Modeling message preferences: An adaptive conjoint analysis of persuasive messaging to increase fruit and vegetable consumption

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Abstract

Few past studies have used conjoint analysis to assess message design features and even fewer have looked at health issues. This research applies conjoint analysis to the quest to design motivational messages for African Americans at risk for diet-related adverse health outcomes (e.g., heart disease) in Kentucky. African American health in the state of Kentucky can benefit from a diet high in fruit and vegetable consumption, but little past research has been conducted with African American Kentuckians to explore the best message structure for communicating about increased fruit and vegetable consumption. This study reports on the outcome of the final phase of formative campaign research. We use an adaptive conjoint analysis to identify the most important elements of message design for this group of Kentucky residents. Results indicate that the message's source (i.e., the person delivering the message) is the most important design element for creating persuasive health messaging about fruit and vegetables for African Americans in Kentucky, followed by the stated benefit of eating more fruit and vegetables and the manner in which the behavior is described, respectively. To our knowledge, this study is the first to treat campaign message features as the subject of a conjoint analysis in order to identify which combination of features might be most motivating for a specific target audience. Recommendations for future health communication campaign application, as well as future research are discussed.

Keywords: Message design, Conjoint analysis, Fruit and vegetable consumption, Health communication, Message source, Framing, African Americans

Introduction

African Americans are disproportionately affected by many preventable negative health conditions (e.g., cardiovascular disease, obesity).[1] Past research has linked some of this disparity to socioeconomic status,[2] access to food,[3] and food culture.[4] More specifically, socioeconomic status, cultural traditions, and perceptions of what constitutes 'healthy' living, diet, or activity may limit some African American community members' ability to adopt lifestyle changes (i.e., increased fruit and vegetable consumption for a high fiber, low fat diet) that would help reduce their risk of a future negative health event.

In the state of Kentucky, several of these limiting factors have been identified, particularly with regard to food choices. African American neighborhoods have been shown to possess an overabundance of food marketers selling high-fat, high-calorie diet options.[5,6] Past research has also shown that African American populations may be better served by adopting culturally sensitive messages about food preparation and taste preferences,[7–9] which are influenced by tradition and heritage.[10] Given these realities, the central purpose of this study is to understand how individual-level health communication efforts designed to increase fruit and vegetable consumption might be tailored for African American communities in Kentucky.

This paper reports on findings from the last phase of a multi-phased NIH study. The first several phases of the study concentrated on understanding individual, community, and cultural-level determinants of dietary choices using an integrated socio-ecological model and social marketing campaign planning framework. These earlier phases of research led to a need to gain a better understanding

of the kinds of tailored message structures that might motivate audiences to increase fruit and vegetable consumption. In this study, we take a unique approach to further developing this understanding, employing a decision-based analysis approach (i.e., adaptive conjoint analysis).

Adaptive conjoint analysis (ACA) is a market survey research methodology that defines a product, service, or concept as a set of features and attributes.[11] In ACA, each attribute is described by several possible alternatives (often called 'levels'). Researchers use an experimental design to independently vary these levels to create different product profiles. Then, study participants are presented with a series of choice tasks in which they are shown two different profiles and are asked to indicate which profile they prefer. The resulting data allow for the estimation of importance scores for each attribute as well as preference ratings (called part-worth utilities) for each attribute level tested.[11] These utility scores help researchers determine the most desirable and influential combination of product features in a competitive purchase decision context.

Applying conjoint analysis to message design
Although generally used for modeling demand for various product and pricing structures in marketing research,[11] we apply an ACA as the final component of our multi-phased formative research study to better understand the optimal combination of message design features that are most likely to motivate African Americans to consume more fruit and vegetables in two Kentucky communities. In the context of the present study, the product features/attributes include the *message source*, the *situation illustrated* in the communication, the *behavior* being promoted, and the *benefit*/outcome of enacting the desired behavior. Health decisions are complex and messages about them must compete with other messages in the market for audience attention. A conjoint analysis approach is 'more likely to elicit the heuristics influencing the choices that [audience members] actually make'[12], p. 4 than more traditional message design approaches. This approach to developing motivational messages may help communicators identify findings that would not surface through traditional formative research methods.[12]

To date, the application of ACA to health message design is novel. Only three recent studies have applied a conjoint methodology to social or health-related issues.[12–14] Cunningham and co-workers used the approach to identify the kind of information that should be disseminated to youth at

risk for mental health conditions in an effort to encourage them to seek professional assistance. Bennett and Barkensjo identified which child-level characteristics (e.g., health issues, ethnicity, age) should be highlighted in an advertising campaign to promote child adoption in the United Kingdom. And finally, Ryan and Ferrar advocated for a choice-based approach to healthcare decision-making facing the National Health System (NHS) in the United Kingdom. None of these studies, however, has specifically used conjoint analysis to compare variations across message features (e.g., message source, message frame).

