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Interpretation and Understanding of the Dietary Guidelines for Americans Consumer Messages Among Low-Income Adults

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ABSTRACT

Objective: The objective of this study was to determine the interpretation, understanding, and implementation of the Dietary Guidelines for Americans (DGA) consumer messages among low-income adults and compare findings to perceptions of the messages by community nutrition educators.

Methods: In this mixed methods, cross-sectional study, a convenience sample of low-income adults (n = 98) with a child between the ages of 3 and 10 years old and nutrition educators (n = 9) were interviewed individually about the DGA messages, food-related behaviors, and barriers related to consuming fruits, vegetables, and whole grains. Interviews were audio-taped, transcribed verbatim, and analyzed using the inductive approach. Interpretation and ranking of the clarity and ease of the DGA messages by low-income adults and nutrition educators and perceptions about the messages were assessed. Descriptive statistics were conducted for demographic data and Fisher’s exact tests were used to examine differences regarding the clarity and ease of the messages among low-income adults and nutrition educators.

Results: According to the interview results, messages that tended to be misinterpreted most frequently were on topics such as sodium, fruit and vegetables, portions, and whole grain intake. Low-income adults and nutrition educators also differed in perceptions for the message clarity addressing whole grain servings (p = .001), avoiding oversized portions (p = .002), and comparing sodium (p < .001).

Conclusions: Improvements in the DGA consumer messages are warranted to improve clarity and feasibility for low-income adults through new communication tools or strategies that complement the DGA.

Introduction

The Dietary Guidelines for Americans (DGA) are a set of evidence-based guidelines intended to prevent chronic disease and promote health in individuals aged 2 years and older (1). While the DGA are written for policymakers and health professionals, the DGA communication initiative includes a multifaceted approach to communicate DGA content to consumers (2). As part of the initiative, a communicator’s guide is available for educators to disseminate key DGA concepts into nutrition education materials and outreach including a set of consumer messages to deliver consistent and accurate DGA information to individuals, families, and other audiences (3).

The consumer messages are developed based on the need to encourage consumption of foods or nutrients that are deemed a public health concern by the DGA, especially in populations who are at higher risk for chronic diseases.

The 2010 DGA consumer messages (4) focus on encouraging consumption of fruits, vegetables, and whole grains; using smaller portion sizes; drinking water instead of sugary beverages; switching to lower-fat milk; and selecting and consuming lower-sodium products. Some modifications were then made to update the messages in a subsequent 2015 DGA edition (Table 1). Initial messaging concepts on topics addressing calories, food groups, dietary components, and physical activity were developed with input from parents of children aged 2 to 17 years (n = 49) during focus groups and then tested in a larger group of parents (n = 1000) using a web-based survey (5,6). Limitations of the formative research include the lack of transcription of the videotaped focus groups, lack of coding to verify findings, and lack of a theoretical framework or model as a basis for the interview content (5). Further, the messages evaluated in the web-based survey (6) were not the final messages released for use with consumers (4).

When considering programmatic outreach to deliver DGA messages and information, the Expanded Food and Nutrition Education Program (EFNEP) is a federally funded program that applies the DGA recommendations through
interactive hands-on workshops delivered by nutrition para-professionals to low-income individuals and their families (7). Across the United States, the EFNEP staff have flexibility in determining what curricula to implement, but all lessons and materials must be based on current DGA content. Programs targeting low-income populations were previously recognized as solutions for addressing primary prevention efforts in reducing diet- and disease-related disparities (8). However, the DGA consumer messages were not tested rigorously with EFNEP educators and low-income adults to determine whether the recommended dietary behaviors are understood and implemented in households. Further, barriers to implementation of consumer messages may be related to the multiple influences (e.g., individual, interpersonal, community, policy) on dietary behavior including those depicted in the Social Ecological Model of Health Behavior (SEM) (9). Therefore, the objectives for the study were to determine how low-income adults interpret, understand, and implement the DGA consumer messages and compare them to the perceptions of the EFNEP community nutrition educators in the context of the SEM. While this study was focused on the 2010 DGA messages and conducted prior to the release of the most current 2015 DGA consumer messages, common themes were retained in the most current DGA messages and the questions and content of this study remain relevant in consideration of the current and future DGA consumer messages.

Materials and methods

This study consisted of a mixed-methods design including a quantitative questionnaire and separate qualitative interviews during the time frame of October 2012 through November 2013 with EFNEP nutrition educators and low-income adults.


