

Using qualitative and quantitative formative research to develop tailored nutrition intervention materials for a diverse low-income audience

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Abstract

More effective nutrition education to reach low-income and ethnic minority populations is needed. As part of a project to develop a tailored nutrition education intervention to meet the needs of low-income Hispanics and non-Hispanics, complementary, mixed methods of formative research were used to determine specific characteristics of the target population. The aim was to ensure that the full array of nutrition messages would be comprehensive enough to effectively tailor to the level of the individual. Barriers to healthy eating were delineated for three main dietary behaviors (number of items delineated in parentheses): lowering fat (11), increasing fruit (8) and increasing vegetables (6). Information was also collected regarding motivators for healthy eating (5), situational barriers to making healthy choices (4), other nutrition-related interests (8) and typical eating habits and food-related choices of the target audience.

Introduction

National dietary guidelines recommend a diet limiting total fat intake and including a minimum of five servings of fruits and vegetables a day [1–4].

However, data show that the average American does not meet the national goals for dietary intake [5–7] and low-income, less educated and ethnic minority individuals may be even further from the national guidelines [8–13]. Effective communication of these dietary guidelines to the public is important and can have a positive effect on cancer prevention and risk reduction [14]. Written nutrition education interventions have been developed mostly for middle-income, non-minority populations and usually require high literacy levels [15]. Fewer interventions have been developed for multi-ethnic audiences with low literacy skills [15, 16], who often lack knowledge and materials about how to modify their diets [17, 18]. Approximately 20% of all Americans read below the fifth-grade level with some population sub-groups estimated at ~40% reading below the fifth-grade level [19]. Because of the high prevalence of functional illiteracy in the United States, many traditional patient education materials are not appropriate for the majority of the population, especially ethnic minorities and low-income groups [20].

Tailoring health education is a strategy used to bring individualization and personalization of health messages to members of a target group [21] and may be an important tool for nutrition education in minority groups [22, 23]. Kreuter *et al.* [24] and Kreuter and Skinner [25] have suggested a definition for tailoring as, ‘Any combination of information or change strategies intended to reach one specific person, based on characteristics that are unique to that person, related to the outcome of interest, and have been derived from an individual assessment.’ To successfully design a tailored health education program that can reach that level

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of specificity, it is necessary to delineate the important individual characteristics of the target audience to ensure that the full array of educational materials is comprehensive enough to effectively tailor the intervention at the level of the individual.

Your Healthy Life/Su Vida Saludable is a National Cancer Institute-funded nutrition education intervention that seeks to develop and test culturally and linguistically appropriate, tailored, written nutrition education materials. The target audience is low-income Spanish- or English-speaking adults not already eating a healthy diet. The dietary aim of the intervention is to increase fruit and vegetable consumption and decrease fat consumption. The intervention was planned to have an impact on theory-based predictive factors that in turn would lead to dietary change. These mediating factors included perceived pros (motivators) and cons (barriers) for dietary change, stage of change, social support and self-efficacy, all of which are tied to theoretical constructs from the Transtheoretical Model [26, 27] and Social Cognitive Theory [28]. This article describes the mixed-method, qualitative and quantitative, formative research activities undertaken to determine how some of these predictive factors manifested in our target populations and to determine specific intervention messages that could impact on these predictive factors in ways relevant to the target audience.

Methods

Formative research is used to test concepts, product or message design and to pre-test materials with the target audience [29]. Our formative research used a design based on complementary assistance of research methods (Fig. 1). Complementary assistance uses mixed methods to integrate the strengths of each, as one method can enhance the other and allows for greater creativity and adaptability in studies in real-world conditions [30–32]. According to Morgan [30], complementarity is a likely strategy for health researchers because the strengths of different methods help address the complexity of health research topics which often have dual

goals—pure research as well as applications for practitioners. Qualitative data gathered from exploratory focus groups and individual interviews were used to determine and explain the factors that influence food-related choices and behaviors in our target populations. This information was supplemented and expanded with data from a quantitative telephone survey, enabling us to gather data on the frequency of these factors in a more representative cross-section of the target population. These results guided the design and development of the intervention materials, which were then confirmed and pre-tested with additional qualitative research. The telephone survey was also used to test the feasibility of some of the tailoring questions intended for the main trial evaluation instruments. A total of