Theoretical foundation for message construction
In the present study, we were interested in understanding which fruit and vegetable message design features would be most appealing and motivational to African American Kentuckians. As such, we identified three main theoretical constructs to explore: cultural geography, message source, and framing.

Cultural geography:
Cultural geography reflects the idea that the physical environment in which one resides interacts with the traditions and behavior of the people living in that environment.[15] Past phases of this study suggested that small but meaningful differences might exist between urban and smaller, rural towns in Kentucky.[16] Following this line of thought, two research questions were developed to assess differences by geography.

RQ1: What is the relative importance of the message attributes for African American adults in an urban Kentucky environment?

RQ2: What is the relative importance of the message attributes for African American adults in a small Kentucky town surrounded by rural farmland?

Message source:
Identifying an appropriate message source has long been of interest to persuasive communicators. Seminal work by Kelman[17] suggests that message recipients are more likely to be persuaded if they can internalize a message and identify with a message source. Internalization is more likely if the message source possesses a similar value system or ideology, whereas identification is influenced by the physical characteristics of the source.[18–21] In past phases of this study, we examined the appeal of different message sources and

found mothers/grandmothers and personal physicians were preferred sources of dietary information for our participants.[16] Some participants also mentioned healthy close friends and church pastors, but they did not overemphasize the importance of these sources. Given this list, some of these message sources would be more likely to embody physical characteristics similar to our study participants while others would be more likely to possess similar values and ideologies. As such, we tested the following research question:

> RQ3: Which message source will be perceived as the most motivational to encourage eating more fruit and vegetables in an urban environment? In a rural environment?

Framing theory:

Framing theory[22] also has special implications for health communication messages. The theory posits that the way in which an idea or concept is presented to an audience affects how people attend to and process its information. Message frames help audience members structure communication meaning. Since Kahneman and Tverksy's[23] work on gain versus loss frames, much of the subsequent research has focused on testing semantic differences. In this study, however, we take a broader perspective on framing, aligning ourselves with Entman.[24] He espoused that

> to frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described (p. 52).[24]

Thus our study examines how a communication message can highlight or make salient specific ideas, concepts, and attributes so as to help connect a behavior to specific *schema* in the mind of the audience.

In the current study, we assess different ways to define the desired behavior as well as different rewards for engaging in the recommended behavior. Our definitions reflect variations traditionally employed by health communicators and our own previous study findings. We also tested ways to frame different descriptions of actions that would help increase fruit and vegetable consumption levels.

> RQ4: Which description of how to eat the recommended daily allowance of fruit and

vegetables will be perceived as most motivational in an urban environment? In a rural environment?

> RQ5: Which benefits will be viewed as most motivational in an urban environment? In a rural environment?

> RQ6: Which action described in the communication will be perceived as most motivational in an urban environment? In a rural environment?

Finally, historical research has shown some African American communities to possess strong community cohesion[25]; however, messages in the United States have tended to place the responsibility for enacting healthy behavior on the shoulders of the individual vis-à-vis individually-oriented prevention messages.[16,26] Therefore, we assessed the appeal of a variety of different situational frames for message delivery.

> RQ7: Which situation will be perceived as most motivational in an urban environment? In a rural environment?

Method

Data collection setting

Given our focus on cultural geography, data were collected in summer 2013 from residents in Louisville (Kentucky's largest metro area) and Hopkinsville, Kentucky (city of 31 000 in rural, south central Kentucky). Of Louisville's 597 337 residents, 22.9% are African American,[27] the majority of whom live in the West End[28] where we focused our data collection. African Americans comprise 31.9% of Hopkinsville's residents.[27]

Sample

Individuals over 18 years of age were screened for racial self-identity, overweight or obese BMI, and general familiarity with computers. A participation incentive of $20 spurred survey completion. We collected a convenience sample of $n = 142$ surveys in Hopkinsville and $n = 169$ in West Louisville, providing enough power to test geographic group differences but insufficient to further divide the data by additional subgroups. Our study sample was 67% female, and the average age was 42. Typically, respondents had graduated high school and received some college or technical education but had not completed a bachelor's degree. Many

households were single adult households (45.4% single, 14.9% divorced, versus 19.9% married) with one wage earner (45.4%), and these numbers largely explain the average annual salary range of $15 000–$19 000. Nineteen percent were unemployed; 39.7% received food stamps; 16.6% were disabled. Respondents were managing at least one chronic health condition, often exacerbated by their average BMI of 33.3 and their lack of health insurance (29.0%).