EFNEP nutrition educators

Nutrition educators working directly with low-income adults as part of EFNEP were recruited via email outreach to participate in a 45- to 60-minute one-on-one audio-recorded in-depth interview at their office. These nutrition educators (n = 9) represented the full staff of the EFNEP program in Connecticut. Each nutrition educator provided written consent and received a copy of the consent form. The interviews were conducted by a trained research assistant and audio-taped.

The interview script was developed based on the SEM framework (9, 10) and reviewed for content validity by the research team prior to the study implementation. The script contained 28 questions related to behaviors and barriers that low-income populations may experience in meeting the 2010 DGA recommendations. The nutrition educators were also asked questions (Supplemental Table 1) about their perceptions of how their low-income nutrition education program participants would rank the clarity, feasibility, and ease of each DGA message (Table 1), which is the focus of this study. These message testing concepts were based on the Health COMpass pretesting guidelines (11). After the interview, nutrition educators received a reusable tote bag as a small thank you incentive for their time.

Low-income adults

In addition, low-income parents or guardians aged 18 years and older were recruited for a 45- to 60-minute one-on-one similar interview. Criteria included having at least one child between the ages of 3 and 10 years old, participant or self-reported eligibility for a program serving low-income families (EFNEP, Women Infants and Children [WIC], Supplemental Nutrition Assistance Program), or child participated in Head Start, and ability to speak and understand English. Low-income adult participants were recruited from community locations such as Head Start or the Special Supplemental Nutrition Program for WIC from one Northeastern U.S. state. Recruitment sites served as a proxy for income. Interviews were scheduled at a convenient location for each participant and audio-taped. Written informed consent was obtained from each low-income adult prior to the interview and a copy of the consent form was provided.

The 24 interview questions were based on the SEM and included questions about food selection, preparation, and dietary consumption behaviors of the participant and family members; perceived motivating factors and skills needed to change eating habits within the family; and reported preferences, benefits, and barriers related to fruit, vegetable, and whole grain consumption. The interview also contained questions (Supplemental Table 2) for low-income adults to assess interpretation, clarity, ease, and behavioral intention for all seven 2010 DGA messages (Table 1), which are the focus of this study. Similar to the EFNEP educator questions, clarity of the message was assessed using the scale: 1 = very clear, 2 = clear, 3 = neutral, 4 = not clear, and 5 = not clear at all. Ease of implementation of the message

<table>
<thead>
<tr>
<th>Table 1. The 2010 and 2015 Dietary Guidelines for Americans (DGA) consumer messages.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2010 DGA Messages</strong></td>
</tr>
<tr>
<td>Make half your plate fruits and vegetables.</td>
</tr>
<tr>
<td>Make at least half of your grains whole grains.</td>
</tr>
<tr>
<td>Avoid oversized portions.</td>
</tr>
<tr>
<td>Enjoy your food but eat less.</td>
</tr>
<tr>
<td>Drink water instead of sugary drinks.</td>
</tr>
<tr>
<td>Switch to fat-free or low-fat 1% milk.</td>
</tr>
<tr>
<td>Compare sodium in foods such as soups, breads, and frozen</td>
</tr>
<tr>
<td>meals and choose the foods with lower numbers.</td>
</tr>
</tbody>
</table>

(1) Be physically active. (2) Make at least half of your grains whole grains. (3) Avoid oversized portions. (4) Enjoy your food but eat less. (5) Drink water instead of sugary drinks. (6) Switch to fat-free or low-fat 1% milk. (7) Compare sodium in foods such as soups, breads, and frozen meals and choose the foods with lower numbers. (8) Make half your plate fruits and vegetables. (9) Make half your plate fruits and vegetables: -Vary your veggies. -Focus on whole fruits. -Make half your grains whole grains. -Vary your protein routine. -Move to low-fat or fat-free milk or yogurt. -Drink and eat less sodium, saturated fat, and added sugars.
was assessed using the scale: 1 = very easy, 2 = easy, 3 = neutral, 4 = difficult, 5 = very difficult. The interview script was reviewed prior by the research team for content validity. To facilitate the interview, vibrant message cards were created for each DGA message. Each low-income adult participant also completed a 19-item demographic form and received a $20 gift card as an incentive at the end of the interview.

**Qualitative Analysis.** Each interview was transcriped verbatim, reviewed by the research team, and coded using an inductive approach (12). This approach involves identifying and coding text relevant to the research objectives to generate categories and themes (12). The codes were derived from key words or phrases that addressed the study purpose in the interview text and written next to the bracketed sentences or paragraphs (13). Both Microsoft Excel and a qualitative software program, NVivo (Version 10, QSR International), were used to organize the transcript codes. Once coding was completed, the research team met to discuss and confirm themes. The interviewer responsible for coding created a set of notes called memos during the process to categorize behaviors and barriers reported from the interviews.

