

Evaluating MyPlate: An Expanded Framework Using Traditional and Nontraditional Metrics for Assessing Health Communication Campaigns

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ABSTRACT

MyPlate, the icon and multimodal communication plan developed for the 2010 Dietary Guidelines for Americans (DGA), provides an opportunity to consider new approaches to evaluating the effectiveness of communication initiatives. A review of indicators used in assessments for previous DGA communication initiatives finds gaps in accounting for important intermediate and long-term outcomes. This evaluation framework for the MyPlate Communications Initiative builds on well-known and underused models and theories to propose a wide breadth of observations, outputs, and outcomes that can contribute to a fuller assessment of effectiveness. Two areas are suggested to focus evaluation efforts in order to advance understanding of the effectiveness of the MyPlate Communications Initiative: understanding the extent to which messages and products from the initiative are associated with positive changes in social norms toward the desired behaviors, and strategies to increase the effectiveness of communications about DGA in vulnerable populations.

Key Words: MyPlate, dietary guidelines, health communication, program evaluation, nutrition policy (*J Nutr Educ Behav.* 2012;44:S2–S12.)

INTRODUCTION

In June, 2011, the MyPlate icon and its supporting multicomponent communications plan were unveiled by the United States Department of Agriculture (USDA) Center for Nutrition Policy and Promotion (CNPP) as a platform to support the translation of the 2010 Dietary Guidelines for Americans (DGA).¹ MyPlate replaces MyPyramid as USDA's healthy eating communications initiative. Like its predecessors, the Food Guide Pyramid and MyPyramid, MyPlate illustrates the food groups and is supported by communication tools and materials that underlie the DGA. However, according to USDA, MyPlate is a substantial communications departure from the previous approach. The Pyramid was

designed to be a teaching tool to communicate the DGA as a whole and represented what and how much to eat over the course of a day. In contrast, the MyPlate icon is "a simple, yet powerful, visual cue to prompt consumers to think about their food choices across food groups and to build a healthy plate at meal times."² To that end, MyPlate is part of a multimodal communication strategy that includes the MyPlate Web site with the SuperTracker tool to personalize food plans, consumer educational materials and e-tools, social media engagement, and a partnership initiative to help coordinate and disseminate consistent messages of the DGA.^{1,3}

The MyPlate initiative has been designed for maximum visibility. Like the USDA efforts that preceded it,

MyPlate will be incorporated into health curriculum resources created for nutrition education purposes for children and adults, translated into several languages, and promoted by nutrition communicators, educators, and the food industry. The MyPlate communications initiative also shares with its predecessors high expectations for performance, and the evaluation of its effectiveness will be challenging—an aspect shared by all health communication campaigns. Evaluation must be appropriate for its intended use and realistic based on the stage of the communications initiative. Yet with constant scrutiny of monies allocated for health education,⁴ communication researchers need to demonstrate the worthiness of interventions, especially when communication plan components have indirect connections to long-term goals. Indeed, when it comes time to re-examine the DGA and the communication tactics, how will researchers know whether the MyPlate initiative is effective? How will the initiative's success be measured, and over what period of time?

The objective of this manuscript is to propose a framework for evaluating the DGA communications initiative,

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST AND FUNDING/SUPPORT: See page S10.

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including the MyPlate icon, the concepts of which can be applied to other health communication efforts designed for the general population. It is hoped that the framework will stimulate various approaches to evaluating the effectiveness of the DGA communication and highlight the importance of even small changes that occur before long-term goals are reached, for example, changes in perceptions of what a healthy amount of meat looks like for a meal. This process will, in turn, *inform improvement of the initiative* and provide a wider toolbox to *share lessons learned*. To build the case for the framework, the next section summarizes challenges of evaluating health communication campaigns and shows how communication initiatives built around DGA serve as good case studies. This section is followed by the proposed framework for evaluating the MyPlate communication initiative and a discussion on considerations for acceptable evidence of effectiveness in health communications. Finally, applications for the framework are suggested, focusing on areas that would advance understanding of the effectiveness of the 2010 DGA communications initiative.

Health Communication Evaluation Challenges

Hornik notes “evaluations of public health communication programs will rarely produce the unequivocal evidence promised in randomized controlled trials of pills.”⁵ This truism can be explained by 3 main observations. First, many consider behavioral changes the most important outcome of communication campaigns, but communication most frequently works as an indirect contributor to behavior change outcomes.⁶⁻⁸ For example, seat belt use was aided by messages featuring car crash dummies, but real change came about through incentives from insurance companies and “click it or ticket” regulations, which were also influenced by communication to industry and policy makers.⁹

Second, in interventions that find evidence of behavior change attributed to communication, the magnitude of the effects is much smaller

than those observed in medical trials. This finding was illustrated by Snyder's systematic analysis of health campaigns, which yielded an average effect size of about 5 percentage points.¹⁰ Although often seen as insufficient among critics, small effect sizes, she argues, can actually have a big impact at the population level, particularly in dietary health.

Finally, messages need substantive exposure and sufficient time to work, yet many health communication campaigns cannot achieve the level of saturation needed to produce measurable results.¹¹ Real change, like that seen in seat belt use, is typically measured over decades, whereas most behavioral researchers can hope to secure funding for only 3-5 years.

The Food Guide Pyramid and its successor MyPyramid serve as good illustrations of these challenges. Both graphics benefitted from formative research, especially the communication plan for the MyPyramid infographic symbol, corresponding consumer messages, and Web content.^{12,13} However, evaluation efforts were scarce, and measures that were reported relied on only a few indicators, as will be discussed in more detail below. Published findings indicate that many Americans report recognizing the Pyramid and having knowledge of its specific recommendations.^{12,14} In fact, the criterion that most use to judge the effectiveness of communication about the DGA is dietary quality among Americans, which did not improve during the 2-decade reign of the Pyramid.^{8,15,16} Regardless of whether dietary intake is the best measure of effectiveness, the lack of information on other, intermediate outcomes raises questions that can be better addressed within an evaluation framework. For example, what explains the apparent ineffectiveness of MyPyramid and its communications? Was it overly complex? Did it send misleading messages, such as “all fats are bad,” as was reported during news coverage of the MyPlate launch?^{17,18} Despite a lack of information on why, how, and with whom the MyPyramid communications needed improvement, an expert roundtable assembled after the release of the 2010 DGA reached consensus that “consumer messages

around nutrition and especially weight loss need to be even simpler than the past communications of the DGA.”⁸

