend, and if it is an urban or remote locale. A large portion of rice is almost always consumed with some type of complement like a chicken quarter-leg, turkey drumstick, reef fish, or canned meat. Rice and meats are usually eaten with soy sauce. Common side dishes in the midday meal are potato salad (urban areas) or breadfruit with coconut milk (*kalel*) or fermented breadfruit (*bwiro*) (if in season in remote locales). Dinner is similar to the midday meal but is typically chicken in the urban areas and canned meats (tuna in oil or corned beef) or locally caught fish in the remote locales.

Eating Habits

Many informants emphasized how eating habits and meal patterns have drastically changed in recent years,

In the olden days, if there were three women and five men, they will prepare food on the same fire and use the same pot. . . . Our custom in food preparation has changed. Food was very scarce in the olden days, thus there were conservative ways in food preparation. To avoid food problems, only one fire and one pot were used. After the food was cooked in that one fire hole, the *Alab* (leader) for that *bwij* (mother's familial group) would divide the food. (elderly man, remote)

Food was equally distributed among all of the members of the group, and everyone ate together. This tradition does not appear to exist today in the urban area. The traditional communal eating pattern has changed drastically with migration, acculturation, and time constraints on working parents. In both urban and remote settings, we observed most families' members to eat separately or in small subgroups as they got hungry, rather than all together as formal meals.

Eating behaviors of children. After about 18 months, we observed that children tend to be very mobile and wander from house to house, thus it is difficult for parents and primary caregivers to monitor their consumption. There is little if any active encouragement from parents or caregivers of children to eat. The majority of young children ate at shared plates with other adults and children.

These observations are supported by the KAB survey results. Almost half (44.7%) the respondents felt that children know how much they want to eat and need no encourage-

Table 4. Mean Body Silhouette Selected by Gender and Locale^a

Question	Urban (n = 25)		Remote (n = 25)	
	Male	Female	Male	Female
Where do you see yourself?	5.7	5.2	4.1	4.1
What size do you want to be in the future?	5.7	5.0	4.4	4.4
Which figure is the size of a healthy male?	5.2	5.4	4.7	6.0
Which figure is the size of a healthy female?	5.2	6.3	4.9	6.7
Which figure is the most beautiful/pleasing male?	4.9	4.3	4.1	4.1
Which figure is the most beautiful/pleasing female?	4.9	4.5	4.2	2.9

a. On a scale ranging from 1 to 9, where 1 = *very thin* and 9 = *very heavy*.

ment to eat. Of the respondents, 50.9% agreed that children should eat as much as they want of whatever foods they want, and 29.8% agreed with the statement that children should only eat the types of food they want to eat and not worry about other foods.

Eating behaviors of adults. Female adults are the main food preparers for the household and have ready access to food throughout the day. We observed a great deal of snacking by women in Marshallese households. Women tend to eat the leftovers from all plates, including that of their and other's children. Adult men tend to be highly mobile and frequently eat outside their homes.

From the KAB Survey, we found strong evidence of cultural norms supporting a heavy consumption of food among women in particular: 83.3% of people agreed that a nursing woman should eat about twice as much food as a woman who is not nursing, 75.2% of people agreed that a woman should eat her child's leftovers, while 62.1% of people believe it is healthy for a woman to eat her child's leftovers.

Local Concepts Shaping the Cultural Valuation of Body Shape/Size

Body size is associated with health and beauty in the Marshall Islands. In discussion on the topic of desired body sizes for men and women, a common greeting was noted: "*ko kiellip lok jen mokota*." ("Oh you look good; you look fatter than you did before"). This expression is commonly used when you may meet a relative or friend you haven't seen for a long time. Thinness was generally perceived as a sign of ill health. One young male informant noted, "Some people may think, 'Oh are you sick or something?' Could be many kinds of sick, maybe like diarrhea, TB, we can add all those things." In addition to associating a large body size with health, people linked body size with being wealthy and rich. An informant explained,

Because when you see fat people, you think that those people are rich and can afford everything. It means they can buy those expensive foods like steak and chicken all those meats in the store. In their houses, they have an air conditioner and a TV so they don't ever work outside their house. They spend all their time watching TV and listening to the radio. (male, age 27, urban)

Results from the assessment of the cultural valuation of body size are summarized in Table 4. Urban respondents, on average, saw themselves as one body size larger than their remote counterparts. More important, on average across locale and gender, most respondents were satisfied with their body and did not desire a change in their body size. Remote

respondents perceived a healthy male or female figure to be about one to two body sizes larger than their own perceived body size, respectively. Urban women showed a similar pattern, but this was not observed for urban men. Both urban and remote respondents felt that a more beautiful body size was about one size smaller than their current body size. Both men and women indicated that what they considered to be healthy body sizes were one to four sizes larger than what they considered to be beautiful body sizes. Thus, most Marshallese appear to feel that compared to their own body size, healthy (*ejmour*) bodies are larger bodies but that thinner bodies are more attractive (*jet jet tata*).