Research design and survey administration

Responses to a cross-sectional, self-administered survey were collected using netbook computers. Before entering the field, we obtained IRB approval for the study. We pilot tested the survey with several residents of West Louisville and Hopkinsville, who also happened to be on staff at the Principal Investigator's university. Based on the feedback from the pilot test, we made minor adjustments to the survey to simplify its administration before the team entered the field.

We collected data at a variety of local gathering spots such as community fairs, festivals, barbershops, homeowners association meetings, neighborhood grocery stores, and malls. We relied on the extended social networks of research team members, who possessed close community contacts in the study locations, to help us identify and gain access to community events. Although not a probability sample of either study location, past research with the African American community in the U.S. indicates that relying on community contacts and gatekeepers along with designing data collection to meld into community gathering locations helps build trust of outside researchers and may yield better results than probability-level sampling approaches in predominantly African American communities.[29–30]

Survey development

The survey asked respondents to complete three main question tasks: (1) provide demographic data, (2) rate the perceived importance of the message attributes and their associated levels as outlined in Table 1 (i.e., provide self-explicated importance scores), and (3) select one of two message descriptions as being more motivational (i.e., complete a series of trade-off tasks). We used earlier phases of our research to guide our selection of demographic and health status questions. Specifically, we collected data about: gender, age, height, weight, current chronic health conditions, employment status, number of adults and children in the household, and whether participants received any financial food assistance.

The second task collected self-explicated importance scores for each of the message attributes and attribute levels identified in Table 1 using a traditional Likert response format. Table 2 provides an example of how these questions were asked. We collected self-explicated information with the intention of using it to help weight the conjoint model. King *et al.*,[31] however, indicate that these 'self-explicated importance scores' can sometimes be confusing to participants and may result in biased model estimates.

Finally, using a fractional-factorial experimental design algorithm developed by Sawtooth Software,[32] which maximizes attribute level balance and efficiency (although the design is not strictly orthogonal), respondents completed the third question task. Presented with 26 sets of paired trade-off choices, respondents were asked to indicate the extent to which one communication message, composed of a specific combination of attributes and attribute levels, motivated them to eat more, fewer, or the same amount of fruit and vegetables than a second message with a different combination of attributes and attribute levels. We assessed level of motivation using a nine-point choice scale anchored by 'strongly motivated by the option on the left' versus 'strongly motivated by the option on the right' (see Fig. 1).

Analysis

Using Sawtooth Software's ACA component (SSI Web 8.2.2),[33] we estimated an overall level of importance for each attribute using a process similar to regression. In this analysis, the attributes are the independent variables and the trade-off choice of the respondent form the dependent variable data. Part-worth utilities are akin to estimated regression coefficients for the model. In this study, we decided to estimate two models: an initial model that included the self-explicated importance data and a final model that excluded those data from the analysis. Both models estimated part-worth utilities using hierarchical Bayes estimation, which is a dynamic statistical method that updates model estimations based on a sequence of data. Updates to the model occurred as more information became available (i.e., after each trade-off decision was made by each respondent). Two models were estimated because it was clear from observations at data collection sites that the self-explicated importance questions were confusing to participants (i.e., research team members frequently explained how to answer or helped participants select responses). We were also concerned about the impact of social desirability in the self-explicated data because early phases of research had identified higher-

Table 1 Attribute, attribute importance scores, and attribute levels used in the adaptive conjoint analysis

Attribute	Attribute importance	Attribute levels*
Message source: the person delivering the message	25.5%	• Someone who looks like your healthiest close friend • Someone who looks like your mother or grandmother • Someone who looks like your doctor • Someone who looks like your local health department representative • Someone who looks like a church leader
Situation illustrated: the situation in which the message source delivers the message	21.5%	• Person in the message talks about setting a good example for other people (family, friends, relatives) • Person in the message talks about living with a chronic condition (for example, high blood pressure, high cholesterol, diabetes) • Person in the message talks about how eating habits can affect other aspects of family life • Person in the message talks about how a close family member's serious health problem is influencing their own health decisions • Person in the message talks about how they felt when they learned that their weight classified them as obese
Behavior: the way that eating more fruit and vegetables is described in the message	19%	• Eat two cups of fruit and $2\frac{1}{2}$ cups of vegetables every day • Eat two to three servings of fruit or vegetables with every meal • Fill half your plate with fruits and vegetables at each meal or eating occasion • Eat double the amount of fruit and vegetables you are now eating each day
Benefit: the reward you might get if you ate more fruit and vegetables	18%	• Lower your risk of heart disease and heart attack • Lose weight • Help you look better (clear skin, healthier hair, stronger muscles) • Help your family learn healthy eating habits
Action demonstrated: images that show ways to help you get more fruit and vegetables everyday	17%	• Ways to buy more fruit and vegetables for less • New recipes for cooking with fruit and vegetables (for example, as extra flavorings) • New ways to prepare fresh fruit and vegetables as a main dish • Ways to get your money's worth out of the fruit and vegetables you purchase (for example, reminders to eat those purchased or tips for making them last longer)