MyPlate Communication Initiative

In response to the perceived shortcomings of the MyPyramid communications, health professionals hope that the MyPlate icon and corresponding communications will better bridge the gap between knowledge and behavior. The agency with primary responsibility for setting nutrition policy for USDA and its nutrition promotion, USDA's CNPP, developed a comprehensive communication initiative to disseminate the key messages of the DGA for optimal use, and it set goals and objectives for the effort within the scope of theory-based communication interventions. The goal of the initiative is “to support Americans in building healthy diets.”¹ The USDA will try to accomplish this goal by “providing an easy-to-understand icon that will help deliver a series of healthy eating messages that highlight key consumer actions based on the 2010 DGA” and “empowering people with information they need to make healthy food choices.”¹

Toward these objectives, the USDA CNPP designed the MyPlate icon to be a visual cue prompting consumers to build healthy plates at meal times.² The plate icon with the 5 food groups it symbolizes (fruit, vegetables, grains, protein food, and dairy food), along with a new Web site, were pretested for comprehension and overall appeal, as were the 7 key selected messages, prioritized from 16 tested messages.¹⁹ The icon and communications initiative that supports MyPlate includes a comprehensive Web site with interactive features and resources for educators, health professionals, and consumers to put the messages into practice, and 2 other elements supported by communication theory. The first element is a plan to release 1 key message at a time through multiple channels to help ensure maximum exposure, raising awareness and building a foundation for subsequent messages.³ The second feature is a 2-level partnership

plan to help disseminate the messages through a wide range of like-minded groups and institutions with close proximity to the public.

Although using partners to amplify exposure and reach for public health messages can be beneficial,²⁰⁻²² the MyPyramid initiative was criticized for its over-reliance on industry sources, which could weaken the validity of the message.²³ The "Community Partner" level is open to all who wish to help spread the word through their communication vehicles; at the time of writing, the Web site to sign on as a Community Partner counted over 6,000 individuals and organizations. Organizations committed at the "National Partner" level, which includes over 85 representatives from health associations, research and professional organizations, food service and restaurant chains, the food industry, food retailers, and media with missions consistent with the USDA's, provide in-kind resources to further the success of the communication initiative.²⁴

Why Develop an Evaluation Framework for the MyPlate Communications Initiative?

Grounded in evidence-based nutrition science and pretested for optimal usability, the USDA CNPP used sound practices to create the MyPlate initiative.¹⁹ However, current options available for evaluating its effectiveness are limited. Findings can be gleaned from national databases, including the National Health and Nutrition Examination Survey,²⁵ the Healthy Eating Index,²⁶ the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System,²⁷ as well as the International Food Information Council Foundation's annual Food and Health Survey.¹⁴ Proprietary sources of data, such as Porter Novelli's HealthStyles,²⁸ Gallup-Healthway's Well-Being Index,²⁹ and panel data managed by the NDP Group,³⁰ may provide additional information. Specific questions that have been used for previous DGA communication initiatives from nonproprietary instruments are presented in Table 1.

A quick survey of this compilation shows it taps a limited set of constructs. Most items ask about aware-

ness of the DGA and/or MyPyramid, or they alternatively tap the anticipated long-term outcomes—food consumption (eg, how many fruits and vegetables consumed) and measures of obesity. These data are undisputedly important, but they are insufficient to ascertain what works and what needs improvement. As discussed earlier, food consumption and obesity are, at best, uncertain measures of communication effectiveness because changes in these outcomes cannot be attributed exclusively to the communications; rather, they result from multiple determinants including policy and environment. It is further suggested that careful tracking of contributing factors along a more comprehensive causal pathway can help identify promising elements that can best contribute to MyPlate communications plan goals, which can also be leveraged in communication initiatives or campaigns of related intent.

The limited measures available from ongoing national surveys provides an opportunity for partners of the MyPlate initiative and academic institutions to help evaluate the campaign through independent research. The MyPlate effort also offers a new opportunity for partnering organizations and nutrition and health educators to contribute to a pool of knowledge that will help develop and refine evaluation measures of large health communication initiatives. To that end, a framework is presented to help visualize the breadth of interventions and observations that can contribute to a fuller evaluation of campaign effectiveness.

A PROPOSED EVALUATION FRAMEWORK FOR THE MYPLATE COMMUNICATION INITIATIVE

The primary goal of this comprehensive, use-focused evaluation framework, illustrated in the Figure, is to encourage consideration of a wide perspective of evidence when health communicators seek to measure effectiveness of MyPlate and other health communication initiatives. A multifaceted evaluation framework is pro-

posed that invites qualitative and quantitative research methods to measure both communications implementation and outcomes. With this approach, health communicators can better identify the links between program inputs, activities, and outcomes that can guide communications improvement and help to assess the overall effectiveness of the initiative.

The terms "framework" and "model" are sometimes used interchangeably, but for the purpose of this article, a framework is defined as a rubric to provide a common set of variables to use in the design, collection, analysis, and application of findings.³¹ As described by Ostrom, "Without a common framework to organize findings, isolated knowledge does not cumulate." Models for health education research and practice are defined as causal linkages among a set of concepts; models are often informed by more than 1 theory, as well as by empirical findings.³² To use a familiar and fitting metaphor, frameworks have been compared to maps that show the lay of the land, theories represent the highways and routes that lead to the destination, and models use 1 or more theories as the preferred route. For the purposes of this illustration, the institutions that shape recommendations and the communities in which people interact can be compared to the cities and landmarks that mark progress. Observations at each of these levels will all contribute toward a collective pattern of "what works."

The framework is composed of well-tested elements in the field of health interventions. The structure of a logic model is used to organize the major components into possible sources of data and the context from which information will be derived (inputs), anticipated interventions (activities), and expected outcomes. The consensus of an expert panel convened at the CDC posits that campaign planners should use their logic model to identify issues of relevance to specific audiences (current beliefs, practices, group identification) before education efforts commence.⁶ Messages should then be tailored to meet the needs of unique segments of the population.

