Evaluation of the Champions for Change

2017 *Be Better* Media Campaign

Nutrition Education and Obesity Prevention Branch
California Department of Public Health

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Executive Summary

Introduction

Champions for Change is a program of the California Department of Public Health (CDPH), Nutrition Education and Obesity Prevention Branch (NEOPB). As part of the Champions for Change Program, the *Be Better* media campaign was designed to promote three healthy behaviors: eating fruits and vegetables (FV), engaging in physical activity (PA), and drinking water instead of sugary drinks. The primary audience for the media campaign was low-come California households, eligible for the Supplemental Nutrition Assistance Program (SNAP), which is funded by United States Department of Agriculture (USDA).

The 2017 *Be Better* media campaign included television, radio, billboard, public transit, and digital advertisements (ads), aimed at a multicultural audience of low-income California mothers. The campaign ran over a 26-week period in 12 designated market areas (DMAs) across California.

For the 2017 media evaluation, SNAP-eligible mothers from four DMAs were recruited and interviewed by telephone; the first prior to the commencement of the media campaign (Wave I), the second approximately four to six months later (Wave II). Responses from Wave II were compared to responses from Wave I to determine the extent of mothers' ad awareness and to examine changes in mothers' responses over time.

Method

Low-income Latina, African-American, and White mothers were randomly sampled and recruited for two telephone interviews that were administered in English and Spanish. A total of 1,202 mothers participated in the first interview, which was conducted prior to the start of the media campaign. Of these, 796 mothers were re-interviewed four to six months later.

From these interviews, nine outcome variables were derived from the interview questions to measure changes in mothers' FV intake and PA over time. Three of the nine outcomes (1, 2, and 7) concern mothers' dietary behavior. Six outcomes (3, 4, 5, 6, 8, and 9) relate to mothers' PA behavior.

To assess maternal ad awareness, open-ended and closed-ended (yes/no) questions (from Wave II survey) were used to categorize mothers according to their level of ad awareness. Unaided ad recall was determined by comparing mothers' open-ended descriptions of ads to a list of images, messages, and spoken words appearing in the *Be Better* ads. Aided ad recall was determined by a 'yes' response (indicating recognition) to descriptions of the campaign ads provided by the interviewer. In contrast to previous *Be Better* evaluations, a third category of recall was included in the 2017

evaluation. Mothers who were unable to recall or recognize the ads were categorized as no-recall mothers. Thus, three (versus two – unaided and not unaided) levels of ad awareness were included.

Another difference from previous evaluations is the analytic approach. For this evaluation, Generalized Estimating Equations (GEE) were chosen as the overall analytic approach, which is an analytic procedure appropriate for the types of data collected, namely discrete (limited range) and binary (yes/no) data. The primary benefit of GEEs is that they produce parameter estimates that are efficient and unbiased relative to other analytic approaches for discrete and binary data.

We first examined how mothers' responses changed over time (Wave I to Wave II interviews), with the inference that these changes in response correspond to changes in behavior. Following these analyses, maternal levels of ad awareness were entered into the models to determine if ad awareness uniquely contributed to changes in responses.

Results

Extent of Ad Awareness

Results suggest that the media campaign successfully reached the intended population, namely SNAP-eligible, low-income California households: 18 percent of surveyed mothers demonstrated unaided recall of at least one *Be Better* ad, and 74 percent indicated recognition only (aided recall) of one or more ads. Thus, a total of 734 mothers, or 92 percent of the sample, had some level of ad awareness.

The campaign effectively reached mothers across the three racial/ethnic groups recruited: 93 percent of African-American mothers indicated either recall or recognition of at least one campaign ad. Similarly, 94 percent of Latina mothers demonstrated ad recall or recognition. White mothers showed a comparable rate of recall or recognition (88%). A small number of mothers (n=18), who self-identified as Asian/Pacific Islander, also evinced a high level of campaign awareness (94%).

Changes in Behavior Over Time (Wave I to Wave II Interviews)

Changes in maternal responses were found for several outcomes. Results indicated an increase in the proportion of mothers who met or exceeded the USDA's recommendation of at least ½ plate of FVs (outcome 2). Mothers were also more likely to have met the USDA recommendation of 150 minutes of PA per week over time (outcome 3), more likely to provide support for their children's PA (outcome 8), and more likely to be physically active with their children (outcome 9) over the survey period.