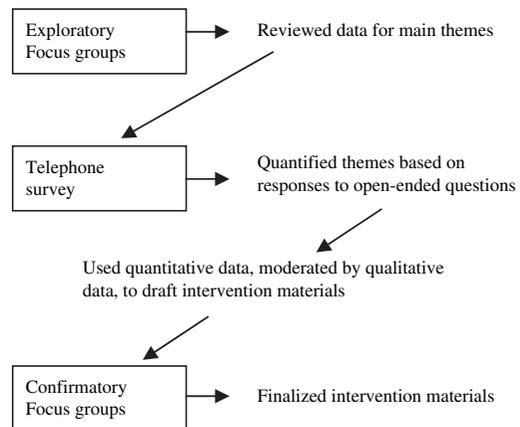


Fig. 1. Research steps.

Table I. All formative research participants by ethnicity and gender

	Total n = 474		
	Female	Male	Total
Hispanic	269	59	328 ^a
Non-Hispanic	116	20	136
Unknown/not reported	10	0	10

^a298 (90.85%) Spanish speaking.

474 participants took part in the formative research (Table I). All procedures and informed consent forms were approved by the Institutional Review Boards of Memorial Hospital of Rhode Island and Brown University.

In order to design an intervention that could be effectively tailored at the level of the individual, we explored the following issues: major barriers to making healthier food choices, main motivators of dietary change, specific eating habits (in terms of both food and behaviors), food beliefs and knowledge and preferences in educational materials, including other nutrition-related topics. Barriers to healthy eating were delineated into three main dietary behaviors: lowering total fat, increasing fruit and increasing vegetable consumption. Additionally, information was collected with regard to situational self-efficacy and types of restaurants frequented by the target audience.

Exploratory focus groups and interviews

Exploratory research consisted of 4 focus groups with members of our target audience; 2 focus groups with nutrition para-professionals, Expanded Food and Nutrition Education Program (EFNEP) aides and *Promotoras de Salud* (lay health educators in the Hispanic community); 20 'mini'-individual interviews, each consisting of five verbal open-ended questions, conducted with target audience members at health fairs and 5 in-depth individual interviews with nutrition professionals (nurses, dietitians, nutritionists) who work with diverse low-income populations. Target audience participants were recruited using face-to-face methods by bilingual research assistants as well as through flyers and posters at varied sites including low-income housing, health fairs sponsored by community centers and local social service agencies, public health clinics and Women, Infants and Children (WIC) Program cooking demonstrations at local farmers' markets. All focus groups were led by one of two trained moderators, assisted by a research assistant. Bilingual moderators and assistants were used for all Spanish-speaking groups and interviews.

All focus groups and interviews were conducted using a semi-structured moderator's guide and were video- and/or audiotaped with the participants' permission. Focus groups were ~2 hours long, individual interviews ~1 hour and mini-interviews ~5 min each. Focus group participants received a \$10 cash incentive and were served a healthy meal. Nutrition professionals doing in-depth interviews received a \$25 honorarium. Participants in the 'mini'-individual interviews received a lottery scratch-off ticket to thank them for their time.

Question topics focused on current typical dietary habits, especially related to fruit, vegetable and fat intake, as well as barriers faced by people when trying to improve their dietary habits. We also asked questions aimed at discerning cultural or personal issues with regard to food. For example, 'Many people have favorite foods that they would not give up, no matter what. Sometimes these foods are special because you grew up eating them or they are a part of your culture. What are some of these foods for you?' Other questions took the form of third-person problem solving, or 'role-playing' with regard to barriers faced and how to facilitate change. For example:

Your friend asks for your advice and says, 'The doctor said I should eat more vegetables, but I don't know how to begin.' What do you think would be the easiest ways for your friend to add more vegetables to her meals? ... A few weeks later, you ask your friend how she's doing. She says, 'I did well for a time, but some things are making it hard to keep up with eating more vegetables.' What do you think are the main things that make it hard for your friend to have more vegetables.... What advice would you give to help her with these problems?