*Each attribute level listed was developed from either a review of the literature or findings from our previous phases of this study.

than-normal levels of social desirability via the Marlowe-Crowne social desirability scale.[34] For this reason, we directed the software to omit prior self-explicated importance information in our final model. The initial model's results were compared with the final computational results, and very few differences were noted across the order of preference for attributes or attribute levels. The results of these

Table 2   Sample self-explicated survey questions

Attribute importance questions

Using the numbers 1 through 10, rate which part of the message tends to catch your attention the most. Use a '10' for the part that catches your attention the most, and then rate the other parts with respect to that most important part. If a part of the message is half as important as the part you gave a '10' you should give it a '5'

	Rate each item with a number between 1 and 10
Action demonstrated: images that show ways to help you take action	_____]
Situation illustrated: the situation in which the message source delivers the message	_____]
Behavior: the action that the message asks you to take	_____]
Benefit: the reward for taking action	_____]
Message source: the person delivering the message	_____]

Attribute level ratings

Below you will find different methods that can be used to create a part of the message about eating more fruit and vegetables. We want to know which method you like the best. Please rate the action demonstrated in terms of how appealing it is by clicking one circle for each action.

	Not appealing … Extremely appealing
Ways to get your money's worth out of the fruit and vegetables you purchase (for example, reminders to eat those purchased or tips for making them last longer)	○ ○ ○ ○ ○ ○ ○
Ways to buy more fruit and vegetables for less	○ ○ ○ ○ ○ ○ ○
New ways to prepare fresh fruit and vegetables *as a main dish*	○ ○ ○ ○ ○ ○ ○
New recipes for cooking with fruit and vegetables (for example, as extra flavorings)	○ ○ ○ ○ ○ ○ ○

analyses are provided side by side in Table 3 for comparison. Using the results of our final model, we conducted separate *t*-tests to assess differences in mean part-worth utility scores between our two geographies. Statistical differences were assessed at a significance level of .05 and directional differences at .10.

Results

Prioritizing message attributes (RQ1 & 2)

The attribute importance scores (see Table 1) address our first two research questions and reflect which attributes were perceived to be the most motivational message components (i.e., most likely to encourage more fruit and vegetable consumption). It is worth noting that cultural geography did not affect the order of attribute importance. Relatively speaking, *message source* emerged as the most important factor for motivational message structure (accounting for 25.5% of respondents' choice behavior); *situation illustrated* followed (21.5%). In contrast, the *behavior*, *benefit*, and *action demonstrated* in the message were not as motivational (19%, 18%, and 17%, respectively).
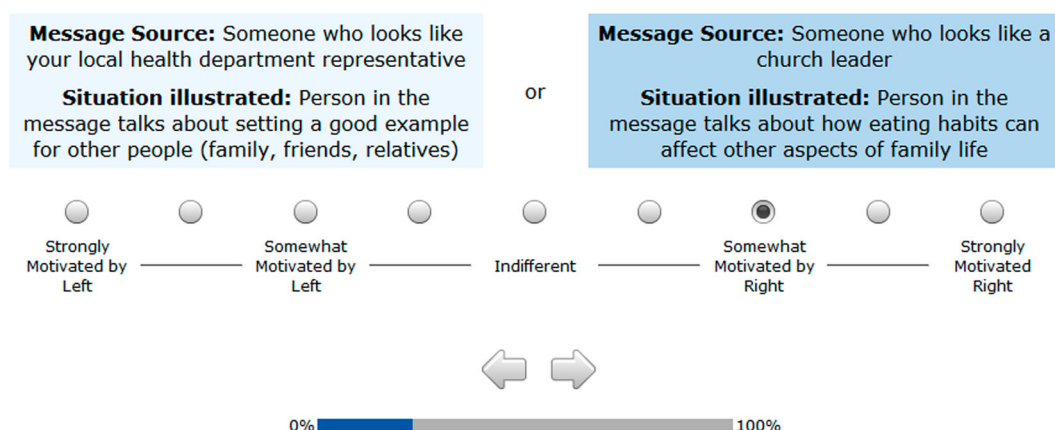
Identifying the most motivational message source (RQ3)

Table 3 presents average part-worth utilities for all attribute levels in this study. These utilities are scored as interval data and should be viewed relative to one another rather than as absolute.[11] To address our third research question, we compared the utility estimates for each level of the message source attribute (see Table 3). In both West Louisville and Hopkinsville, respondents' choices favored a person who might look like one's healthiest close friend. Given that message source was identified as the most important driver of motivation, identifying the correct type of message source is an important finding.