Major classifications of research—formative, process, outcome research—are also represented in the model and inform each key component of the logic

Table 1. National Data Collection Vehicles for Monitoring Previous Dietary Guidelines for Americans (DGA) and Related Initiatives

Data Collection Instrument	DGA Indicators and Sample Measures ^{a,b}	Notes
Federal/state data collections		
National Health and Nutrition Examination Survey (NHANES) ²⁵	Food consumption: How often did (you) drink any type of milk, including milk added to cereal? Overweight and obesity: Assessment using height and weight. How much did you weigh 1 year ago? Ten years ago? At 25 years of age?	Annual survey combining interviews and laboratory tests, n = 5,000, administered annually since 1999.
Flexible Consumer Behavior Survey ⁷²	Awareness of DGA icon/communication plan: Have you heard of MyPyramid? Use of DGA messages: Have you looked up the MyPyramid plan for a (man/woman/person) your age on the Internet? Have you tried to follow the (MyPyramid plan/Pyramid plan) recommended for you? Knowledge of DGA: How many ounces of meat and beans would you say a (man/woman) of your age and physical activity should eat each day for good health?	Added to the National Health and Nutrition Examination Survey 2007-2008, 2009-2010.
Behavioral Risk Factor Surveillance System ²⁷	Food consumption: How often (does your family/do you) have any of these dark green vegetables available at home? This includes fresh, dried, canned, and frozen vegetables. Awareness of DGA icon/communication plan: Have you heard about the US Department of Agriculture's Food Guide Pyramid? ⁷³ Fruit and vegetable consumption: ^c During the past month, how many times per day, week, or month did you eat orange-colored vegetables such as sweet potatoes, pumpkin, winter squash, or carrots?	State-based system of surveys; more than 350,000 interviewed annually by telephone; separate modules for states.
Youth Risk Behavior Surveillance System ⁷⁴	Overweight and obesity: Assessment using self-reported height and weight. Fruit and vegetable consumption: During the past 7 days, how many times did you eat fruit? Overweight and obesity: Assessment using self-reported height and weight.	Conducted every other year. Includes a national school-based survey conducted by the CDC (n > 16,000 in 2009) in addition to state, territorial, tribal, and local surveys.
Healthy Eating Index-2005 ^{d,26}	Diet quality: Food intake or availability in conformance with Federal dietary guidance recommendations.	US population scores use the most recent NHANES data available when the HEI is analyzed; scores have been provided for subpopulations including older adults, children, and populations served by food assistance programs.
California Health Interview Survey ⁷⁵	Food consumption: During the past month, how many times did you eat fruit? Do not count juices. Overweight and obesity: Assessment using self-reported height and weight.	Collected from > 50,000 individuals every other year since 2001.
Nongovernment data collections		
International Food Information Council Food and Health Survey ¹⁴	Familiarity with DGA and MyPyramid: Which of the following best describes your familiarity with the DGA, which are the US government-approved food and nutrition guidelines? Intention to act on specific guidelines: Which specific guideline are you most interested in personally adopting?	Web survey, n = 1,000, conducted annually since 2006.
Porter Novelli Styles ²⁸	Exposure to DGA: Where, if at all, have you seen Dietary Guidelines information? Food and beverage consumption; fruit and vegetable consumption; healthy eating intent; nutrients respondents try to consume/avoid; familiarity with the DGA (2010); DGA importance (2010); motivations to eat healthy. ^e	Conducted by Porter Novelli since 1995, fielded three times per year, n = 6000 for Spring survey and n = 4000 each for Summer and Fall surveys.
Well-Being Index ²⁹	Food consumption; overweight and obesity. ^e	Daily survey n = 1,000/d conducted by Gallup-Healthways since 2008.
NDP Group, Inc. National Eating Trends Panel Data ³⁰	Food consumption. ^e	National Eating Trends panel data has been collected since 1980; monitors eating and drinking habits of thousands of consumers.

CDC indicates Centers for Disease Control and Prevention; HEI, Healthy Eating Index; US, United States.

^aDGA indicators and measures reported are examples. Other measures were also used for assessment; ^bDGA indicators are bolded; ^cIn core questions on the Behavioral Risk Factor Surveillance System every other year; ^dAt the time of writing the HEI was being revised to reflect the 2010 DGA; ^eProprietary data, individual questions are added by licensing organizations.