**Quantitative Analysis.** Descriptive statistics including demographic data for the low-income adults, clarity scores, and ease of implementation scores for the DGA messages were conducted using IBM SPSS Statistics Version 24. Fisher’s exact tests were used to examine proportional differences in low-income adults and educators’ perceived clarity and ease of implementation of the DGA messages by low-income adults.

**Results**

**Demographics.** A total of 100 low-income parents or guardians aged 18 years and older were recruited and 98 completed a 45- to 60-minute one-on-one interview. The final sample size was determined sufficient once saturation of thematic responses were reached in the interviews and to allow comparisons of themes across groups in future analysis by participant demographics. The mean age was 35.5 ± 9.4 years of age, and most adults were female (97%) and Non-Hispanic (67%) and had less than a bachelor’s degree (88%; Table 2).

### Table 2. Demographic characteristics of low-income adults interviewed about Dietary Guidelines consumer messages (n = 98).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Female</td>
<td>95</td>
<td>97</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Non-Hispanic American Indian or Alaskan Native</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Non-Hispanic Asian</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Non-Hispanic other</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Hispanic</td>
<td>33</td>
<td>34</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>High school diploma or GED</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>Some college/technical or vocational school</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Associate’s degree</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Bachelor’s degree or more</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Federal nutrition program participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head Start¹</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>Supplemental Nutrition Assistance Program</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>Women, Infants, and Children</td>
<td>70</td>
<td>71</td>
</tr>
<tr>
<td>Other</td>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>35.5</td>
<td>9.4</td>
</tr>
</tbody>
</table>

¹Child currently or previously enrolled in Head Start.
²One adult did not report age.

“healthy” or “good” (Table 4). One quote illustrates this interpretation:

“It’s just a message to get you and your family to eat healthier. It states that the more fruits and vegetables you eat with every meal you’re going to be healthier.” (White Female #91)

For fruit behaviors, low-income adults reported having fruit during breakfast meals or snacks (Table 5).

“Eggs, milk, cereal, we like cheese, bread—whole wheat bread. They like fruits in the morning as well: bananas, apples, strawberries, oranges. Or waffles.” (Black Female #93)

The main barriers related to fruit consumption were having limited money to spend on food for the household and also the cost of fruit (Table 5).

“Not working full time, sometimes I have to pop up at food pantries and I’m a coupon clipper, so I make sure the money I have or my food stamps I do have, I use them wisely. I shop with them wisely. ‘Cause when fruits are out of season they cost little more, even though I still want to buy them, but I just get less in the bag, that’s all. Like if I wanted a bunch of grapes, I couldn’t get a whole bag of grapes if I know I have to buy other stuff … those $200 of the food stamps I get.” (Hispanic Female #20)

Also, some parents were concerned with the spoilage of fresh fruit as a barrier to consumption.

“Sometimes I’m stressed that fruit can be expensive so I can only get so much for like the month or pick up a piece here and there when you run in the store. And it goes bad so you can’t really buy fruit in bulk or anything.” (White Female #42)

Vegetables were consumed in low-income households during lunch and dinner meals and for snacks (Table 5). For lunch and dinner meals, low-income adults cited consuming vegetables with a protein-based food:

“Rice, a meat—chicken or pork, we usually have beans on the side or mixed in with rice, sometimes salads—either lettuce, tomato, or lettuce and corn and green beans, and then their
Drink water instead of sugary drinks. Call to action; confusion about message size. Waters with lower numbers. Avoid oversized portions. Make at least half of your grains whole grains. Enjoy your food but eat less. Drink water instead of sugary drinks. Switch to fat-free or low-fat 1% milk. Compare sodium in foods such as soups, breads, and frozen meals and choose the foods with lower numbers. 

choice of milk or juice or sometimes water for dinner." (Hispanic Female #98)

In addition, low-income adults discussed different ways of preparing vegetables (Table 5).

"Boil, I boil vegetables sometimes I do hard boil for salads or sandwiches. Steaming, I’ve tried steaming my vegetables but I don’t like it. I buy the whole milk. It’s more fulfilling, 1% and fat-free milk is better than whole milk but it doesn’t taste better." (Black Female #53)

Low-income adults also cited cost as a barrier to vegetable consumption (Table 5).

"That would be the cost also. I also like eggplant but I don’t get that a lot cause that’s expensive." (Other Female #74)

Further, child pickiness or dislike of vegetables was another reported barrier to consuming vegetables (Table 5).