Message source data also revealed that the participants from the two geographies expressed directionally different preferences for a message source who looks like one's mother or grandmother (see Table 4). Urban respondents were more motivated by someone who looks like a mother or grandmother than small town respondents (15.03 vs. 5.52). In contrast, someone who looks like a church leader had a significantly higher level of motivation in Hopkinsville versus West Louisville (.74 vs. −20.82).

Paired Comparison Choice Trade-off with Two Attributes

If these messages about eating more fruit and vegetables were **identical in all other ways**, which would you find more motivating?

| **Message Source:** Someone who looks like your local health department representative **Situation illustrated:** Person in the message talks about setting a good example for other people (family, friends, relatives) | or | **Message Source:** Someone who looks like a church leader **Situation illustrated:** Person in the message talks about how eating habits can affect other aspects of family life |

Strongly Motivated by Left — Somewhat Motivated by Left — Indifferent — Somewhat Motivated by Right — Strongly Motivated Right

0% ■■■■■ 100%

Paired Comparison Choice Trade-off with Three Attributes

If these messages about eating more fruit and vegetables were **identical in all other ways**, which would you find more motivating?

| **Behavior:** Eat 2-3 servings of fruit or vegetables with every meal **Message Source:** Someone who looks like your doctor **Benefit:** Lose weight | or | **Behavior:** Eat double the amount of fruit and vegetables you are now eating each day **Message Source:** Someone who looks like your healthiest close friend **Benefit:** Lower your risk of heart disease and heart attack |

Strongly Motivated by Left — Somewhat Motivated by Left — Indifferent — Somewhat Motivated by Right — Strongly Motivated Right
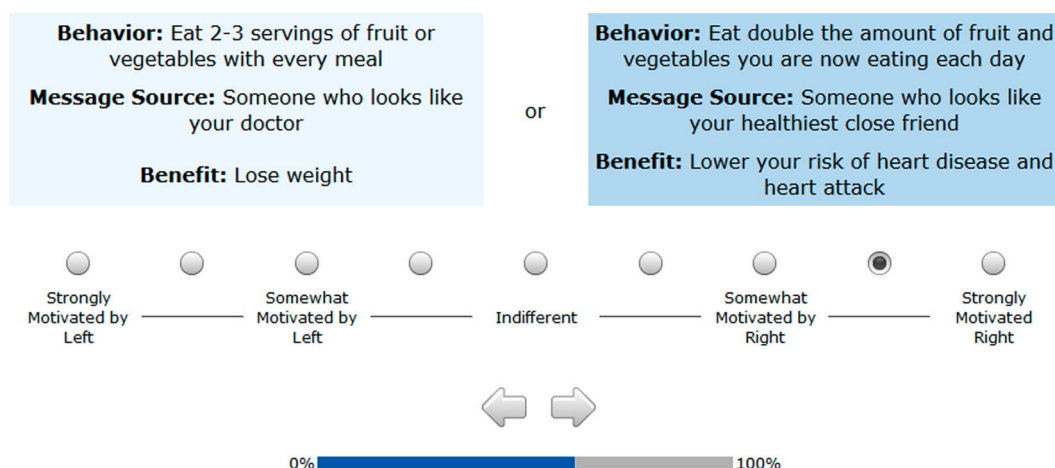
0% ■■■■■ 100%

Figure 1   Two screen shots from the digital survey administered during the study. Example paired comparison choice trade-offs with two and three attributes tested, respectively.

Determining appropriate message frames
Desired behavior (RQ4)
On average, the call to fill half one's plate with fruit and vegetables, as is the current United States Department of Agriculture's (USDA) recommendation (www.choosemyplate.gov) is not very popular; Table 3 indicates a −5.09 utility estimate. Overall, there is a higher level of preference shown for the recommendation to eat two cups of fruit and two and a half cups of vegetables daily.

Behavioral benefit (RQ5)
When deciding on which reward was most motivational, participants from both communities liked the message that discussed lowering one's risk of heart disease and heart attack (utility = 7.87, see Table 3). This result was not surprising given that heart disease is one of the most frequent causes of death among African Americans in Kentucky.[35] It is also interesting to note that despite a few outliers, the average respondent found the message that highlighted looking better to be fairly motivational (utility = 5.42). After noting that a few people really disliked this benefit, the spread of the remainder of utility estimates was smaller than any other benefit's (see Fig. 2), suggesting general preferential agreement across the majority of respondents.