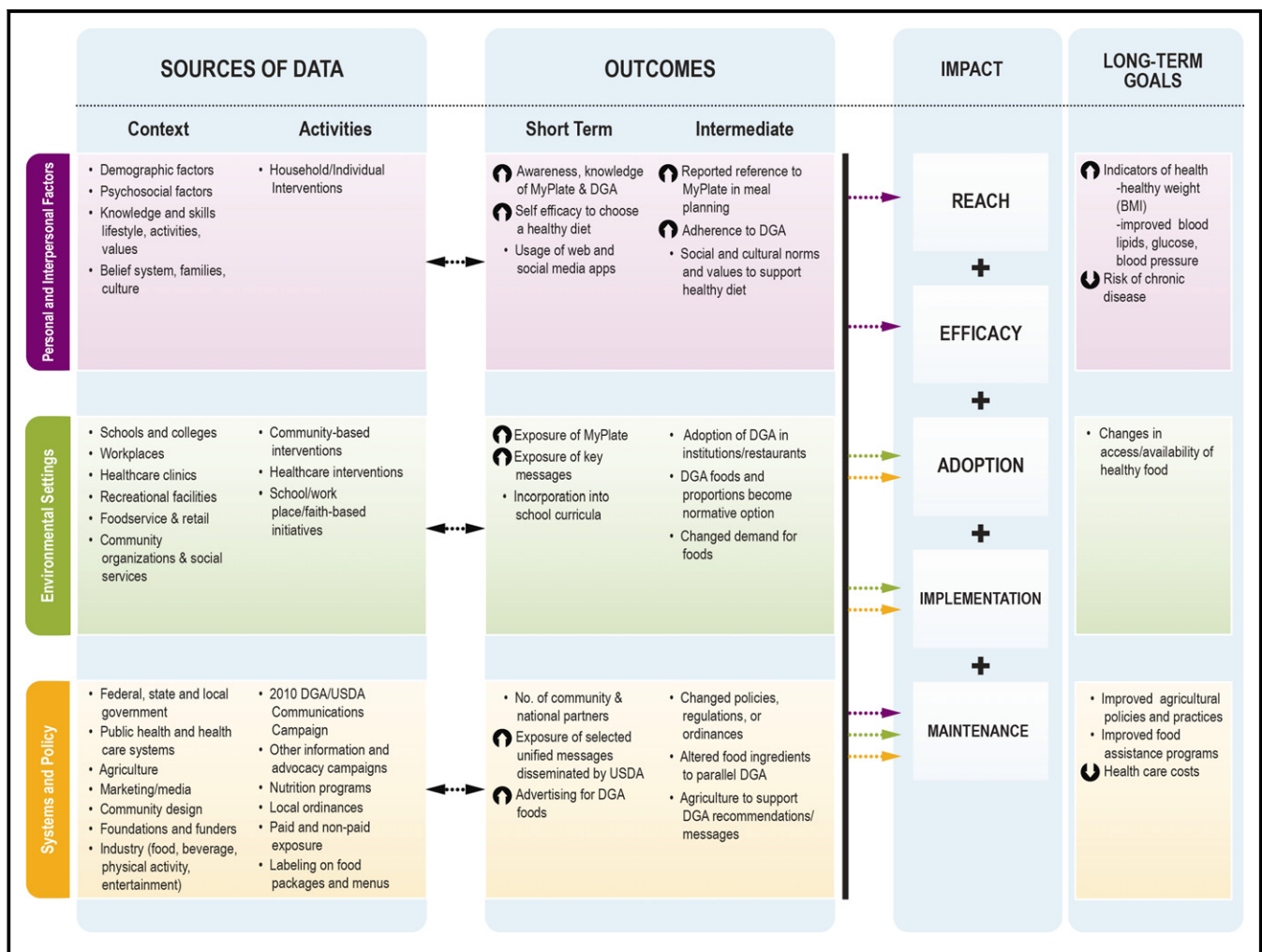


Figure. Evaluation framework for the MyPlate communication initiative. BMI indicates body mass index; DGA, Dietary Guidelines for Americans; USDA, United States Department of Agriculture.

model. Examples of specific questions related to the use-focused evaluation are presented in Table 2.

Formative research assesses the potential feasibility and desirability of planned program inputs within the context of the resources that the MyPlate communications initiative can leverage to achieve its goals. Formative research uses qualitative and quantitative research to obtain stakeholder feedback on knowledge, beliefs, attitudes and practices, motivators and barriers to desired outcomes, specific activities or outputs planned for the campaign, and baseline information to measure change for specific audiences. It is often an iterative process of revising and soliciting further feedback within the constraints of the research timeframe and resources. The USDA conducted formative research to develop the

icon and the messages that support it from the DGA,¹⁹ however, it is expected that more formative research will be forthcoming to tailor the use of MyPlate and other communication inputs for special populations, as well as to make the best use of emerging or changing resources (eg, partnerships, new media applications).

Process evaluation is conceptualized under the "activities" header in the framework, and focuses on the implementation of the initiative, assessing the extent to which all program activities (outputs) are being conducted as planned. The systematic collection of process information over time will help the MyPlate initiative and USDA partners to modify components and activities as needed. Research efforts should be designed to answer questions such as: Is the initiative being implemented as intended? Is it

reaching intended audiences? Have external factors (policy and other environmental factors that might influence nutrition patterns) emerged during the communication period? Which components are showing most promise? Are there communication plan elements that need to be altered in some way or even eliminated altogether? Are community-level partners receiving the materials and support they need to educate populations of special interest?

Outcome research allows identification of links between communication components and desired outcomes in both audience knowledge and dietary behaviors. This research will enable researchers to answer questions such as: What are the short-term, intermediate, and long-term outcomes of the initiative? Are desired outcomes being reached and, and to what extent?

Table 2. Sample Research Questions for a Use-Based Approach to Evaluation Research

		Research Type	
Levels of Influence	Formative	Process	Outcome
Personal/ interpersonal	What social media tools designed to communicate MyPlate initiative-related messages are desired and would be used by targeted populations?	How many MyPlate initiative social media tools have been developed? How often are MyPlate initiative social media tools used by targeted populations?	Have social media tools influenced knowledge/ awareness of MyPlate initiative-related messages?
Environmental	How can MyPlate initiative-related messages best be incorporated into the school system (eg, school cafeteria)?	What proportion of institutions—schools, pre-school and after-school programs—have adopted MyPlate initiative-related materials/messages?	To what extent have schools adopted DGA recommendations? (eg, has dietary quality of menus for schools improved?) Is successful implementation and adoption of DGA in schools associated with improvements in children's dietary intake?
Systems and policy	What are the costs and benefits of agribusiness to align systems and policies to support wide adoption and maintenance of DGA?	To what extent have agribusiness and manufacturers changed food ingredients to reflect DGAs?	To what extent are changes in agribusiness and policy to support adoption of DGA associated with improved dietary quality, decreased prevalence of overweight and obesity, and decreased health care costs?
DGA indicates Dietary Guidelines for Americans. Note: Selected questions are presented as examples; this is not an exhaustive list.			

As discussed earlier, a goal of the framework is to expand knowledge of important intermediate outcomes, such as changes in self-efficacy for choosing healthy food, or the number and quality of organizational partnerships that promote the messages that support MyPlate. The intermediate outcomes not only contribute to desired long-term outcomes, but they can be identified as short-term campaign successes in and of themselves. The framework illustrates that combining process and outcome measures widens the range of factors contributing to program successes and failures.

Another overarching structure incorporated into the framework is the socio-ecological (SE) model, which is referenced widely with respect to influences on food choices and was notably used in the development of the DGA. The SE model provided organizing frameworks for systematic reviews conducted by Contento and by Thomson.^{7,33} Story et al based approaches to healthy food environments on the SE model,³⁴

and Medeiros et al used the SE model to develop a logic model for community nutrition education.³⁵ The inclusion of the SE model in the proposed evaluation framework for the MyPlate communications initiative acknowledges many levels of influence affecting food choices, including individual, household, and community dynamics; work and school environments; access to healthy food; policies; and market forces. The SE model populates each of the components of the framework with examples specific to the MyPlate initiative.

In arguing for the importance of program theory, Contento presents evidence gleaned from over 300 nutrition-related communication studies, which suggest that “nutrition education is more likely to be effective when it ... systematically links relevant theory, research and practice.”⁷ Thus, the major constructs within each level of the framework are derived from theories of behavior change, including the Health Belief Model,³⁶ the Theory of Reasoned

Action,³⁷ and the Theory of Planned Behavior³⁸ for studies at the personal and interpersonal level. Theories that are useful at the levels of environmental settings include Social Cognitive Theory and Diffusion of Innovations.^{39,40} Reciprocal determinism, a concept from Social Cognitive Theory that acknowledges continuous interactions between personal factors and the environment, is illustrated in the framework (Figure) with arrows depicting multiple interactions that can be realized for favorable behavior change to occur. This concept was also noted by Contento, who emphasized that interactions between biological, behavioral, and environmental factors are at play in diet-related health.⁷ An expert panel assembled by the CDC also noted that some mass media communication efforts “reverberate at multiple levels of the sociopolitical environment” and thus may change the context within which individuals receive and process campaign messages.⁶ In fact, as discussed below, altering social

norms and popular culture around dietary attitudes, beliefs, and ultimately behaviors is a desired consequence of the MyPlate initiative.