"My kids won’t eat them, and I think if the kids ate them and my husband could eat them I could make more meals that are vegetables based." (White Female #93)

From the viewpoints of EFNEP educators, cost and availability of fruits and vegetables were barriers for low-income adults:

"Availability. With our urban clients, they have a harder time buying less processed food because of the cost issues, like fruits and vegetables may be more costly and less available in an urban market." (EFNEP Educator #3)

### Table 3. Comparison of perceived clarity and usage ease of the Dietary Guidelines for Americans messages by low-income adults (N = 98) and nutrition educators (N = 9).

<table>
<thead>
<tr>
<th>Message</th>
<th>Very clear or clear</th>
<th>Very easy or easy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low-income adults</td>
<td>Nutrition educators</td>
</tr>
<tr>
<td></td>
<td>n %</td>
<td>p value¹</td>
</tr>
<tr>
<td>Make half of your plate fruits and vegetables.</td>
<td>93 95</td>
<td>0.10</td>
</tr>
<tr>
<td>Make at least half of your grains whole grains.</td>
<td>87 89</td>
<td>0.001</td>
</tr>
<tr>
<td>Avoid oversized portions.</td>
<td>84 86</td>
<td>0.002</td>
</tr>
<tr>
<td>Enjoy your food but eat less.</td>
<td>86 88</td>
<td>0.12</td>
</tr>
<tr>
<td>Drink water instead of sugary drinks.</td>
<td>98 100</td>
<td>0.08</td>
</tr>
<tr>
<td>Switch to fat-free or low-fat 1% milk.</td>
<td>94 96</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Compare sodium in foods such as soups, breads, and frozen meals and choose the foods with lower numbers.</td>
<td>88 90</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

¹ Fisher’s exact tests; p ≤ 0.05 considered significant.
² One adult did not answer the question.
³ Two adults did not answer the question.

### Table 4. Perceptions and Interpretations of Dietary Guidelines for Americans Messages by Nutrition Educators (n = 9) and Low-Income Adults (n = 98).

<table>
<thead>
<tr>
<th>Message</th>
<th>Theme for low-income adults</th>
<th>Low-income adults’ interpretation</th>
<th>Nutrition educator perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make half of your plate fruits and vegetables.</td>
<td>Interpreted the message behavior incorrectly</td>
<td>&quot;It means we have to eat less carbohydrates and more fruits and vegetables.&quot; (Black Female #61)</td>
<td>&quot;It’s a great message. I think they understand it. But I don’t think people will do it.&quot; (Educator #1)</td>
</tr>
<tr>
<td>Make at least half of your grains whole grains.</td>
<td>Interpreted the message behavior incorrectly</td>
<td>&quot;It’s promoting people to eat whole grains, it doesn’t help people to understand what are whole grains versus not whole grains.&quot; (White Female #59)</td>
<td>&quot;Some people don’t know what whole grains are and if they like them.&quot; (Educator #4)</td>
</tr>
<tr>
<td>Avoid oversized portions.</td>
<td>Call to action; confusion about implementation</td>
<td>&quot;Avoid eating too much. I’m a little skeptical about what they mean by how much.&quot; (Hispanic Female #82)</td>
<td>&quot;I don’t think they have any clue because they don’t know what portion size is. So oversized means nothing.&quot; (Educator #4)</td>
</tr>
<tr>
<td>Enjoy your food but eat less.</td>
<td>Call to action; duplicated message</td>
<td>&quot;Kind of like the same—avoid overeating and enjoy the food that you have.&quot; (Hispanic Female #49)</td>
<td>&quot;It is understandable for my clients.&quot; (Educator #8)</td>
</tr>
<tr>
<td>Drink water instead of sugary drinks.</td>
<td>Call to action; general perceptions about water</td>
<td>&quot;Try to drink more water, which I do that.&quot; (Black Female #28)</td>
<td>&quot;One thing I have seen is that people drink more water. That has to do with the water companies and marketing.&quot; (Educator #1)</td>
</tr>
<tr>
<td>Switch to fat-free or low-fat 1% milk.</td>
<td>Perception that lower fat milk is better; barriers to acceptance of lower-fat milk</td>
<td>&quot;I tried that for six months and I was like no, I don’t like it. I buy the whole milk. It’s more fulfilling. 1% and fat-free milk is better than whole milk but it doesn’t taste better.&quot; (Black Female #53)</td>
<td>&quot;People read it because it’s missing the why, it’s not as motivating. It’s separate from the clear and maybe that’s another question down the line.&quot; (Educator #9)</td>
</tr>
<tr>
<td>Compare sodium in foods such as soups, breads, and frozen meals and choose the foods with lower numbers.</td>
<td>Interpreted the message behavior incorrectly; general perceptions about sodium</td>
<td>&quot;Sodium is not good for you and try to keep it low sodium.&quot; (White Female #5)</td>
<td>&quot;I think that one is unclear because they don’t know what the numbers are, what a lower number would be.&quot; (Educator #4)</td>
</tr>
</tbody>
</table>
In contrast to low-income adults, EFNEP educators perceived that low-income adults lacked vegetable preparation skills:

“Vegetables tend to be more of a preparation issue, they know how to prepare one or two types of vegetables, but if there’s more variety, they don’t know how to prepare it. If they lack cooking skill, they don’t feel confident in how to prepare correctly. It’s both exposure and how to prepare.” (EFNEP Educator #3)

Make at least half of your grains whole grains. Most adults reported understanding the whole grains message as either very clear or clear (89%) and that the message was easy for meal planning (84%; Table 3). However, fewer EFNEP educators reported that the whole grains message was understandable (p = 0.001) and easy for low-income adults to implement (p < 0.001; Table 3). Again, the majority of adults misinterpreted the whole grains message, similar to the fruit and vegetable message. For example, they interpreted the message as replacing all refined grain products with whole grains, misunderstood the classification of whole grain products, or just indicated that whole grains are healthy as a general interpretation of the message. The following adults’ comments help illustrate these misinterpretations:

“Exactly what is says—instead of white bread use wheat bread.” (Hispanic Female #99)

“The grains that we should eat should be whole grains, it’s the healthiest choice. You replace white bread for wheat bread. Replace the white rice for brown rice, and the cereals for multigrain cereals. I’ve been trying to do that, and more and more, it’s getting better.” (Hispanic Female #68)

“Sounds like whole grains are healthier for you.” (White Female #42)

For whole-grain behaviors, low-income adults consumed whole grain foods primarily during breakfast meals (Table 5).

“Fruits, oatmeals, whole grains, Shredded Watts, Raisin Bran, we try to eat healthy as possible, shopping the outskirts of the grocery store, we love eggs and it’s a great protein.” (Other Female #74)

In addition, sources of grains were often mainly from refined grain foods across meals and snacks for low-income adults (Table 5):

“Eggs, pancakes, bacon sometimes, bagels, muffins, Hot Pockets, waffles, and cereal. I like Honey Bunches of Oats, my youngest daughter likes the Rice Kripsy cereals, Coco Puffs. My oldest one likes Frosted Flakes.” (Black Female #13)

In regard to barriers to whole grain consumption, low-income adults perceived that whole grain foods were expensive and had negative perceptions about the taste of whole grain foods (Table 5).

“Just the same (finances). I wouldn’t want to waste my money. I’m not really big on bread. The taste and I always think I’m gonna get fat off it.” (White Female #57)

“Not the wraps, we won’t really eat those. They taste funny.” “We get it with the WIC so I eat it because I don’t like to waste food.” (White Female #56)
An additional barrier to whole grain food consumption was related to the family’s preferences of foods (Table 5).

“No. The only thing that prevents me from buying something [is] if they won’t eat it. Like if three of the five won’t eat it then I won’t make it.” (White Female #91)

EFNEP educators perceived that cost and lack of exposure were barriers to consuming whole grains by low-income adults (Table 5).

“I think the lack of education as to what a whole grain is, and the concern of the taste of it and how their families will react to it. Maybe the expense of it also may be a concern to people.” (EFNEP Educator #7)

Taste was another barrier for low-income adults to consume whole grains as perceived by EFNEP educators (Table 5):

“They don’t realize that they are healthier, they don’t like them because they are not used to the taste of them compared fully to white bread or white rolls. It’s a taste thing, and lack of exposure. For some it’s cost, or they say their kids don’t eat them so they go back to the white processed or refined products.” (EFNEP Educator #4)

Avoid oversized portions. Most adults reported understanding the message as either very clear or clear (86%; Table 3) and that the message was easy for meal planning (67%; Table 3). However, fewer EFNEP educators reported that the message was clear (p = 0.002) and easy to implement for low-income adults (p = 0.02; Table 3). When low-income adults interpreted the message, most adults indicated that the message meant “not eating too much overall.”

“Avoid eating too much. I’m a little skeptical about what do they mean by how much?” (Hispanic Female #81)

Low-income adults were also confused about appropriate portion sizes to consume, especially about specific foods. For example:

“This is a big thing because everywhere you go, everything is oversized. Like how do you cook the perfect amount for three people, you know? Like a cup of this, a cup of that, but really when people eat, they put a spoonful, some people go back for more, you know. So you wonder like, I’m having zucchini and squash with my meat tonight and I am going to have two spoonfuls, but like is that a bad or good thing you know? (White Female #95).