Table 3   Standardized (zero centered) utilities means and standard deviations for West Louisville and Hopkinsville across the various attribute levels tested

Tested attribute level	Utilities estimated from initial model	Utilities estimated from final model	Standard deviation for utility estimate in final model
Message source			
Someone who looks like your healthiest close friend	16.41	**17.68**	45.67
Someone who looks like your mother or grandmother	9.67	9.98	49.87
Someone who looks like your doctor	−3.89	−4.81	47.43
Someone who looks like a church leader	−10.49	−9.51	44.25
Someone who looks like your local health department representative	−11.69	−13.34	40.21
Situation illustrated			
Person in the message talks about setting a good example for other people (family, friends, relatives)	9.45	**11.24**	38.03
Person in the message talks about how eating habits can affect other aspects of family life	3.98	5.22	33.30
Person in the message talks about living with a chronic condition (for example, high blood pressure, high cholesterol, diabetes)	3.65	4.58	40.94
Person in the message talks about how a close family member's serious health problem is influencing their own health decisions	2.91	1.44	36.85
Person in the message talks about how they felt when they learned that their weight classified them as obese	−19.99	−22.48	35.58
Behavior			
Eat two cups of fruit and $2\frac{1}{2}$ cups of vegetables every day	13.53	**15.90**	32.64
Eat two to three servings of fruit or vegetables with every meal	2.94	3.52	37.00
Fill half your plate with fruits and vegetables at each meal or eating occasion	−4.15	−5.09	37.30
Eat double the amount of fruit and vegetables you are now eating each day	−12.32	−14.34	42.33
Benefit			
Lower your risk of heart disease and heart attack	10.67	**7.87**	36.22
Help you look better (clear skin, healthier hair, stronger muscles)	1.88	5.42	35.39
Lose weight	−3.51	−3.19	39.90
Help your family learn healthy eating habits	−9.04	−10.10	34.41
Action demonstrated			
Ways to buy more fruit and vegetables for less	3.84	**6.37**	33.60
New ways to prepare fresh fruit and vegetables as a main dish	3.12	1.40	31.72
New recipes for cooking with fruit and vegetables (for example, as extra flavorings)	−2.19	−2.76	36.18
Ways to get your money's worth out of the fruit and vegetables you purchase (for example, reminders to eat those purchased or tips for making them last longer)	−4.77	−5.00	35.31

Note: Bold values indicate the attribute level with the strongest motivation factor in the final model.

Table 4 Test of statistical difference using standardized utilities and standard deviations for both locations across various attribute levels

Attribute and attribute levels	West Louisville		Hopkinsville		Test of statistical difference	
	Mean standardized utility value	Standard deviation	Mean standardized utility value	Standard deviation	t-Statistic	P-value
Message source (RQ4)						
Someone who looks like your mother or grandmother	15.03	48.68	5.52	49.08	1.70	.09*
Someone who looks like a church leader	−20.82	44.71	.74	41.55	4.32	.0001**
Action demonstrated (RQ6)						
New recipes for cooking with fruit and vegetables (for example, as extra flavorings)	1.02	36.49	−5.72	35.98	1.64	.10*

*Indicates a statistically directional difference at the $P = .10$ level.
**Indicates a statistically significant difference at the $P = .05$ level.
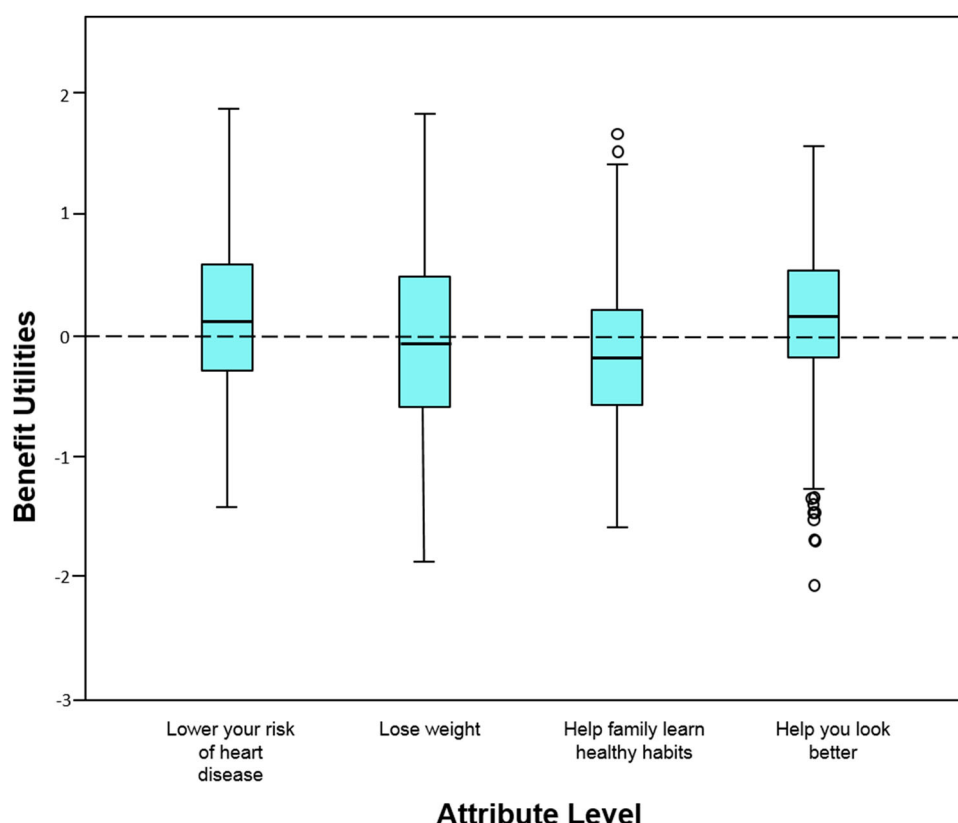
Figure 2 Box plot distributions of zero-centered individual-level utility estimates for benefit attributes.