At the systems and policy level, theories can be used to assess leveraging of public and political will. These theories include Framing Theory, for which framing is defined as “the process by which people develop a particular conceptualization of an issue or reorient their thinking about an issue.”⁴¹ Framing theory can be used with other communication theories to examine how changes in the presentation of an issue or an event can produce (sometimes large) changes of opinion. Logic models, sometimes called “theories of change models” are also used at this level to help visualize how resources and strategies can be used to achieve change.⁴²

In order to help describe the range of possible outcomes that can result from a communications initiative as far-reaching as MyPlate, the RE-AIM dimensions of reach, efficacy, adoption, implementation, and maintenance developed by Glasgow and colleagues could be used.⁴³ The reach and efficacy dimensions capture desired impact at the personal/interpersonal level. Reach refers to the proportion of the target audience that was exposed to DGA and MyPlate-related communications, and efficacy refers to the rate of “success,” which can include behavior change, among those who were exposed if the guidelines were implemented as intended. The dimensions of adoption and implementation capture impact at the environmental and system/policy levels. Adoption refers to the proportion of settings, such as worksites, health departments, or communities that adopt the MyPlate-related messages. Implementation refers to the extent to which the intervention is executed as intended in the real world. Maintenance refers to the extent to which MyPlate-related messages and guidelines are sustained over time. This dimension acts at the personal/interpersonal level and at the systems and policy level. All are crucial constructs for evaluating programs intended for wide-scale dissemination. Although the evaluation framework is not designed to accommodate scoring or quantifying the outcomes of the

MyPlate communication initiative to compare with other programs, as has been suggested by Glasgow et al,⁴³ RE-AIM dimensions, or similar models that focus on overall population-based impact, are useful in their full assessment of strengths and limitations of public health interventions.

So how *does* one evaluate success for an iconic communication initiative? A multifaceted framework expands the paradigm for determining communications “success” beyond a singular focus on positive behavior changes. In retrospect, MyPyramid could have been said to be successful in dimensions of reach to individuals and adaptation by institutions, but not in other dimensions that are needed to achieve the anticipated outcomes from increased dietary quality. Although communication campaigns can contribute meaningfully to long-term outcomes,¹⁰ this framework illustrates that success may also be found in small, positive changes at each level of the socio-ecological model and within intermediate outcomes. Also, it is hoped that the proposed evaluation framework will enhance evidence of success for the key purposes of health communication initiatives—to raise awareness, increase knowledge of benefits and risks, shape attitudes, heighten self-efficacy toward desired actions, and motivate healthful behaviors.

The framework also helps identify how success for MyPlate communications (or lack of success) depends on the context of “upstream” factors and the “downstream” effects. Upstream factors are those that contribute to adverse health practices, such as low health literacy or poor socioeconomic conditions, whereas downstream refers to interventions that aim to change adverse behaviors.⁴⁴ As discussed below in more detail, it is equally important to understand the mediating effects of upstream factors on downstream effects of MyPlate communications.

This explanation does not mean that health communications have been without frameworks. Rather, frameworks can and must evolve over time, in the same way that behavior change theories such as Social Cognitive Theory³⁹ and Theory of Reasoned Action³⁷ can be considered

evolutionary refinements of the basic knowledge-attitude-behavior model.

DEFINING EVIDENCE IN EVIDENCE-BASED HEALTH COMMUNICATION EVALUATION

Not surprisingly, there are more structures and processes in place for advancing nutrition science than there are for the art and science of nutrition communication. Frameworks for medical science have evolved to optimize evidence-based findings. Several organizations for nutrition professionals, such as the Academy of Nutrition and Dietetics, American Society for Parenteral and Enteral Nutrition, and health and medical research agencies including the United States Agency for HealthCare Research and Quality, the Cochrane Collaboration, and the Natural Standard Research Collaboration, have published evidence-based practice guidelines.⁴⁵⁻⁴⁹ Recommendations from the Dietary Guidelines for Americans Advisory Committee are, appropriately, evidence based. However, no such “evidence-based” or even “practice-based” report exists as it relates to what works for communicating the DGA and/or MyPlate to change consumer dietary behavior. According to the roundtable discussion summarized by Rowe et al, USDA and other government agencies “apply [the] equivalent of clinical judgment” to develop consumer guidance and implementation tools.⁸

Swinburn and colleagues recognized the importance of evidence-based/practice-based processes and campaigns, but they also acknowledged the limitations of what is considered acceptable evidence when they developed an evaluation framework for obesity prevention.⁵⁰ Citing Rychetnik et al and Kroke et al,^{51,52} they observed:

The term ‘evidence-based’—a term now quite familiar to health professionals and policy makers—has become somewhat problematic because (i) it tends to be understood as referring only to frameworks used in ‘evidence-based medicine’ (EBM), which heavily

weights internal validity as the defining characteristic of evidence, and (ii) it largely ignores, and therefore devalues, the importance of external validity as well as a host of additional social, political, and commercial considerations that actually drive decision making on policies and programs.

Similar calls for more comprehensive approaches and dimensions to broaden “admissible” or “appropriate” evidence of effectiveness, including contextual and organizational information, as well as informed opinion,^{43,50} have been noted outside of health initiatives. An example of this type of thinking to advance math and science teaching was articulated in the National Science Foundation publication *Footprints: Strategies for Non-Traditional Evaluation*.⁵³ The title of this compilation refers to the elusive nature of evidence of a program's impact. The introduction suggests the following questions as indicators for knowing (p. 5):

How do we know we have collected all the evidence? Where are the likely places to look for missing evidence? For example: What are the untouched areas of research? What is not being done or is being done ineffectively? Are there key target groups that are not being served or are being served inadequately? What rival hypotheses can we formulate, e.g., where would we have been if this program did not exist?

These questions are especially relevant for public health communication initiatives like MyPlate, and they support the need for an inclusive framework that encourages application of a greater diversity of models and theories to health communication and its evaluation. The CDC's expert panel recommended exploring a wide range of theories, which purportedly are currently underused, including communication theories that address attention, attitudes, and subjective norms;⁵⁴ theories of language comprehension and information processing;⁵⁵ and theories examining the effects of emotion on communication.⁵⁶ Social network theory⁵⁷⁻⁵⁹ and network analysis⁶⁰ also hold unrealized promise for illuminating the

social dynamics within which communication operates. The ideation model,⁶¹ which takes into account cognitive, emotional, and social factors and is frequently used abroad, also has great potential use within US-based studies. Further, Davis suggests that the outcomes derived from using the Memorable Message Framework⁶² have the potential to enhance campaign evaluation efforts and even redefine “how we measure campaign success.”⁶³ These theories and models are amenable for a use-focused evaluation approach, and their applications can fit within the proposed framework for evaluating the MyPlate communications initiative illustrated in the Figure. Used collectively, they support the basic premise of health communication theory as detailed earlier: that it is important to collect evidence of small changes occurring along the pathway toward long-term goals.