In addition, some adults indicated specific concerns about oversized portions and weight gain:

“Don’t want oversized portions because you’ll add on weight. That’s not good.” (Black Female #15)

Enjoy your food but eat less. Most adults reported that this message was either very clear or clear (88%) and that the message was easy for meal planning (79%). No differences were observed between low-income adults and nutrition educators regarding clarity or ease. Most low-income adults interpreted this message as a call to action, particularly drinking water instead of sugar-sweetened beverages.

“Drink a lot of water, don’t drink much from soda or something, there’s sugar inside it.” (White Female #86)

Low-income adults also viewed the message as “increasing water intake.”

“Try to drink more water, which I do that.” (Black Female #28)

Also, adults perceived that drinking water is “healthier” or “better” compared to other beverages.

“Water’s healthier. We drink a lot of water. It’s cheaper but mostly it’s healthier. It’s good for your teeth.” (White Female #12)

Switch to fat-free or low-fat 1% milk. The majority of low-income adults indicated that the milk message was very clear or clear (96%) and that the message was easy for planning family meals (80%; Table 3). Compared to low-income adults, fewer nutrition educators reported this message as very clear or clear (p < 0.001; Table 3). However, low-income adults sometimes mistakenly perceived 2% milk as low-fat milk:

“Whole milk is fattening and there’s lesser fat in 1% or 2%.” (White Female #51)

“The regular milk is fattening. I drink 2%, I went to 1% at one time and I think it was too flat. I went back to 2% but I think I’m going to try 1% again. I’m just trying to do anything that’s healthy.” (Black Female #25)

Low-income adults also reported that their children disliked the taste of lower-fat milk:

“Not to buy regular—I guess it’s bad. Even though I was buying fat-free my son says it tastes different. They can tell the difference.” (Other Female #80)

Compare sodium in foods such as soups, breads, and frozen meals and choose the foods with lower numbers. The majority of low-income adults reported that the sodium message was very clear or clear (90%) and that the message was easy to use for meal planning (74%; Table 3). However, fewer nutrition educators reported this message as being very clear or clear for low-income adults to understand (p < 0.001; Table 3). In accordance, and similar to other messages, some adults erroneously interpreted the sodium message as “decreasing sodium intake” in general rather than the specific action to compare sodium food labels and subsequently choose the lower-sodium food item.

“It’s telling me that I should really cut down on sodium.” (Black Female #18)

Low-income adults also had negative but unclear perceptions about the sodium content in foods.

“The same as the last one. I like the other one better. This one is a little less clear. Smaller meals.” (White Female #2)

Drink water instead of sugary drinks. The majority of low-income adults reported understanding the message as either very clear or clear (98%) and that the message was easy for planning meals (93%; Table 3). No differences were observed between low-income adults and nutrition educators regarding clarity or ease. Most low-income adults interpreted this message as a call to action, particularly drinking water instead of sugar-sweetened beverages.”

"Drink a lot of water, don’t drink much from soda or something, there’s sugar inside it.” (White Female #86)

Low-income adults also viewed the message as “increasing water intake.”

"Try to drink more water, which I do that.” (Black Female #28)

Also, adults perceived that drinking water is “healthier” or “better” compared to other beverages.

"Water’s healthier. We drink a lot of water. It’s cheaper but mostly it’s healthier. It’s good for your teeth.” (White Female #12)

Switch to fat-free or low-fat 1% milk. The majority of low-income adults indicated that the milk message was very clear or clear (96%) and that the message was easy for planning family meals (80%; Table 3). Compared to low-income adults, fewer nutrition educators reported this message as very clear or clear (p < 0.001; Table 3). However, low-income adults sometimes mistakenly perceived 2% milk as low-fat milk:

"Whole milk is fattening and there’s lesser fat in 1% or 2%.” (White Female #51)

"The regular milk is fattening. I drink 2%, I went to 1% at one time and I think it was too flat. I went back to 2% but I think I’m going to try 1% again. I’m just trying to do anything that’s healthy.” (Black Female #25)

Low-income adults also reported that their children disliked the taste of lower-fat milk:

"Not to buy regular—I guess it’s bad. Even though I was buying fat-free my son says it tastes different. They can tell the difference.” (Other Female #80)

Compare sodium in foods such as soups, breads, and frozen meals and choose the foods with lower numbers. The majority of low-income adults reported that the sodium message was very clear or clear (90%) and that the message was easy to use for meal planning (74%; Table 3). However, fewer nutrition educators reported this message as being very clear or clear for low-income adults to understand (p < 0.001; Table 3). In accordance, and similar to other messages, some adults erroneously interpreted the sodium message as “decreasing sodium intake” in general rather than the specific action to compare sodium food labels and subsequently choose the lower-sodium food item.