Comparing the initial model, which included traditional (self-explicated) attribute importance measures, with those from the final analysis, lowering one's risk of heart disease was clearly preferred (utility = 10.67). When utilities were estimated without the traditional importance scores, respondents' choice behavior demonstrated less of a preference for an appeal to personal health (7.87) and a stronger preference for an appeal to personal vanity (5.42 in the final dataset versus 1.88 in the initial dataset). We believe that this difference in preference is attributable to the socially acceptable nature of the personal health benefit versus the personal vanity benefit.

Action demonstrated (RQ6)
Participants indicated that they were most interested in learning about ways to buy more fruit and vegetables for less (see Table 3). Across our two geographies (see Table 4), Hopkinsville participants expressed directionally less preference for messages that present 'new recipes for cooking with fruit and vegetables (for example, as extra flavoring)' than Louisville participants.

Situation illustrated (RQ7)
When faced with different reasons for eating more fruit and vegetables, respondents found it most motivational for the message to involve content focused on

the idea of setting a good example for other people (utility = 11.24). Interestingly, two of the three situations with positive utilities centered on the social aspect of eating (see Table 3). Thus, it appears that messages depicting how one's behavior can impact those around her will resonate well with this audience.

Discussion

This study's results add three unique findings to the literature on message development and design. First, having identified the most influential message elements for an African American audience in two Kentucky geographies, our findings provide a roadmap for communicators to develop effective messages in these specific markets. Secondly, and in a broader context, the results of the study point to a hierarchy of theoretical influence for message design in our sample. Finally, our analyses highlight the value of applying a choice-based conjoint methodology over traditional formative message research approaches for health communication campaigns.

Influential message elements for African American Kentuckians
The importance and utility estimates generated from this analysis suggest that the most motivating

message for African Americans residents of Kentucky should:

- be delivered by someone whom residents perceive to look like their healthiest close friend;
- suggest that audience members eat two cups of fruit and $2\frac{1}{2}$ cups of vegetables everyday;
- provide tips for how to buy more fruit and vegetables for less money;
- highlight the key benefit of lowering one's risk of heart disease and heart attack if the suggested amount of fruit and vegetables are consumed each day;
- be delivered via a medium where audio, text, and/or visuals can illustrate the message source setting a good example for important others by engaging in the recommended behavior.

Theoretical implications

Three main theoretical constructs were employed in this research: cultural geography, message source, and framing. Our tests of group differences assessed whether cultural geography was an influential construct, while ACA part-worth utility estimates provided guidance for prioritizing message source and framing decisions. It is important to note, however, that our findings should be viewed as study-specific (i.e., estimates should not be compared across studies with different lists of attributes and attribute levels).[11]

Cultural geography

In general, cultural geography did not result in large differences in our data. We only found a significantly stronger preference for a church leader as a message source in Hopkinsville versus Louisville. Our results, however, do directionally suggest that church-based interventions might be more appropriate for less urban environments. This finding might be interesting to explore in future studies given the history of federal funding for church-based dietary interventions.[36–38]

Message source

Message source was identified as the most powerful driver of motivational message choice. This finding is interesting in that past research into the effect size of message source in persuasive communication research has found a significant but rather small overall effect for message source.[39] In general, the source effect has been stronger in lower involvement situations than in higher involvement ones.[40] Although one might suspect that personal health

would be considered a high involvement situation, it is possible that fruit and vegetable consumption is viewed by many as a lower involvement decision.

In our study, a peer-level message source outperformed all other possible source alternatives, which was surprising because the literature points toward a stronger source effect by individuals with objective expertise (e.g., a doctor, health department representative).[39] The literature, however, might be affected by a methodological aberration in traditional ANOVA experiments where expertise is more easily measured than other important dimensions (i.e., credibility and similarity). Future research could explore how to better capture these other dimensions methodologically.