A total of 101 people participated in exploratory research including 87 target audience members (28 men and 59 women, 68 of whom were Spanish speaking), 10 para-professionals (1 man and 9 women, 6 Spanish speaking) and 4 nutrition/health professionals (all women, 1 Spanish speaking). The audiotapes of focus groups and interviews were translated (where necessary) and transcribed by

professional staff. Moderators, co-moderators and other project staff read the transcripts and viewed the videotapes several times and coded for themes regarding dietary habits, barriers, facilitators and motivators to making healthy eating choices, health beliefs regarding diet and preferred styles of education. The transcripts were read initially to isolate obvious themes and then subjected to open coding—careful scrutiny through a line-by-line read to identify additional relevant themes, concepts, terms and actions. Results across groups and interviews were summarized in a report used to guide the development of the quantitative telephone survey.

Telephone survey

The telephone survey was conducted via a computer-assisted telephone interviewing system. Participants were recruited via the same methods as the focus groups. Survey questions included topics such as dietary habits, barriers and motivators to making healthy food choices as well as attitudes towards and beliefs about specific healthy eating recommendations. Demographic data were collected from all participants. Data on country of origin and acculturation, as measured by two questions on spoken and written language, were collected for Hispanic participants. The survey included open-ended, multi-pick questions in order to determine if there were any major themes we had overlooked. To minimize respondent burden, we collected only limited data on mediating variables such as stage of change, social support and self-efficacy as we already knew the intervention would address these issues. Upon completion of the survey, participants were entered into a drawing to win one of two \$100 grocery store gift certificates as an incentive for participation. The survey reached 334 individuals, 238 who self-identified as Hispanic (211 surveys conducted in Spanish). Of the 238 Hispanic respondents, 52% of them spoke only Spanish, with 36% speaking Spanish better than English. More than half read only Spanish with another 29% reading Spanish better than English. Respondents included 295 women and 39 men, and had a mean age of 38.1 years. In terms of the most

frequent response to level of education, 51% of Hispanics reported less than a high school education and 40% of non-Hispanics reported having a high school degree.

The telephone survey results were used to confirm and, to some extent, quantify the themes identified in the exploratory phase of research. For example, frequency data from the survey helped to determine what barriers were most prevalent, what fruits and vegetables were eaten most often and which issues most motivated people to eat better. The answers to open-ended questions such as ‘What would make it hard for you to eat less fat?’ were coded by theme and ranked by frequency of response. Respondents were able to give multiple answers to each question. To determine situational self-efficacy, situations where it is difficult to make healthy choices, we read a series of statements and asked the respondent how much they agreed or disagreed. Additionally, information was collected about the types of nutrition advice acceptable to the target audience including which changes were acceptable given the importance of specific cultural habits. For example, Hispanics were not generally open to eliminating oil when making rice, but were willing to consider reducing the amount used. The research team used the data from the exploratory qualitative research and the telephone survey about foods, barriers and facilitators, motivators, restaurants frequented, situational self-efficacy, other nutrition-related interest topics and other notable themes that influenced healthy eating to draft the specific intervention messages so they were relevant for the target audience and specific to their needs and interests.

In reviewing the survey data, we faced the challenge of interpreting results to open-ended questions that were not always clear or specific. For this, we used the brainstorming technique mentioned by Bartholomew *et al.* [33]. We put aside all formal data and put forth spontaneous ideas about and interpretations of the responses. We did this within the context of the topic with the plan of testing our findings in the confirmatory focus groups. For example, we found that many respondents would answer ‘nothing’ to open-ended

questions, in fact it was the answer most often given to all open-ended questions about ‘what makes it hard to eat ... [less fat ... more fruit ... more vegetables?].’ Based on our experiences with the exploratory focus groups and our previous research with the target population, we speculated what ‘nothing’ might really mean and used confirmatory groups to test our ideas.