What More Should be Measured, and in What Context?

Beyond recall of initiative messages and components and reported changes in diet-related behaviors, the authors suggest more attention to overlooked measurement opportunities that can provide evidence of success particular to the MyPlate communication effort.

Focus on social norms. Having an impact at the level of social norms should be considered an important intermediary outcome for the MyPlate initiative, and its evidence should thus be identified as markers of campaign success. The icon status of MyPlate is a strength of the initiative that is challenging to measure, as the “footprints” are often woven into the very fabric of society (vis à vis pop culture and secular trends) rather than easily identified in traditional data sources. However, evidence abounds of social normalization of DGA. For example, Sesame Street's Cookie Monster singing that “A Cookie is a Sometime Food” echoed the “anytime and sometime food” concepts associated with the Pyramid messages and responded to a growing awareness that a popular children's

character eating only cookies was no longer acceptable in a child obesity epidemic.⁶⁴ In charting the pervasiveness of the MyPlate icon resulting from efforts, researchers may consider indicators of cultural adjustment that can be used cumulatively for tracking national sentiment: general references to MyPlate in pop culture (social media and traditional media venue mentions, including both intended and unintended product placement within programming, etc); smartphone and other electronic media applications; active “counter-movement” activities and rhetoric (for example, Harvard School of Public Health's alternative to the USDA's MyPlate, “Healthy Eating Plate”);⁶⁵ environmental scans to track increased depictions of meals that look like the DGA; specific policy outcomes (eg, subsidization of healthy food and taxation of unhealthy food); changes in sentiment toward agricultural subsidies and nutrition program regulations that do not reflect DGA; changes in food manufacturing practices; and/or changes in fast-food restaurant menus to be more inclusive of DGA recommendations.

This list is by no means exhaustive for possible footprints left by MyPlate in the culture, but hopefully these ideas can inspire creative means of accounting for the initiative's potential to affect social norms.

Focus on vulnerable populations. Another area that is often overlooked when evaluating health campaigns for the general public is the effectiveness with vulnerable populations. It is hoped that research on the effectiveness of the MyPlate communication initiative will be conducted among populations in greatest need of healthier food consumption, including those with low health literacy, low socioeconomic status, and/or with language barriers. Few examples of this focus on “upstream factors” that mediate food choices can be found in the literature; a notable study conducted by Zoellner et al in the Lower Mississippi Delta illustrates the need for greater attention to socioeconomic status and cultural background, which mediate the effectiveness of campaigns like MyPlate.⁶⁶ A survey of 177 adults from the region

revealed that only 12% of adults surveyed could identify the MyPyramid graphic about 2 years after it was released. The authors noted that the Internet was the least used and least trusted source of nutrition information among the respondents, yet MyPyramid was the cornerstone of the DGA communication campaign. However, more recent work indicates that some segments of the low-income population are using the Internet to search for nutrition information.⁶⁷ Thus, several factors need to be taken into account to tailor communication strategies to the needs and preferences of vulnerable audiences. In terms of identifying the theoretical underpinnings of a logic model for a campaign, one must also consider whether factors of interest will operate as predicted among ethnic minority and/or limited resource populations as they will among general audiences. If not, logic models and measures should be adjusted, and supplemental theories incorporated (such as theories of cultural assimilation).⁶

Expand the range of strategic analyses. Improved understanding of the effectiveness of MyPlate across the framework can be realized with analyses that account for latent or underlying relationships between factors. These methods include analysis of upstream and downstream factors as mediators, moderators, covariates, or confounders. All of these terms refer to variables that help explain nuances in the relationship between an independent variable and the dependent or outcome variable. A good review of these analyses as they pertain to nutrition research is presented by Lockwood et al.⁶⁸ Conjoint analysis is frequently used in marketing,⁶⁹ but it may also be applicable to studies of individual decision making around food choices. Conjoint analysis assesses how people make tradeoffs in situations in which one has to choose among options with criteria of importance, for example, nutrition, taste, or convenience. Multilevel modeling, hierarchical linear analysis, or mixed methods⁷⁰ are analytical methods that account for group or nesting effects, which is important in studies focusing on environmental settings.

At the systems and policy level, analytical methods such as social networking, which uses a structural approach to illustrate patterns of linkages between actors,⁵⁸ can help assess the interplay of institutions and policy makers working for (and against) policy change amenable to the DGA.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Assessing the effectiveness of nutrition communication initiatives is difficult, even for narrowly targeted populations in controlled environments like school classrooms. Initiatives such as MyPlate, which are broadcast to the general population, present myriad challenges to adequately capture measures of success. The USDA's CNPP has appealed to its partners and academia to conduct studies and share findings that assess effectiveness of this carefully planned initiative. The framework presented here takes this approach a step further by suggesting a version of professional "crowd sourcing,"⁷¹ inviting not only well-executed studies, but also documentation of MyPlate's effectiveness in practice-based evidence and its footprint in policies, markets, and the culture. By widening the net, it is hoped that health communicators can capture more evidence of effectiveness. The accumulated evidence can provide more guidance than is currently available in communicating DGA. Two important areas warranting more research and observation are MyPlate's message use in vulnerable populations, and signs of its impact on social norms.

The framework is untested—a major limitation—but it is composed of validated social science characteristics, most notably the overall structure of a logic model, the socioecological model, and constructs from theories of behavior change. It is presented as a starting point to facilitate hypothesis generation, study design, indicator definition, and data collection from disparate sources of evidence for the purpose of documenting the effectiveness of MyPlate. It is expected that health communication frameworks will continue to evolve with the progress of social sci-

ence, and the framework will also be refined as information on the performance of MyPlate communications becomes available.