Framing effects

Our study tested four different types of frames. The situational frame was actually the second most important (superseded only by message source) motivational message attribute across both geographies (see Table 1). Our finding that the most effective messaging about fruit and vegetable consumption should communicate the importance of setting a good example for family and friends corroborates past research that showed African American women were able to easily discuss ways that they might be able to modify their daily lives and personal priorities to help others but were not as motivated to do the same to help themselves.[41]

Regarding the behavioral frame, our results showed that respondents preferred to see the recommended daily allowance of fruit and vegetables presented in terms of measuring cups rather than plate portions or servings. Over the years, the U.S. government has modified its recommendations from using the term 'servings' to 'cups'.[42] However, the current USDA nutrition guide employs the My Plate image rather than a description of measured cups.[43] Future research could examine why our respondents were more motivated by measuring cups than plate descriptions and test textual versus pictorial representations of these descriptions.[44]

Additionally, the data generally point to a preference for framing the behavioral benefit as a personal health benefit. However, our small town respondents also expressed a preference for messages that communicated that fruit and vegetables can help you look better, indicating that the idea of personal vanity may be an effective secondary message for increasing fruit and vegetable consumption. Finally, both communities preferred the action being demonstrated in the message to present ways to buy more fruit and vegetables for less,

which fits with the low income levels of our respondents and the large portion of our sample relying on food assistance.

Strengths of choice-based conjoint methodology for message development in health communication

This study adds to the nominal number of conjoint studies focused on a healthy or socially positive behavior. One of the main advantages of this type of study design is that the results of a conjoint analysis can guide communication strategies when resources are limited, ensuring that the most valuable communication features are included in the final design. Using conjoint analysis to assess different message attribute options can help engage audiences with the message development process and improve campaign outcomes[45] while streamlining the time and budget requirements typically required to conduct mixed-method formative campaign development research.

Conjoint analysis is also preferable to traditional formative message research when respondents are likely to indicate that several design alternatives are equally appealing. The ability to discern between multiple agreeable attributes is a hallmark of conjoint analysis. Moreover, the ability to include or remove traditional, self-explicated preference data from the model lends flexibility to this approach when researchers anticipate that socially desirable responses might bias results. Although not the focus of our main analyses, there were two instances (*action demonstrated* and *benefit*) in which we noted that our small town participants' choice preferences changed from our initial analysis to our final analysis. Both of these instances involved rating attribute levels that could be socially judged as very positive: 'new ways to prepare fresh fruit and vegetables as a main dish' versus 'ways to buy more fruit and vegetables for less' and 'lower your risk of heart disease and heart attack' versus 'help you look better'.

Limitations

This study, although unique in methodological application, should be considered a starting point rather than an end-point in formative research. Our readers should note that we have not tested our findings in any sort of applied campaign situation. Additionally, this analysis has focused on message structure targeted toward an individual while other factors most likely need to be addressed in tandem with individual behavior (e.g. lack of grocery stores, safe transportation, eating habits). Finally, our sample was a nonprobability sample, which affects the generalizability of our findings.

Conclusion

Developing message strategies that use choice-based conjoint approaches can help researchers understand how message components work together to influence target audiences in a competitive message environment where audience members are forced to make decisions about whether or not to attend to multiple messages competing for their consideration. Considering audience preferences for health communication messages via innovative applications of marketing science may create audience-focused, evidence-based messages that hold promise for increased and enhanced attention and processing.

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Contributors Lindsay J. Della was the principal investigator of the grant. She was integral in the design and implementation of data collection and was the primary author on this paper. Margaret U. D'Silva was a senior researcher on the grant and heavily participated in the design of the study as well as data collection. She aided with data interpretation and the identification of substantive conclusions, and provided important substantive suggestions for the revision of this manuscript. Latrica E. Best contributed to the design and development of the ACA survey, assisting with data collection in the field, and consulting on data analysis results for the development of this manuscript. Quaniqua N. Carthan spearheaded data collection efforts for this survey and contributed to this paper with her intimate knowledge of data collection issues and challenges. Her knowledge informed critical decisions in data analysis, interpretation, and

manuscript development. Siobhan E. Smith heavily participated in the design of this study as well as data collection for this manuscript. She also was critical to the substantive theoretical development of this manuscript. Theresa A. Rajack-Talley aided in the sampling design of this study, providing insight into optimal methods for working with and collaborating with local African American gatekeepers and sponsors in the field. She reviewed this manuscript critically for race-based ethical concerns.

Conflict of interest None.

Ethics approval Ethics approval for this study was granted by the University of Louisville's Institutional Review Board.

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