Confirmatory focus groups and interviews

Five confirmatory focus groups were conducted to confirm, correct or clarify the conclusions drawn from the prior research and pre-test draft editions of the intervention materials. Three focus groups were conducted with members of the target audience and two with para-professionals. Also, one in-depth interview was conducted with the nutrition director of a program serving members of our target audience. Because there is no simple way to analyze readability of Spanish materials, one of the focus groups was used to check the readability of the Spanish-language intervention materials as well as to confirm that our Spanish word choices were understandable across Hispanic sub-groups commonly living in the area. A total of 39 (9 male, 30 female) participants were enlisted in this phase of the research including 29 target audience members, 9 para-professionals and 1 professional. Twenty were Spanish speaking. Information gathered was used to fine-tune and finalize the intervention materials.

Results

The exploratory qualitative research revealed numerous barriers within each dietary behavior category (fat, fruit and vegetable) and the telephone survey further refined the list. Many of these issues have been discussed by other researchers [34–37]. This information was used to determine which tailoring questions to ask on the baseline survey and which corresponding intervention messages/pages to develop.

Barriers to eating less fat

Based on the exploratory focus groups and telephone survey, we outlined 14 barriers to decreasing fat intake and ranked them by frequency of mention in answer to an open-ended question on the phone survey (Table II). We then reviewed the list, using knowledge gained from the exploratory focus groups as well as answers to attitude questions on the survey, to delineate the intervention messages needed for tailoring. The majority of respondents were unable to articulate any response (i.e. answering ‘nothing’) to the open-ended question, ‘What would make it hard for you to eat less fat?’ We theorized that this might reflect the idea that making healthier food choices is not a habit or that a lack of internal will-power may be the barrier, which was supported by confirmatory focus groups. This led to the development of materials directly addressing how to change habits for specific dietary behaviors. Additionally, we created general goal-setting messages with interactive activities to encourage a step-by-step approach to creating new habits.

In some cases we combined several barriers into one intervention message. For example, the barriers ‘no control over food preparation’ and

Table II. Percentage of telephone survey respondents answering: ‘What would make it hard for you to eat less fat?’ (multiple answers allowed)

Response category	No. of respondents (%)
Nothing	41.9
Taste	18.0
Do not know how	11.1
No control over food preparation	6.0
No reason to	4.5
Most food is from restaurants	3.9
No time	2.7
Cost	2.4
Family does not want to eat less fat	2.4
Traditional food eaten is not low fat	2.1
Already eat well	1.8
Not a habit	1.8
Do not want to	0.9
No will-power	0.9
Not satisfying	0.3

'family doesn't want to eat less fat' were combined into messages on dealing with family and friends to engender support for dietary changes. In other cases, we split one barrier into two separate messages. For 'don't know how to eat less fat', we decided to add a second category of 'don't know how much fat is in food' because many focus group respondents were specific that this was their problem.

Some respondents felt that they did not need to lower the fat in their diets. Because we did not do a diet assessment, we could not confirm this and decided not to include this choice in the fat barrier messages as it would be addressed elsewhere in the intervention. People who did not want to change would likely not join the project. Low-fat foods not being satisfying was mentioned once and thus not included for message development.