"It’s telling me that I should really cut down on sodium.” (Black Female #18)
“The higher the sodium is not too good. It should be the lesser the better.” (Hispanic Female #75)

In addition, low-income adults discussed the health implications of consuming sodium.

“Yes, I am aware of that because sodium gives you kidney disease, different types of high blood pressures, so I am concerned about that. In a lot of canned products, the sodium is so high, it’s ridiculous so it’s an important message.” (Hispanic Female #68)

Discussion

Nutrition and health messages have the potential to encourage individuals to make dietary changes to impact their health. With rising overweight and obesity rates in the United States, the 2010 DGA introduced consumer messages that were not previously thoroughly tested in low-income populations. The subsequent DGA consumer messages released in 2015 with indications of some minimal testing and a communicator’s guide was developed to assist practitioners in creating nutrition education materials based on the messages (14). However, according to the present study, while low-income adults indicated that they understood and were able to implement the DGA messages, frequent misinterpretation of the DGA messages was evident. Consistent with a previous study examining nutrition or child obesity prevention messages, parents misinterpreted the intended message or directed behavior (15). Specifically, when participants were asked whether they understood the message and/or reported that it was easy to implement, their interpretations of the messages frequently indicated that they did not actually fully understand the message or were not implementing it correctly (15). In accordance, EFNEP educators perceived for most DGA messages that low-income adults did not understand the messages and that the level of implementation was difficult. Since the nutrition educators work directly with low-income families during nutrition education lessons, they understand the challenges that the families face.

Low-income adults and EFNEP educators had similar perceptions regarding the barriers to fruit, vegetable, and whole grain consumption. These barriers such as perceived cost were sometimes related to factors beyond individual knowledge or education. Cost barriers for fruit and vegetable intake were also reported in another study (16). However, other studies reported other major barriers including lack of availability and access, quality, and transportation (16). Barriers to whole grain intake were related to taste and cost, similar to findings reported in the general population (17). Future nutrition education and messaging efforts should address strategies of overcoming these barriers to promote consumption of these plant-based food groups. In addition, policies addressing availability and affordability of these foods are additional needs to address for helping improve plant-based food group consumption.

According to the in-depth interview results, messages misinterpreted most frequently were on topics such as sodium, fruit and vegetables, portions, and whole grain intake. For example, often participants did not interpret the sodium and fruit and vegetable messages as action messages to engage in a particular behavior but rather just general recommendations to reduce sodium and acknowledge the healthfulness of fruit and vegetables. This is similar to another qualitative study examining the understanding of common childhood obesity prevention messages among low-income mothers (18). Hispanic and black mothers interpreted the message “eat more fruits and vegetables” as “good for you” or “healthy,” while white mothers indicated that fruits and vegetables are substituted for unhealthy foods (18).

While many low-income parents associated the sodium message with reading food labels as it is actually intended, they did not elaborate further about how to read the sodium content. Some parents also believed that the message meant to lower sodium intake in general, while other parents interpreted the message as sodium content in foods being high. One study examining label reading in primary care patients observed that being low-income and black was associated with low performance on reading nutrition labels (19). In another study, a lower percentage of individuals with lower education and income levels used the Nutrition Facts label compared to those with higher education and income levels (20). Specific to the sodium DGA message, further evaluation of the sodium recommendation and understanding of the percentage daily values listed on the Nutrition Facts label should be assessed in further studies in low-income adults if the message is retained. Labeling strategies that are feasible for consumers, such as traffic light labeling (21), could also help reduce the challenge of trying to interpret sodium content by using representative colors such as red to indicate high sodium content of the product and green to indicate low sodium content.

Another notable finding was related to the message about dairy. While parents understood the message about switching to lower-fat milk, some reported being unable to implement this message due to barriers such as lactose intolerance, dislike for the taste of lower-fat milk, and children drinking primarily whole milk in the household. These results are consistent with another study investigating barriers related to milk consumption in a low-income population (22). Future suggestions addressing milk consumption in DGA messages should consider tailored and multiple messages addressing lactose intolerance, appropriate milk type recommendations for children aged 1 to 2 years, and addressing taste preferences.