Maternal Levels of Ad Awareness

When maternal ad awareness was added to the analyses, some new, more complex, findings emerged. For instance, unaided recall mothers (at Wave I) spent less time

doing physically active work than no-recall mothers, but did not differ from aided recall mothers (outcome 4). This difference, however, was not evident at Wave II. This lack of difference at Wave II is explained by an increase in physical activity among unaided recall mothers over the survey period. Aided- and no-recall mothers', in contrast, decreased in work-related PA over time, which eliminated the between-group difference. In brief, unaided recall mothers increased in work-related PA over time, aided- and no-recall mothers did not.

Other findings of interest included: Unaided recall mothers tended to report eating more FVs than aided-recall and no-recall mothers (outcome 1). Unaided recall mothers were more likely to have met the USDA recommendation for PA (outcome 3) and more likely to state that they were supportive of their children's PA than aided- and no-recall mothers (outcome 9). Although unaided recall mothers differed from no-recall mothers, and at times from aided mothers, these between-group differences were not related to change over time.

Maternal Demographic Characteristics

Mothers' demographic characteristics interacted with survey period in informative ways. For example, higher levels of education were associated with less time spent in physically active tasks across a variety of settings (e.g., work, housework). Similarly, increases in maternal age were associated with decreases in time spent physically active tasks.

Language also emerged as an important predictor. English speakers reported eating fewer FVs (outcome 1), spending less time doing physically active work (outcome 4), and were less likely to provide support for their children's FV intake (outcome 7) than Spanish speakers. However, English speakers reported spending more time walking (outcome 5) and were more likely to provide support for their children's PA (outcome 8) than Spanish speakers.

With respect to race/ethnicity, Latina mothers and African-American mothers were less likely to have met the USDA recommendation for FV than White mothers. However, African-American and (to a lesser extent) Latina mothers reported spending more time walking than White mothers and Asian/PI mothers (outcome 5). Race/Ethnicity also interacted with maternal ad awareness in varying ways. For example, among Latina mothers, unaided recall mothers were more likely to have met the USDA FV recommendation than aided recall mothers, but not more likely than no-recall mothers.

Discussion

The 2017 *Be Better* media campaign successfully reached SNAP-eligible, low-income California households as indicated by mothers' recall or recognition of campaign ads. The high rate of aided recall (74%) may overestimate to an extent the true level of

maternal awareness. Although aided recall (recognition) is a commonly used metric in evaluations of advertising effectiveness, recognition responses are subject to biases in memory and responding. These biases can be reduced, to an extent, by the inclusion of sham questions that can identify individuals who have a tendency to response 'yes' to all or most questions, regardless of actual memory. Nevertheless, the results suggest that unaided-, aided-, and no-recall mothers responded in differing ways, increasing our confidence that that aided-recall (even if imprecise) contributed to the findings.

Positive changes over time were found for several dietary and PA behaviors. Also observed were positive between-group differences associated with maternal ad awareness. However, some of these differences were either already evident at Wave I (prior to the campaign) or were observed at both Wave I and Wave II and thus not related to change over time as would be expected after exposure to the media campaign. One possible explanation for these findings may be that the *Be Better* campaign is a multi-year project. The ad campaign had already been shown in the four evaluation DMAs, for a period of three months the year prior. These differences, therefore, could be carry-over effects from the previous years' ad exposure.

Of interest, mothers' demographic characteristics also influenced their responses and interacted with maternal ad awareness and survey period. These demographic differences can inform our understanding of the families served. It also highlights the need to develop media campaigns that address the needs of families at different stages (e.g., age, education) of their life and that address the unique needs, values, and history of each culture.

Disparities in dietary and physical activity behaviors were evident in the interactions between mothers' race/ethnicity and their responses over the survey period. In at least some of those instances where the mother's race/ethnicity interacted with ad awareness, minority mothers evinced small, but positive changes over time.

INTRODUCTION

The California Department of Public Health (CDPH), Supplemental Nutrition Assistance Program-Education (SNAP-Ed) program provides funding, training, and technical assistance to local health departments to promote healthy eating and physical activity through community-wide and face-to-face interventions. These SNAP-Ed interventions are funded by the United States Department of Agriculture (USDA) SNAP-Ed Program and are aimed at low-income Californians eligible for the USDA Supplemental Nutrition Assistance Program (SNAP).

The CDPH SNAP-Ed Champions for Change Program complements these interventions, using social marketing campaigns to encourage Californians to lead healthier, more active lives. Low-income, SNAP-Ed-eligible Californians constitute the primary audience for the Champions for Change Program statewide media campaigns.