In the end, we delineated 11 main barriers to eating less fat for development of the tailored intervention messages: (i) low-fat foods do not taste good, (ii) do not know how to eat a low-fat diet, (iii) do not know how much fat is in foods, (iv) family does not want to eat less fat, (v) no reason to eat less fat, (vi) traditional foods eaten are not low fat, (vii) not a habit, (viii) most food eaten is from restaurants, (ix) no time, (x) too expensive and (xi) no will-power. For example, one non-Hispanic woman said, 'I eat a lot of fat ... I like to eat what I want to eat.' Another Hispanic woman stated, 'I don't have the control to cook with just a little. It's like I like fat, I like to see the food with fat' (translated). Lack of family support for healthy dietary changes was especially heard from Latina women. For example, 'My sister ... started cooking healthier ... and he [her husband] was like "no, you go ahead with your little healthy diet, you cook my stuff in grease and the way that I am used to."' Women feel that they're not going to cook two different dishes.'

Barriers to increasing fruit

Based on exploratory research, there were 11 barrier topics to consider for message development on what makes it hard to eat more fruit (Table III). Once again, most respondents were unable to

Table III. Percentage of telephone survey respondents answering: 'What would make it hard for you to eat more fruit [vegetables]?' (multiple answers allowed)

Response category	Fruit (%)	Vegetables (%)
Nothing	36.8	45.8
Cost	12.3	7.2
Eat enough already	11.1	10.5
Do not like the taste	9.6	20.1
Prefer other food	6.9	n/a
Not available	6.7	n/a
Not a habit	6.0	10.8
Spoils quickly/poor quality	5.7	n/a
Physical reasons (allergies, gas)	5.4	n/a
Fruits in United States not like native country	1.2	n/a
Do not like the way it feels in my mouth	1.2	n/a
Fear of contamination from pesticides	0.6	0.6
Not appealing	n/a	8.1
Family does not want to eat more vegetables	n/a	2.1
Vegetables not satisfying	n/a	1.2
Most food is from restaurants	n/a	0.3
Do not know/refused	6.7	5.1

n/a = not applicable.

articulate an answer to this open-ended question (i.e. answering 'nothing') and it was again theorized that habit was an operative factor in not choosing fruit more often.

Some respondents felt they ate enough fruit already. Since fruit and vegetable intake would be assessed in the main trial and personal feedback given based on intake, it was decided not to develop a barrier message for this 'barrier'. Two barriers, 'mouth-feel' and fear of pesticide and/or bacterial contamination, were not mentioned often enough to warrant message development. In the end, we decided upon eight themes for message development: (i) too expensive, (ii) do not like many fruits, (iii) prefer other foods, (iv) good fruit is not always available, (v) not a habit, (vi) spoils too quickly, (vii) health/physical reasons and (viii) not used to the fruit in the local stores (Hispanic only).

For example, when asked what prevents her from eating more fruit, a non-Hispanic woman stated, 'I love fruit ... I would eat it every day if I had enough

money to buy fruit.’ A Hispanic man said, ‘Some of the fruits are kind of ... they have been sitting there for a while. That’s why the majority of the time if they don’t come in fresh, the majority of people just don’t buy them’ (translated). A dietitian stated, ‘People have gas or maybe they find if they eat a little too much fruit, they might have diarrhea or you know.... It’s embarrassing to them or maybe it bothers their stomachs. So they tend to cook other things or not eat them at all.’

Barriers to increasing vegetables

An underlying theme as to why people did not eat more vegetables seemed to stem from the fact that people were not used to eating vegetables for one reason or another. Therefore, the thought of vegetables was unappealing or not a habit. Again, ‘nothing’ was heard most often. From a group of nine topics mentioned (Table III), six were chosen for educational message development: (i) do not like many vegetables, (ii) not a habit, (iii) not appealing, (iv) too expensive, (v) family does not like them and (vi) not satisfying. Once again, the self-perception that a person eats enough vegetables already was dealt with in another area of the intervention. The other barriers not chosen for vegetable barrier message development were fear of pesticide and/or bacterial contamination and eat out a lot because these were not mentioned often.