The DGA message deemed most problematic in its interpretation by low-income adults was the whole grains message “to make half of your grains whole grains.” Several barriers to whole grain consumption have been previously identified, including the taste and appearance of whole grain foods, challenges in changing dietary habits, and lack of preparation skills (17). Moreover, the ability to properly identify whole grains is another reported barrier to whole grain consumption (23). Because Americans are far from meeting the recommendation for whole grain foods (24), nutrition messaging and educational resources should focus on the behaviors that promote or enhance whole grain
intake that are both understandable and culturally relevant to populations.

When asked about fruit and vegetable consumption, low-income adults reported that they consumed fruit during breakfast and as a snack, while vegetables were consumed primarily during lunch, dinner, and snacks. This is consistent with other findings reported in the general population (25). In contrast, the majority of low-income adults self-reported consuming the adequate whole grains per day. However, previous studies have found that whole-grain food consumption among low-income populations were well below the recommendations (26), therefore indicating a possible overestimation of whole grain intake most likely due to the inability to identify whole grain foods. When reported, low-income adults most often consumed whole grain foods during breakfast. This finding is also similar to the general population consumption of whole grain foods which is primarily hot or cold cereal during breakfast (27). These findings are important when considering how to frame messages and opportunities to increase intake of fruit, vegetables, and whole grains during meal and snack times for low-income families.

For opportunities to improve consumption, both low-income adults and EFNEP educators mentioned resources in the community such as WIC and farmer’s markets for accessibility and affordability of fruits, vegetables, and whole grains, which relate back to the community and policy level influence in the socioecological model. Prior studies have demonstrated an association between farmer’s market access and fruit and vegetable intake (28). Moreover, recent changes to the WIC program help promote consumption of fruits, vegetables, and whole grains by providing vouchers for these foods, while WIC-authorized stores are required to carry these products (29). Recent research investigating the impacts of these changes to the WIC food package reported improved availability and variety of these foods in both WIC-authorized and non-WIC-authorized convenience and grocery stores (30). Another study that evaluated the impact of these changes reported that WIC clients increased intake of these plant-based food groups (31). Future nutrition education efforts, resources, and messages, through use of print materials and technology, should consider tailoring information for consumers as cues about obtaining affordable plant-based foods in stores, retail settings, and food pantries.

Strengths of the study include the mixed methods design and large sample size of an underserved population particularly for a project with a large qualitative component. Limitations include the inability to extrapolate results to all low-income populations outside of the geographic area where the study was conducted. Further, actual implementation of the messages by low-income adults and rigorous methods to assess dietary intake were not evaluated or utilized.

Conclusions

The Dietary Guidelines Advisory Committee Reports, used as a basis to develop the recommendations for the DGA, are currently lacking research about the utilization and impact of the DGA consumer messages and materials disseminated through the MyPlate website, schools, and community agencies. Additional research is needed, especially about how individuals from different ethnic/racial groups, age groups, and income and education levels interpret, implement, and understand the DGA consumer messages and materials. Unfortunately, the updated consumer messages (Table 1) in the 2015 DGA are not necessarily reflective of changes that may be needed. Recently, a panel of experts who work with low-income adults was convened to prioritize a set of nutrition messages based on the DGAs to be used by national programs such as EFNEP (32). The report recognized the need to use food-focused messages rather than nutrient-focused messages and identified two overarching and eight specific messages to prioritize for outreach with low-income populations. However, the messages that were prioritized have not been thoroughly tested with low-income adults; thus, the expected impact of the messages is unclear.

Overall, findings from this study and other studies indicate that low-income individuals have difficulty following the DGA (33) and corresponding nutrition messages. Previous recommendations suggest that nutrition messages should be communicated in a scientifically precise, practical, and motivating manner for positive dietary changes to occur (34). Current guidance from the U.S. Department of Agriculture (USDA) further recognizes the importance of “knowing your audience, tailoring messages to your audience, using plain language, considering health literacy, and working with partners to maximize impact” (35). While a Communicator’s Guide (14) is available from the USDA to guide nutrition and health professionals on their use of DGA materials and messages, further actual in-depth testing of the DGA consumer messages is needed. Nutrition educators can further translate and adapt DGA messages for their audience’s needs but, the top line DGA consumer messages are currently incorporated into stand-alone educational materials available to the public and health professionals, thereby risking misinterpretation and confusion by consumers. Future research should identify strategies to eliminate the disconnect between message perception and implementation by consumers through the use of new communication tools or strategies to develop feasible and impactful messages that complement the DGA and resonate with low-income adults while considering the multiple influences on dietary behavior.

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