In 2017, CDPH SNAP-Ed directed the Champions for Change Program to develop the *Be Better* media campaign to promote three healthy behaviors among members of the primary audience: engaging in physical activity, eating fruits and vegetables, and drinking water instead of sugary drinks. First introduced in 2016, the campaign targeted a multicultural audience of low-income African American, Latina, and White California mothers of school-aged children.

The two aims of this evaluation were to assess awareness of advertisements (ads) in 2017 and to examine potential behavioral outcomes related to levels of awareness. The sections that follow contain detailed descriptions of the ads that made up the 2017 *Be Better* campaign, the evaluation methods, and results.

The 2017 *Be Better* Media Campaign

The 2017 *Be Better* media campaign was comprised of English and Spanish television ads, radio ads, outdoor ads that appeared on billboards and public transit, and online digital ads. Ads presented in English were targeted to multicultural, low-income mothers and ads in Spanish were targeted to low-income Latina mothers. Below we describe the main messages of the English and Spanish ads, present the television and radio scripts, show the outdoor ads that appeared on billboards and public transit, and present the still images of the digital ads that appeared online.

The central theme of the *Be Better* campaign was that small steps can add up to big changes – by making small changes each day we enjoy the cumulative effects of healthier living and feeling better overall. The ads implied that healthy eating and physical activity could help families live their lives to the fullest. The campaign was developed by Runyon Saltzman, Inc. (RSE) to be used from 2016 through 2018. The

2017 campaign included ads from the previous year, plus one new television ad, 13 new outdoor ads, and 14 new digital ads.

Be Better Television Ads

The 2017 *Be Better* television ads showed families eating vegetables, drinking water, and being physically active together. Messages in the ads highlighted the short-term and long-term benefits of healthy eating and physical activity. Short-term benefits mentioned in the ads included improvements in mood, physical strength, energy, and school performance. The long-term benefit was a decrease in the risk for obesity, high blood pressure, and type 2 diabetes. Two 30-second television ads were produced in English and two were produced in Spanish.

English-language Television Script #1: GIRL 1: It's day one of walking, let's go! KIDS: We're playing zombie tag! WOMAN 1: I'm tired, but I'm teaching them hopscotch. WOMAN 2: I'm starting a garden with my neighbors so our kids can eat better. WOMAN 3: And we feel happier! WOMAN 4: I have more energy at work. WOMAN 5: I feel stronger! ANNOUNCER: Small changes you make today can make a big difference in how you feel – and may help prevent obesity, high blood pressure, and type 2 diabetes. Start now to turn today into a better day. GIRL 1: It's been a month, and we feel better!

English-language Television Script #2: WOMAN 1: We're trying to turn screen time into active time – here goes! KIDS: We're dolphins! MAN 1: We're making our local park a safe place for families. WOMAN 2: We're in super hero training! WOMAN 3: We're having more water and fewer sugary drinks. WOMAN 4: And we feel stronger. CHILD: I'm doing better in school. WOMAN 5: We feel happier. ANNOUNCER: Small changes you make today can make a big difference in how you feel – and may help prevent obesity, high blood pressure, and type 2 diabetes. Start now to turn today into a better day. WOMAN 1: We're still going, and we feel better!

English-language Television Script #3: MAN: Living a healthier life starts by taking one small step. CHILD: One bite. WOMAN: One choice. MAN: One recipe. CHILD: One snack. WOMAN: One drink. WOMAN: One breakfast. WOMAN: One switch. MAN: One meal. Announcer: Making one small change towards a healthier life can make a big difference in how you and your family feels. Start now and see what a difference one change can make.

Spanish-language Television Script #1 (Translated): WOMAN 1: It's Day 1 of walking. WOMAN 2: I'm tired, but I'm going to play with the kids. MAN 1: My neighbors and I are starting this garden. WOMAN 3: So the kids can eat better. GIRL 1: We feel happier. WOMAN 4: I have more energy. WOMAN 5: I feel stronger. ANNOUNCER: Small changes you make today can make a big difference in how you feel and may help prevent obesity, high blood pressure and type 2 diabetes. Turn today into a better day! WOMAN 1: It's been a month, and we feel better!

Spanish-language Television Script #2 (Translated): WOMAN 1: Starting today, less video games. MAN 1: We're making sure our parks are safer. WOMAN 2: We're in super hero training. WOMAN 3: We're having less sugary drinks and sodas. WOMAN 4: And we feel stronger. CHILD 1: I'm doing better in school. WOMAN 5: We feel happier. ANNOUNCER: Small changes you make today can make a big difference in how you feel and may help prevent obesity, high blood pressure and type 2 diabetes. Turn today into a better day! WOMAN 1: Now we're better than ever.