The group of EFNEP aides had a lot to say about their clients and fruits and vegetables, ‘I’ll tell you why they don’t eat their fruits and vegetables, because everyone eats at McDonalds and other fast foods ... some children eat out 5 nights a week, they have no vegetables.’ From an EFNEP supervisor, ‘They don’t know how to prepare them.’ An aide told us, ‘They’re under the misconception that they [frozen foods or canned foods] are not as good ... and, you know, if you don’t know and you’re poor, you’re not going to waste money trying something.’ There were few differences in major barriers to eating fruits and vegetables between Hispanic and non-Hispanic participants; however, some of the immigrant Hispanic participants preferred the familiarity and/or freshness of the fruits from their

country of origin ‘... because most of the fruits that are sold at the market, they are not fruits that are from our countries ...’ (translated).

Data were also collected about fruits and vegetables people already eat most often (Table IV). This enabled the fruit and vegetable messages to be framed within the context of what people already know and like. There was little difference in preferences for the top fruits and vegetables between Hispanic and non-Hispanic participants and, with the addition of mangoes for Hispanics, the foods used for message development were the same.

Motivators for healthy eating

We were able to group the responses (Table V) to what motivates a person to change his/her dietary behavior into five categories for use in tailoring intervention materials: (i) be healthier/prevent disease, (ii) lose weight/look better, (iii) feel better, (iv) set a good example for one’s family and (v) feel good about oneself. One Hispanic woman said, ‘This is healthy, to lose weight and help your family

Table IV. Percentage of telephone survey respondents answering: ‘What fruit [vegetable] do you eat most often?’

		Hispanics (%)	Non-Hispanics (%)
Fruit	Banana	34	40
	Apple	28	32
	Melon	28	27
	Grapes	21	24
	Orange	23	16
	Mango	21	4
	Peach	16	10
	Pear	16	9
	Strawberry	16	16
	Pineapple	11	8
Vegetable	Broccoli	45	42
	Carrots	36	20
	Corn	18	34
	Green beans	12	20
	Lettuce/salad	25	6
	Tomatoes	14	6
	Spinach	5	16
	Cauliflower	11	8
	Peas	4	11
	Potatoes	11	9

Table V. Percentage of telephone survey respondents answering: 'What would motivate you to eat healthier?' (multiple answers allowed)

Response category	Hispanic (%)	Non-Hispanic (%)
Feel better	51.7	30.21
Lose weight	42.0	33.3
Live longer	36.1	25.0
Prevent disease	47.1	27.1
Look better	28.6	16.7
Be a role model for children	13.9	13.5
Help family eat better	7.9	7.3
If a doctor told me to	2.9	7.3
If it were easier/cheaper to do	2.1	8.3
Not to be a burden on my family	0.4	4.2

... last year I had heart problems.... I want to see my grandchild grow up.' From a non-Hispanic man, '[You have to eat a healthy diet] if you don't, you aren't going to be around.' In answer to what people in the community most wanted to know about, a *Promotora* responded, 'Weight loss'.

Situations that made it difficult for individuals to eat healthy were identified as follows: (i) eating food from a restaurant, (ii) eating at someone else's house, (iii) stress and depression and (iv) tired or in a hurry. Messages directly addressing these situations were developed. A non-Hispanic woman said (regarding frying), 'It's just quicker and easier.' A WIC nutritionist stated, 'You know it's easier just to jump in the car and go to Burger King.' The restaurants most frequented by this audience were (i) Chinese; (ii) fast food burger restaurants; (iii) Italian or pizza; (iv) chicken restaurants; (v) sub or sandwich shops; (vi) sit-down, American-style restaurants like TGI Fridays®; (vii) Mexican style and (viii) steakhouses. Tip pages on healthy choices at each were developed.

To determine content for nutrition-related special interest pages, telephone survey respondents were asked about specific topics that had been mentioned in the focus groups, and then given an opportunity to name any other nutrition-related topics they were interested in. Four new topics were mentioned so often that content pages were developed on them. These were getting children to eat healthier, eat to

control diabetes, eat to control high blood pressure and eat to control cholesterol. Other nutrition-related interest topics and themes that were mentioned in the focus groups as well as the telephone survey were vitamin and mineral supplements, meatless meals and vegetarian diets, losing weight and eating to prevent/treat constipation. An EFNEP aide stated, 'what people want is topical issues just like anybody else. Fat, cholesterol, diabetes, you know. Pretty much whatever is in the news....'