Respondents were also asked to describe the two extreme figures 1 and 9 to elicit attitudes associated with being extremely thin or extremely obese. Although 22.6% perceived the most obese figure to be unhealthy, 19.4% still describe this figure as healthy, while only 9.7% feel the extremely thin figure is healthy, and 58.1% described it as "unhealthy."

Local Concepts of Diabetes in the Study Community

Free listing of illnesses shows diabetes (*tonal*) is a significant concern of the Marshallese people. From the free listing of salient illnesses (Table 5), both urban and remote respondents listed diabetes more frequently than any other illness, followed by diarrhea, arthritis, tuberculosis, headache, cancer, and high blood pressure. Interestingly, a substantial number of respondents mentioned kidney disease, indicating some basic level of awareness of this complication of advanced diabetes.

In-depth interviews with informants revealed a complex conceptual model of diabetes. Many respondents attributed the recent increases in numbers of people affected by diabetes to radiation from the United States' nuclear testing program. This perception is widespread, particularly among people with diabetes:

Diabetics blame you Americans. They say that the cause of diabetes is from you poisoning them. This cause of diabetes is now a problem because of the bomb, they say it is a big part of it. We tell them that we inherit it from the old people, but they say those old people didn't become diabetic. They say it is poisoning from the bomb. More than once I have heard this. (middle-aged man, urban)

Other informants noted lifestyle changes as the cause of diabetes,

Nowadays, even young people get diabetic. People in the old days do a lot of moving. When they want to go somewhere now, they just take a taxi or ride a motor boat rather than paddling a canoe. These days there is a lot of sitting. . . . [Back then] . . . people didn't get sick, so they did a lot of work. Now, instead of getting firewood we just plug in the rice cooker. (middle-aged man, urban)

Data from the KAB Survey and the in-depth interviews were combined to create an overall ethnomedical model of diabetes in the Marshall Islands (Figure 1). The KAB Survey results found that the overwhelming majority (83%) agreed with the statement, "If your parents have diabetes, you will definitely get diabetes," indicating both a recognition of familial linkage of the disease and a certain degree of fatalism. A majority of respondents (54%) agreed with the statement, "Diabetes in the Marshall Islands is caused by the atomic bomb tests." On the other hand, only 28% agree with the statement, "Diabetes in the Marshall Islands is sometimes caused by black magic."

Table 5. Results From Free Listing of Illnesses Salient in Remote and Urban Locales

Marshallese	Approximate English Equivalent	Urban (n = 29)		Remote (n = 8)	
		Frequency	%	Frequency	%
Tonal	Diabetes	20	69	7	88
Bidodo	Diarrhea	19	65	2	25
Kiro	Arthritis (joint pain)	13	45	5	63
TB	TB	13	45	2	25
Metak Bar	Headache	12	41	2	25
Cancer	Cancer	11	38	6	75
Aiblut	High blood pressure	11	38	4	50
Feaver	Fever	10	34	4	50
Lepa	Leprosy	9	32	—	—
Jeblij	Syphilis	9	31	3	38
Jabwe oon	Malnutrition	9	31	2	25
Ameba	Ameoba	9	31	—	—
Nimonia	Pneumonia	8	28	—	—
AIDS	AIDS	7	24	—	—
Wot	Boil	7	24	—	—
Bokbok	Coughing	6	21	2	25
Bilo	Pink eye	6	21	4	50
Tumor	Tumor	6	21	—	—
Metak Ni	Toothache	5	17	6	75
Kutni	Kidney disease	5	17	2	25
Maj	Worm	5	17	—	—
Kito	Ringworm	4	14	5	63
Kajinok	Shortness of breath	4	14	—	—
Molanlon	Nausea	4	14	—	—
Metak ob	Chest pain	4	14	—	—
Metak dri	Back pain	4	14	—	—
Bok	Measles	3	10	4	50
Karko	Scabies	3	10	4	50
Molo	Cold	3	10	—	—
Bwill	Burn	3	10	—	—
Gonorrhea	Gonorrhea	3	10	—	—
Naninmij in jiron im likao	STD ^a	3	10	—	—
Flu	Flu	3	10	—	—
Bolio	Polio	—	—	5	63
Aljer	Ulcer	1	3	3	38
Jen	Tinea	—	—	3	38

a. STD = sexually transmitted disease.

Food is an important part of the local ethnomedical model of diabetes. People generally believe that mona in belle are unhealthy compared with mona in ailin kein. Of the respondents, 81% agreed with the statement that "diabetes is caused by eating too many *ribelle*/American/imported foods," 93% agree that eating lots of fruits and vegetables can help you avoid diabetes, and 78% believe that eating sweets causes diabetes. Similarly, 78% people agreed with the statement that eating less fat can prevent diabetes. More important, 86% respondents agreed with the statement that island foods are always healthier than American/imported foods, regardless of how they are prepared.