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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REFERENCES

1. United States Department of Agriculture: Center for Nutrition Policy and Promotion. MyPlate Background. <http://www.cnpp.usda.gov/Publications/MyPlate/Background.pdf>. Accessed January 6, 2012.
2. Post R. A new approach to Dietary Guidelines communications: make MyPlate, your plate. *Child Obes*. 2011; 7:349-351.
3. United States Department of Agriculture, Center for Nutrition Policy and Promotion. USDA 2010 Dietary Guidelines Communication Message Calendar. <http://www.cnpp.usda.gov/Publications/MyPlate/Communications>

- MessageCalendar.pdf. Accessed March 30, 2012.
4. Mendoza M. Nutrition education ineffective. *USA Today* July 4, 2007; http://www.usatoday.com/news/health/2007-07-04-fightingfat_N.htm. Accessed January 4, 2012.
 5. Hornik RC. Public health communication: making sense of contradictory evidence. In: Hornik RC, ed. *Public Health Communication: Evidence for Behavior Change*. Mahwah, NJ: Lawrence Erlbaum Associates Inc; 2002:1-22.
 6. Abbatangelo-Gray J, Cole GE, Kennedy MG. Guidance for evaluating mass communication health initiatives: summary of an expert panel discussion sponsored by the Centers for Disease Control and Prevention. *Eval Health Prof*. 2007;30:229-253.
 7. Contento IR. Nutrition education: linking research, theory, and practice. *Asia Pac J Clin Nutr*. 2008;17(suppl 1):176-179.
 8. Rowe S, Alexander N, Almeida NG, et al. Translating the Dietary Guidelines for Americans 2010 to bring about real behavior change. *J Am Diet Assoc*. 2011; 111:28-39.
 9. Williams AF, Wells JK. The role of enforcement programs in increasing seat belt use. *J Safety Res*. 2004;35:175-180.
 10. Snyder LB. Health communication campaigns and their impact on behavior. *J Nutr Educ Behav*. 2007;39(2 suppl):S32-S40.
 11. Hornik R, Kelly B. Communication and diet: an overview of experience and principles. *J Nutr Educ Behav*. 2007;39(2 suppl):S5-S12.
 12. Britten P, Haven J, Davis C. Consumer research for development of educational messages for the MyPyramid Food Guidance System. *J Nutr Educ Behav*. 2006;38(6 suppl):S108-S123.
 13. Haven J, Burns A, Britten P, Davis C. Developing the consumer interface for the MyPyramid Food Guidance System. *J Nutr Educ Behav*. 2006;38(6 suppl):S124-S135.
 14. International Food Information Council Foundation. 2011 Food & Health Survey. Consumer Attitudes Toward Nutrition, Food Safety & Health. <http://www.foodinsight.org/Content/3840/2011%20IFIC%20FDTN%20Food%20and%20Health%20Survey.pdf>. Accessed January 2, 2012.
 15. Krebs-Smith S. Diet Quality of Americans in 1994-96 and 2001-02 as Measured by the Healthy Eating Index-2005. Nutrition Insight 37. <http://www.cnpp.usda.gov/Publications/NutritionInsights/Insight37.pdf>. Accessed January 5, 2012.
 16. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *J Nutr*. 2010;140: 1832-1838.
 17. Carollo K, ABC News Medical Unit. No more Pyramid: nutritional icon is now a plate. <http://abcnews.go.com/Health/food-pyramid-food-plate/story?id=13743137>. Accessed January 5, 2012.
 18. Jalonick MC, NBCnews. Food pyramid dumped for "MyPlate." http://www.msnbc.msn.com/id/43253092/ns/health-diet_and_nutrition/t/food-pyramid-dumped-my-plate/. Accessed January 5, 2012.
 19. United States Department of Agriculture: Center for Nutrition Policy and Promotion. Development of 2010 Dietary Guidelines for Americans Consumer Messages and New Food Icon. Executive Summary of Formative Research. June 2011; <http://www.choosemyplate.gov/food-groups/downloads/MyPlate/ExecutiveSummaryOfFormativeResearch.pdf>. Accessed January 4, 2012.
 20. Donato KA. National health education programs to promote healthy eating and physical activity. *Nutr Rev*. 2006; 64(2 Pt 2):S65-S70.
 21. Pivonka E, Foerster SB, Di Sogra L, Chapelsky Massimilla D. Industry Initiatives 5 A Day for Better Health Program. Bethesda, MD: National Institutes of Health, National Cancer Institute; 2001.
 22. Reich MR. Public-private partnerships for public health. *Nat Med*. 2000;6: 617-620.
 23. Brownell KD, Ludwig DS. Fighting Obesity and the Food Lobby. *The Washington Post* June 9, 2002. <http://www.washingtonpost.com/ac2/wp-dyn/A15232-2002Jun7?language=printer>. Accessed January 6, 2012.
 24. United States Department of Agriculture, Center for Nutrition Policy and Promotion. ChooseMyPlate.gov Partnering Program. <http://www.choosemyplate.gov/partnering-program.html>. Accessed February 11, 2012.
 25. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, National Health and Nutrition Examination Survey. National Health and Nutrition Examination Survey: questionnaires, datasets, and related documentation. http://www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm. Accessed March 30, 2012.
 26. United States Department of Agriculture, Center for Nutrition Policy and Promotion. Healthy Eating Index. <http://www.cnpp.usda.gov/healthyeatingindex.htm>. Accessed March 30, 2012.
 27. United States Department of Agriculture, Centers for Disease Control and Prevention, Office of Surveillance, Epidemiology, and Laboratory Services, Public Health Surveillance Program Office. Behavioral Risk Factor Surveillance System. <http://www.cdc.gov/brfss/>. Accessed March 30, 2012.
 28. Centers for Disease Control and Prevention, Porter Novelli. Health styles survey. <http://www.cdc.gov/healthcommunication/ToolsTemplates/EntertainmentEd/HealthstylesSurvey.html>. Accessed March 30, 2012.
 29. Gallup Inc. Gallup Healthways Well-Being Index. <https://www.npd.com/wps/portal/npd/us/industryexpertise/foodandbeverage/>. Accessed March 30, 2012.
 30. NPD Group. Food and beverage market research. <http://www.npd.com>. Accessed March 30, 2012.
 31. Ostrom E. A general framework for analyzing sustainability of social-ecological systems. *Science*. 2009;325:419-422.
 32. Earp JA, Ennett ST. Conceptual models for health education research and practice. *Health Educ Res*. 1991;6:163-171.
 33. Thomson C. Fruits, vegetables and behavior change: a scientific overview. Produce for Better Health Foundation. http://www.pbhfoundation.org/about/res/pbh_res/. Accessed May 23, 2012.
 34. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annu Rev Public Health*. 2008;29:253-272.
 35. Medeiros LC, Butkus SN, Chipman H, Cox RH, Jones L, Little D. A logic model framework for community nutrition education. *J Nutr Educ Behav*. 2005;37:197-202.
 36. Becker MH. *The Health Belief Model and Personal Health Behavior*. San Francisco, CA: Society for Public Health Education; 1974.
 37. Fishbein M. *Readings in Attitude Theory and Measurement*. New York, NY: Wiley; 1967.
 38. Ajzen I. The Theory of Planned Behavior. *Organ Behav Hum Decis Process*. 1991;50:179-211.
 39. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive*