Spanish-language Television Script #3 (Translated): MAN: When you live a healthier life, you have CHILD: More fun. WOMAN: More color. MAN: More creativity. WOMAN: More pride. MAN: More unity. WOMAN: More energy. MAN: More inspiration. ANNOUNCER: Adding more fruits and vegetables to your diet is a small change that can make a great difference in your well-being and in your family's too. Start to make small changes today and get more out of life.

Be Better Radio Ads

One 30-second radio ad was presented in English and one in Spanish. The radio ads highlighted the message that perfection may be unrealistic, but being better is achievable. They also featured the message that small changes can result in long-term health benefits. The English radio ads directed listeners to visit the Nutrition Education and Obesity Prevention Branch's (NEOPB) Champions for Change website. Listeners in Spanish were directed to visit the Campeones del Cambio website.

English-language 30-Second Radio Script: WOMAN: With a busy family and full-time job, I don't have time to be perfect. But what I can be is better. So we're making small changes that make a big difference in my family's health. At C A Champions For Change.net we found fun ways to be active, and discovered delicious recipes that are quick and good for us. ANNOUNCER: Small healthy changes may help your family prevent obesity, high blood pressure and type 2 diabetes. Visit C A Champions For Change.net. WOMAN: And just be better. ANNOUNCER: A message from the California Department of Public Health. Funded by USDA SNAP-Ed, an equal opportunity provider and employer.

Spanish-language 30-Second Radio Script (Translated): WOMAN: My family and I have learned that we don't have to be perfect, just better. And at Campeones Del Cambio.net we found ideas to be more active and yummy recipes that are quick and good for us (our health). ANNOUNCER: Small healthy changes can help your family prevent obesity, high blood pressure and type 2 diabetes. Visit Campeones Del Cambio.net. WOMAN: And learn how to be better. ANNOUNCER: A message from the California Department of Public Health. Funded by USDA SNAP-Ed, an equal opportunity provider and employer.

Be Better **Outdoor Ads**

Outdoor billboard and interior transit ads consisted of thirteen ads in English and thirteen in Spanish. In each language, there were four ads with messages about physical activity, three with messages about drinking water, and six messages about eating fruits and vegetables.

English-Language Outdoor Ads

Spanish-Language Outdoor Ads

Translation: Eat better
Make half your plate fruits and
vegetables

Translation: Better Nutrition
Have a taco with vegetables
Have a meal with vegetables (colloq.)

Translation: Breakfast better
(have a better breakfast)
Eat fresh fruit.

Translation: Breakfast better
(have a better breakfast)
Include delicious fruits

Translation: Season better
Use chile and lime instead of salt

Translation: Enjoy better
With more variety

Translation: You'll feel better
Walk 30 minutes or more today

Translation: You'll rest better
Exercise will help you sleep

*Translation: You'll focus better
Exercise improves your attention*

*Translation: Score the best goals
Help your kids get 60 minutes of daily
physical activity*

*Translation: Refresh better
Add pineapple to water*

*Translation: Drink water instead of
sugary drinks*

*Translation: Refresh better
Add orange to water*

Be Better Digital Ads

The *Be Better* campaign included six animated digital ads in English and six in Spanish. In each of the two languages, two of the ads promoted fruits and vegetables, two promoted physical activity, and two recommended drinking water instead of sugar-sweetened beverages. All digital ads included a link to either the Champions for Change English website or Campeones Del Cambio Spanish website.

English-Language Digital Ads

Boost your **breakfast with berries**
GET HEALTHIER WITH RECIPES

Add **veggies** to pasta sauce
GET HEALTHIER WITH RECIPES

Turn video games into **ball games**
GET HEALTHIER WITH MORE TIPS

Walk during lunch
GET HEALTHIER WITH MORE TIPS

Drink water **with fruit** instead of soda
GET HEALTHIER WITH MORE TIPS

Drink water **with fruit** instead of soda
GET HEALTHIER WITH MORE TIPS

Spanish-Language Digital Ads

Añade **frutas** al desayuno
MEJORA TU SALUD CON RECETAS

Más **verduras** en tu caldo
MEJORA TU SALUD CON RECETAS

Translation: Add fruits to breakfast

Translation: More vegetables in your soup

Translation: Housework Keeps the kids active

Translation: Take a walk after dinner

Translation: Drink water with cucumber instead of soda

Translation: Drink water with fruit instead of soda

Timeline and Placement

The campaign occurred over a 26-week period, from April 1 through September 24, 2017. Digital ads were placed statewide. Television, radio, and outdoor ads were placed in 12 designated market areas (DMAs), which are geographic areas in which residents receive similar local television and radio broadcasts. Ad placement was selected by RSE to reach at least 52.8 percent of individuals with incomes equal to or less than 185 percent of the Federal Poverty Level (FPL), the eligibility criterion for SNAP. Ads in the 12 DMAs varied by language and by type of media (see Table 1).