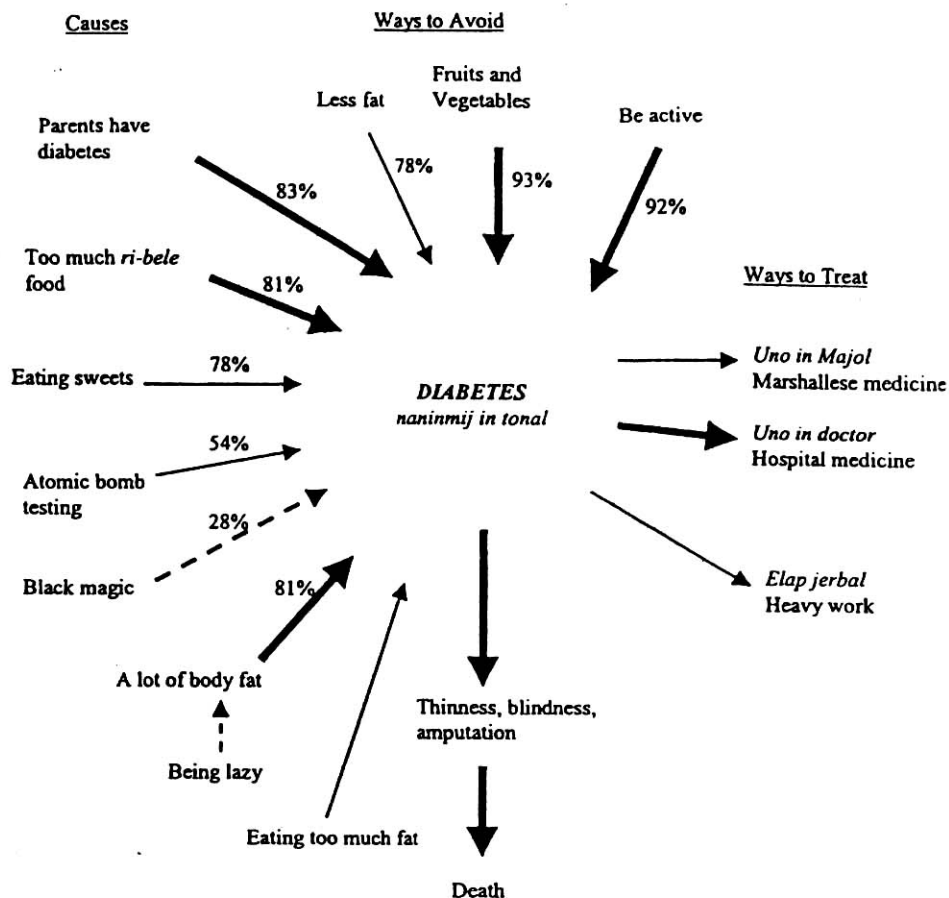


Figure 1. Ethnomedical model of diabetes in the Marshall Islands.

Our Marshallese informants generally perceived a diagnosis of diabetes to be a virtual (although not immediate) death sentence, with intermediate stages of thinness, blindness, and amputations. It could be treated with Marshallese or hospital medicine.

Discussion

This article has presented the results of a formative research study aimed at developing diabetes prevention interventions in the Republic of the Marshall Islands. We explored current practices; local concepts; and valuation of food, body size, and diabetes. Our findings are comparable to other exploratory studies of chronic disease among indigenous peoples. In Native American concepts, very similar classifications of food into traditional versus introduced categories exist, with similar perceptions of the negative health consequences of recent changes in the diet.^{24,42,56} We have also found parallels in terms of the salience of newly emerging chronic diseases, such as diabetes²⁴ and in terms of modifications in the traditional valuation of larger and smaller body sizes.⁵⁷

The study had some limitations. First, most of the qualitative data were collected in only one urban area (out of two possible) and in one remote atoll, possibly limiting the representativeness of the information. Second, much of the formative research focused on

identifying beliefs and perceptions (of food, activity, diabetes, body size valuation, etc.) and collecting information on reported behaviors (e.g., frequency of consumption of foods, how prepared, etc.). There is a gap between this information and meeting the goals of health intervention trials, which are primarily aimed at changing actual behavior.

The formative research described in this article has been directly incorporated into an intervention program, which is currently being implemented and evaluated in 160 households in the Marshall Islands. In collaboration with the MOHE, we developed a series of overall guiding principles for action, selected an intervention format that we felt would be most appropriate and successful in this setting, and developed specific content for the intervention based on formative research results.