- Theory*. Englewood Cliffs, NJ: Prentice Hall; 1986.
40. Rogers EM. *Diffusion of Innovations*. 4th ed. New York, NY: Free Press; 1995.
 41. Austin L, Mitchko J, Freeman C, Kirby S, Milne J. Using framing theory to unite the field of injury and violence prevention and response: "Adding Power to Our Voices." *Soc Mar Q*. 2009;15(S1):35-54.
 42. Harvard Graduate School of Education. Harvard Family Research Project. A user's guide to advocacy planning. <http://www.hfrp.org/evaluation/publications-resources>. Accessed April 6, 2012.
 43. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health*. 1999;89:1322-1327.
 44. Kelly MP, McDaid D, Ludbrook A, Powell J. Economic appraisal of public health interventions, Briefing paper. http://www.nice.org.uk/aboutnice/who-weare/aboutthehda/hdapublications/hda_publications.jsp?o=707. Accessed January 22, 2012.
 45. Academy of Nutrition and Dietetics. Evidence Analysis Library. <http://www.adaevidencelibrary.com/default.cfm?auth=1>. Accessed January 6, 2012.
 46. Agency for Healthcare Research and Quality. Evidence-based practice. <http://www.ahrq.gov/clinic/epcix.htm>. Accessed January 6, 2012.
 47. American Society for Enteral and Parenteral Nutrition. Clinical Guidelines. http://www.nutritioncare.org/Professional_Resources/Guidelines_and_Standards/Guidelines_and_Standards_Library_Features/. Accessed January 6, 2012.
 48. Natural Standard Research Collaboration. Natural Standard database. <http://www.naturalstandard.com/>. Accessed January 6, 2012.
 49. The Cochrane Collaboration. Cochrane Reviews. <http://www.cochrane.org/cochrane-reviews>. Accessed January 6, 2012.
 50. Swinburn B, Gill T, Kumanyika S. Obesity prevention: a proposed framework for translating evidence into action. *Obes Rev*. 2005;6:23-33.
 51. Rychetnik L, Hawe P, Waters E, Barratt A, Frommer M. A glossary for evidence based public health. *J Epidemiol Community Health*. 2004;58:538-545.
 52. Kroke A, Boeing H, Rossnagel K, Willich SN. History of the concept of "levels of evidence" and their current status in relation to primary prevention through lifestyle interventions. *Public Health Nutr*. 2004;7:279-284.
 53. Frechtling JA: National Science Foundation (US). *Footprints: Strategies for Non-Traditional Program Evaluation*. Arlington, VA: National Science Foundation; 1995.
 54. Petty RE, Cacioppo JT. Issue involvement can increase or decrease persuasion by enhancing message-relevant cognitive responses. *J Pers Soc Psychol*. 1979;37:1915-1926.
 55. McGuire W. Theoretical foundations of campaigns. In: Rice R, Paisley W, eds. *Public Communication Campaigns*. Thousand Oaks, CA: Sage Publications; 1981:41-70.
 56. Brehm JW. *A Theory of Psychological Reactance*. New York, NY: Holt, Rinehart & Winston; 1966.
 57. Boulay M, Valente TW. The selection of family planning discussion partners in Nepal. *J Health Commun*. 2005;10:519-536.
 58. Luke DA, Harris JK. Network analysis in public health: history, methods, and applications. *Annu Rev Public Health*. 2007;28:69-93.
 59. Valente TW, Saba WP. Mass media and interpersonal influence in the Bolivia National Reproductive Health Campaign. *Communic Res*. 1998;25:96-124.
 60. Kincaid DL. From innovation to social norm: bounded normative influence. *J Health Commun*. 2004;9(suppl 1):37-57.
 61. Kincaid DL. Mass media, ideation, and behavior: a longitudinal analysis of contraceptive change in the Philippines. *Communic Res*. 2000;27:723-763.
 62. Knapp ML, Stohl C, Reardon KK. "Memorable" messages. *Journal of Communication*. 1981;31:27-41.
 63. Davis LA. *Beyond '5-a-Day': An Examination of Memorable Messages in a Nutrition Education Program for Low-Income African Americans* [dissertation]. West Lafayette, IN: Purdue University; 2011.
 64. Newsweek. Sesame Street: the show that counts. <http://www.thedailybeast.com/newsweek/2009/05/22/sesame-street.html>. Accessed March 30, 2012.
 65. Harvard Health Publications. Comparison of the Healthy Eating Plate and the USDA's MyPlate. <http://www.health.harvard.edu/plate/comparison-of-healthy-eating-plate-and-usda-myplate>. Accessed May 6, 2012.
 66. Zoellner J, Connell C, Bounds W, Crook L, Yadrick K. Nutrition literacy status and preferred nutrition communication channels among adults in the Lower Mississippi Delta. *Prev Chron Dis*. 2009;6:1-11.
 67. Neuenschwander LM, Abbott A, Mobley AR. Assessment of low-income adults' access to technology: implications for nutrition education. *J Nutri Educ Behav*. 2012;44:60-65.
 68. Lockwood CM, DeFrancesco CA, Elliot DL, Beresford SA, Toobert DJ. Mediation analyses: applications in nutrition research and reading the literature. *J Am Diet Assoc*. 2010;110:753-762.
 69. Green PE, Srinivasan V. Conjoint analysis in consumer research: issues and outlook. *J Consum Res*. 1990;5:103-123.
 70. Fisher JO, Mennella JA, Hughes SO, Liu Y, Mendoza PM, Patrick H. Offering "dip" promotes intake of a moderately liked raw vegetables among preschoolers with genetic sensitivity to bitterness. *J Am Diet Assoc*. 2012;112:235-245.
 71. Howe J, WIRED. The rise of crowdsourcing. http://www.wired.com/wired/archive/14.06/crowds.html?pg=1&topic=crowds&topic_set=. Accessed January 15, 2012.
 72. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, National Health and Nutrition Examination Survey. Flexible Consumer Behavior Module. http://www.cdc.gov/nchs/data/nhanes/nhanes_09_10/FCBS_f.pdf. Accessed March 30, 2012.
 73. Centers for Disease Control and Prevention. State-Added Question Database, 1995-1997. https://www.ark.org/adh_brfs_questions/results.aspx. Accessed January 4, 2012.
 74. United States Department of Health and Human Services, Centers for Disease Control and Prevention. Youth Risk Factor Surveillance System Survey Questionnaire, 2009. <http://www.cdc.gov/healthyyouth/yrbs/index.htm>. Accessed January 4, 2012.
 75. UCLA Center for Health Policy Research. California Health Interview Survey CHIS, 2012. <http://www.chis.ucla.edu/main/PUF/default.asp>. Accessed January 2, 2012.