Table 1. *Be Better* campaign ad placement by DMA and language

DMA	Television	Radio	Billboard	Transit
Bakersfield	English/Spanish	Spanish	English/Spanish	English/Spanish
Chico	English	English/Spanish	English	-
Eureka	English	-	-	-
Fresno	English/Spanish	English/Spanish	English/Spanish	English/Spanish
Imperial County	-	Spanish	Spanish	-
Los Angeles	English/Spanish	English/Spanish	English/Spanish	-
Monterey	Spanish	Spanish	-	Spanish
Palm Springs	Spanish	Spanish	Spanish	-
Sacramento	English/Spanish	English/Spanish	English/Spanish	English/Spanish
San Diego	English/Spanish	English/Spanish	English/Spanish	English/Spanish
San Francisco	English	English	English	-
Santa Barbara	-	Spanish	-	-

RSE reported that during the 26-week campaign, 14,920 30-second ads ran on television. Thirty- and 60-second radio ads aired 34,814 times. At least 3,705 billboard ads and 2,168 interior transit ads appeared in low-income neighborhoods. These counts represent conservative estimates because they are based on purchased ads; they exclude "added value" ads, those ads aired or placed by media outlets free of charge. They likely underestimate the true number of ads displayed in low-income neighborhoods.

THE EVALUATION

The evaluation was designed to address three research topics:

- Extent of mothers' awareness of campaign ads
- Changes in maternal responses over time
- Association between maternal levels of ad awareness and changes in self-reported dietary behaviors
- Association between maternal levels of ad awareness and changes in self-reported PA

Data to address these topics came from telephone interviews with women of school-aged children. Mothers were randomly selected from low-income households within four DMAs: Fresno, Los Angeles, Sacramento, and San Diego. These DMAs were selected because African American, Latina, and White low-income women are well represented in these communities, and the placement of television, radio, outdoor and digital ads was well represented among the four DMAs.

Methodology

Sampling and Screening

Households with at least one adult female and one or more children were identified from the Medi-Cal Eligibility Data System (MEDS). The MEDS database provides information on households that were eligible to receive SNAP at least one month out of the previous twelve months (SNAP households). Prior to the launch of the *Be Better* campaign, mothers from a randomly selected sample of MEDS households were recruited for participation in telephone interviews (Wave I interviews). Calls to the selected households included screening questions to identify mothers (or female guardians), 18 to 59 years of age, with one or more children ages 5 to 17 years. Racial/ethnic information in the MEDS database and screening questions were used to obtain equal numbers of African American, Latina, and White mothers so that sample sizes would be sufficient to conduct analyses with mothers from each racial/ethnic group.

Respondents

A total of 1,202 mothers participated in Wave I interviews (Response Rate 4 = 12.5 percent[1]). Of these respondents, 796 mothers were re-interviewed in Wave II, for a 66.2 percent retention rate. This met our target retention rate of 66 percent.

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[1] American Association for Public Opinion Research (2016). *Standard definitions final dispositions of case codes and outcome rates for surveys (9th ed.).* Retrieved from: http://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf.

Among the 796 mothers who participated in both the Wave I and Wave II interviews, 40.7 percent self-identified as Latina, 27.0 percent as White, 30.0 percent as African American, and 2.3 percent self-identified as Asian/Pacific Islander (Asian/PI). Education less than high school was reported by 15.7 percent of the sample, 22.7 percent as high school graduates, 44.0 percent had attended college, and 17.6 percent had graduated from college (See Table 2 for a summary of demographic characteristics).

Interviews were conducted in English with 648 mothers (81.4%) and in Spanish with 148 mothers (18.6%). Bilingual mothers accounted for 28.5 percent of the sample, with 23.5 percent being fluent in both English and Spanish and 5.0 percent fluent in another language. Overall, 83.3 percent of mothers had income levels that met the eligibility requirements for assistance through at least one of two USDA nutrition assistance programs, the Child Nutrition Program or the Special Supplemental Nutrition Program for Women, Infants and Children (WIC).