Other important themes revealed from the formative research were used to inform overall intervention development. Many members of the target audience appeared to lack basic knowledge regarding health and healthy eating, and many lacked sophisticated (or even basic) cooking skills. For example, a pediatric dietitian stated, 'Lack of knowledge is the most significant barrier [to dietary change]. Many parents think they are doing the right thing or don't know what to do.' She continued, 'These people lack even the simplest cooking skills. This is a huge issue [in younger moms] and that's probably truer in Caucasians.' An EFNEP aide said, 'Poor people don't cook anymore either. All these [convenience] foods that are in the market now for the working people, the poor people want them too, they don't want to cook. You know, they just don't realize that they can't really afford them.' A Hispanic nurse educator reported, 'I had one guy who was pretty educated, but he thought that the serving size, he thought the calories was [*sic*] for the whole box. I said, "oh no, a serving size is a cup of this so every cup is this many calories".' A dietitian stated, '[they thought] if they cooked it in the fat and then just took it out, they weren't eating the fat.' The professionals interviewed also gave insight to misconceptions about portion size, such as a table-spoon. One woman from *Promotoras de Salud* told us, 'One of the things we've found ... with Latinos is the definition of a cucharada (table-spoon) of oil in rice preparation ... for some people this meant a ladle.' A WIC nutritionist said, 'A Spanish spoon they call it ... it's just a big spoon, but that's [their] serving of oil. I measured it out to be ½ cup!' Another dietitian said, 'Portion size,

no concept of what's a portion. They don't get that there may be two portions in there.' To confirm these data, on the telephone survey, we asked specific questions about fruit and vegetable serving sizes and intake recommendations and a question about whether vegetable oil consumption needed to be limited (the assumption of participants being that because it was 'vegetable' oil, it was okay). The survey showed that most people thought three servings are the daily recommendation and almost half agreed that vegetable oil need not be limited.

Focus group participants also made suggestions regarding the page content itself. For example, it was determined from the exploratory focus groups, and confirmed with the telephone survey, that many people were not confident about using 'Nutrition Facts' food labels. The Spanish version of the tip sheet on reading labels included an English label, assuming that most foods purchased in the United States would have the label in English. Upon reviewing, Spanish-speaking participants made it clear that they would prefer to see a nutrition label in Spanish. They felt it would be easier to learn about labels in their native language and apply that knowledge to the English labels they see in stores. Findings from the confirmatory focus groups also compelled additional changes to the materials, such as adding an instruction sheet to explain how to use some of the interactive activities in the materials.

Formative research also informed the Spanish translation of the intervention materials. All Spanish-language materials were professionally translated and back-translated. Spanish-speaking participants in confirmatory focus groups indicated they felt that it was important to use all Spanish text with little to no English but conceded that there were times when English was a necessity. For example, the Spanish word for banana is *guineo* but *guineo* has different meanings depending on country of origin. South Americans use *guineo* to mean a green plantain. The Spanish groups agreed that keeping the word banana was the best choice for optimal universal understanding. In cases where there is no Spanish equivalent, such as 'crock-pot or

slow-cooker', discussion over our choice of wording, in this case *una olla electrica*, was held to ensure the meaning came across. As found in previous research, it was agreed that, in some instances, English was the only way to convey the meaning of words such as 'wonton', 'eggdrop' and 'Caesar' [34]. It was also determined that an English-language version of materials for Hispanic participants preferring English would be best for some participants. This version was not translated except for the Spanish project name and logo and specific Spanish words for foods that are commonly known such as *empanadas*, *pastelillos* and *rellenos de papa*.