Intervention Locale and Format

Most of the recent, community-based diabetes prevention interventions in indigenous peoples have been implemented with children or adolescents, usually in the context of schools.⁵⁸⁻⁶⁰ However, the intervention developed for the Marshall Islands takes place in the home and attempts to work with the entire family. This broader emphasis was taken in part due to formative research findings that Marshallese households contain substantial childhood undernutrition as well as obesity in adults. The intervention is delivered in a series of five home visits each approximately 1 hour or 2 in length. Each visit includes one episode from a flip-chart storyboard that is 10 to 11 pictures in length, with a "script" in Marshallese that is read by the health educator to the family. The stories are about a Marshallese family dealing with diabetes and undernutrition. We have tried to make the stories interesting and relevant to the whole family, including teens, grandparents, men, and women. The story line incorporates traditional stories in two of the episodes. Reinforcement materials include posters of everyday foods, a lower fat pancake recipe, sometimes foods, and a fortified low-fat pancake recipe. Reinforcement foods provided to families include low-fat pancake ingredients, cooking spray, lower fat canned foods (such as canned pork and beans and tuna in water). A mealtime behavior-oriented thoughts-to-live-by brochure and completion certificate are also provided to households.

Guiding Principles for the Intervention

A series of guiding principles were developed on the basis of the formative research, discussion with MOHE partners, and incorporation of key constructs drawn from Social Cognitive Theory.

- The intervention should emphasize the need for family members to support change in each other and facilitate goal setting among family members to promote trying new things.

Content example: The stories include characters who learn from each other and work together to support beneficial changes in diet and physical activity.

- The intervention should incorporate an interactive/participatory component and provide a hands-on exposure to new foods and new cooking methods.

Content example: At the end of most sessions, a cooking demonstration or taste testing of a lower fat food is held in each family's home, where a lower fat version of a commonly consumed food is prepared (e.g., pancakes).

- The intervention should use culturally accepted methods of communication.

Content example: The "teachers" in the stories are the parents of the female head of household. In traditionally matriarchal Marshallese society, these are the most appropriate educators.

- Repetition of key messages/themes for reinforcement of the intervention should be built into the intervention through multiple media.

Content example: Traditional Marshallese stories are included in the curriculum to reinforce key messages. The use of traditional stories and concepts has been successfully employed as part of diabetes prevention education programs in indigenous peoples.⁶¹

- Concepts of health and beauty must be understood within the Marshallese cultural context and used to create appropriate messages to promote health, especially with regard to women.

Content example: Little or no emphasis is placed on obesity prevention per se in the curriculum, as being heavy is actually seen as a sign of health and has other positive associations. Instead, we emphasize the need to live a healthy lifestyle to deal with and avoid diabetes.

- Health education efforts should address people's perceptions of the causes of diabetes.

Content example: The curriculum centers on the problem of diabetes, which is highly salient in the Marshall Islands. At key points during the presentation of materials, open discussions are held about a variety of issues, including perceived causes of diabetes. Here the emphasis is not to disprove local theories but to emphasize and reinforce theories relating to appropriate diets and the need to increase activity.

- The intervention should target key behaviors and meal patterns based on the formative research that place family members at risk of obesity and undernutrition.

Content example: In shared plate eating, we suggest that mothers encourage their children to finish foods on their plates, rather than themselves consuming left-over foods.

- The selection of key foods and food preparation methods incorporated into the intervention materials should be based on formative research.

Content example: Lower fat recipes are taught for foods that contribute high amounts of fat in the diet, such as pancakes. Lower fat methods of preparation are taught for commonly consumed foods, such as roasting chicken rather than panfrying, and for the preparation of readily available commodity foods.

- Dietary recommendations must be carefully planned, incorporating taste preference, need for convenience, access to food, and local perceptions of food classification.

Content example: An emphasis is placed on eating healthy island foods when available, thereby reinforcing cultural perceptions. We also teach that the manner of preparation can turn a healthy island food into an unhealthy food.

Implications for Practice

This study provides a model for the collection of formative research on diabetes in different populations. We integrated formative research on cultural valuation of fatness and perceptions of a healthy body size, knowledge about attitudes and beliefs about foods, and perceptions of diabetes and child feeding, and used this information to develop a home visit-centered diabetes prevention curriculum that is currently being implemented in the Marshall Islands. The formative research information was used to (1) identify the

appropriate medium for effective communication of intervention (i.e., stories, songs, etc.); (2) select culturally appropriate concepts and vocabulary with which to address foods, activity, obesity, and diabetes; and (3) identify sociocultural, economic, or behavioral determinants that provide both support and barriers to the successful prevention of diabetes in the Republic of the Marshall Islands. We feel much of the information presented here is relevant to other countries in Micronesia and probably to other Pacific Island Nations. Such work is desperately needed if we are to stem the spread of diabetes and other chronic diseases in nonindustrialized countries, most of which lack the economic resources to cope with high levels of chronic disease morbidity.

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