Discussion

The authors acknowledge that the results of our formative research may be limited by several factors. Participants in the focus group and telephone survey were a convenience sample and may not be representative of the entire target population in terms of education, acculturation, literacy levels and other demographic variables. It is likely that participants who volunteer to take part in a discussion or survey about nutrition may introduce bias with regard to the topics in question. Also, the sampling of men in this research is small and introduces the possibility of gender bias. Any impact of these potential biases cannot be determined until the main trial test of the tailored materials with accompanying process measures is complete.

Despite the limitations, we were able to learn much about our audience. With the exception of familiarity with fruits and vegetables in this country, there was little descriptive difference in the overall important themes heard from Hispanic and non-Hispanic respondents, though there were differences in priorities. As the aim of this research was to delineate the themes needed for message development, no inferential analysis comparing the two groups was done. Additionally, we did not feel our themes differed substantially from those found in previous studies [34–37]. It has been noted that identifying defined groups within populations, with

common characteristics and dietary patterns, is suggested for maximum effectiveness in tailoring [15]. Using mixed-method research with these defined groups enabled us to get detail and specificity from the qualitative research while the quantitative research allowed us to prioritize the themes for tailored message development. Thus, we were able to be more efficient in tailoring at the individual level. Using both methods during formative research, we were able to delineate themes and topics to tailor the intervention messages so they fit into the life context of the target audience and addressed their needs and interests at the individual level. Mixed-method research was particularly useful for our formative needs as the qualitative results helped give meaning and understanding to the quantitative results. In turn, the telephone survey quantitative descriptors helped us to sort through the qualitative data and hone in on what issues were most important to the target audience, as well increasing generalizability by reaching a greater number of people than through focus groups alone. Often, themes inferred from the focus groups were confirmed through the telephone survey. For example, based on the findings from the focus groups, we suspected that there was a lack of basic knowledge about fats, fruits and vegetables. This premise was confirmed on the telephone survey; thus, we decided to include important informational items in the intervention materials.

Conversely, there were themes heard in focus groups that were not confirmed in the telephone survey. While a number of focus group participants stated that the possibility of contamination by pesticides or germs is a barrier to eating more fruits and vegetables, an overwhelming majority of respondents in the telephone survey said it was not a barrier for them and the topic was dropped from content development. The survey also provided themes that never arose in the focus groups, for example, additional nutrition topics of interest as discussed above.

In recent years, there has been an increase in media types and styles for health education among low-literacy audiences. These include audio- and videotaping of material, using stories to convey

messages and a broad societal move to simpler text [19]. If research continues to show the success of tailored health education interventions in achieving positive health and behavior changes, it seems likely that more practitioners will incorporate this approach for their programs. Using the complementary methods of qualitative and quantitative research can help ensure that the full array of messages is comprehensive enough to effectively tailor to the level of the individual.

With regard to achieving change, asking members of the target community to participate in defining problems and goals as well as help in developing the corresponding solutions and strategies is critical to the acceptance and success of a program [29, 38, 39]. This is especially important when there is ethnic, age, cultural and socio-economic diversity in the target audience. The diversity of the growing US Hispanic population highlights the relevance of this and similar research to future public health education programming. The open forum nature of qualitative group discussions and in-depth interviews enables the compilation of a universe of important themes, while surveys allow for additional input and enable the quantification of these themes so that resources can be allocated to focus on developing materials that can best meet the needs of the majority of the target audience. In a world of limited health education resources, it is impossible to prepare health education interventions and materials for every unique need, especially when dealing with topics as potentially individual as barriers to making healthy dietary choices. However, using complementary formative research methods to develop nutrition education materials that are both culturally targeted to the issues common to certain ethnic groups as well as tailored to the needs and interests of particular individuals may be a cost-effective approach to address both concerns.

Acknowledgements

The authors would like to acknowledge H. Joan Lovell, Raul Fortunet and the staff of the Institute for Community Health Promotion Survey Center

for their help in conducting the focus groups and interviews. This study was funded by the National Institutes of Health National Cancer Institute grant RO1 CA81828.

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Received on January 27, 2005; accepted on September 13, 2005