Table 2. Demographic characteristics of mothers completing Wave I and Wave II interviews (N=796)

Race/Ethnicity	
Latina	40.7%
African American	30.0%
White	27.0%
Asian/Pacific Islander	2.3%
Highest Level of Education[1]	
Less Than High School	15.7%
High School Graduate	22.7%
Some College	44.0%
College Graduate	17.6%
Used WIC in Last 12 Months	
Yes	26.3%
No	73.7%
Received Free or Reduced Priced School Meals	
Yes	79.6%
No	20.4%
Maternal Age[2]	
Mean=39.3 years	Range= 20 to 59 years
Primary Language	
English	82.4%
Spanish	17.6

Notes:

1. One mother did not report level of education.

2. Two mothers did not report maternal age.

Wave I and Wave II Interviews

Prior to the commencement of the Wave I interviews, a letter of introduction was sent to potential participants that described the study and let them know that they were likely to receive a call. Following the dissemination of these introductory letters, interviews were conducted between February 17 and April 1, 2017, in either English or Spanish. The Wave I interviews began with screening questions to identify eligible participants, followed by questions about physical activity, diet, knowledge, and household behavior (described below). Wave I interviews ended with questions about mothers' demographic characteristics and use of the Child Nutrition Program and WIC.

Mothers who agreed during their Wave I interviews to be re-contacted for the Wave II interviews were sent a reminder letter before the beginning of Wave II. The follow-up interviews took place between June 30 and August 12, 2017, and began with a series of questions assessing mothers' awareness of the *Be Better* campaign ads (the unaided recall and aided recall measures described below). Mothers were then asked the same series of questions that they were asked in the Wave I interviews.

On completion of each interview, mothers were offered $10 in appreciation of their time. The study procedures were reviewed and approved by the State of California Committee for the Protection of Human Subjects.

Assessing Unaided Ad Awareness: Coding Procedure

During the Wave II interviews, a series of open-ended questions were used to assess mothers' awareness of the *Be Better* ads. The first item was, "I would like to ask you some questions about ads you may have seen or heard. Have you noticed any ads – on television, on the radio, outside on billboards or online – recommending that people be physically active, drink water, or eat fruit and vegetables for better health? I don't mean ads for specific restaurants or grocery stores."

Those responding "yes" to this question were asked to describe the ads. Interviewers were trained to use the following probing questions to elicit detailed responses when applicable.

- What was the main message of the ad?
- Where did you see or hear it?
- What do you remember about the story?
- What do you remember about the characters or people?

Mothers were then asked whether they had seen "any other ads like this in the last three months." Those who answered "yes" to this second question were asked to describe the ads. Interviewers again used the probing questions, when applicable, to elicit details.

Two research staff (Coders) independently compared mothers' responses to these questions with verbal and visual elements from the ads. Prior to coding, the Coders' reviewed all the ads so that they were highly knowledgeable about the content and visual elements of the ads. A third research staff member trained with the coders and served as a "tie breaker," providing a third, independent judgment in cases where the two coders disagreed.

A catalog of *Be Better* ad contents was developed and used for scoring purposes. Coders used the protocol to score each description on its overall resemblance to a *Be Better* ad, its inclusion of keywords, other verbal and visual elements from the *Be Better* ads, and words or phrases belonging to other ad campaigns (See Table 2). Coders then used each score to judge whether a mother's description did or did not clearly indicate that she recalled a *Be Better* ad.

Table 3. Criteria used in scoring unaided recall

Criterion	Description
Global judgment	Coders considered whether the response, as a whole, clearly described the *Be Better* ads.
Keywords	Major themes or ideas expressed in the ads that immediately identified them as *Be Better* ads. Examples of keywords are "Champions for Change" or "*Be Better.*"
Elements	Minor themes, words, phrases, images, settings, or graphics that were present in the ads. Coders counted the number of elements in the description across six categories: Ideas, People, Story, Food/Drink, Actions, and Setting/Visuals. Coders also assigned points to descriptions that clearly represented outdoor ads. Because outdoor ads contain fewer elements than do radio and television ads, this enabled outdoor ads to be scored using the same system as that used for television and radio ads.
Exclusion words	Words or phrases that identified the ad described as one belonging to another campaign. An example of an exclusion word/phrase is, "Sesame Street."

Each mother was assigned a final unaided recall code (unaided recall, no unaided recall). Final determination of respondents' unaided recall code was made at consensus meetings held with the Coders and the study's Co-Principal Investigator. Mothers whose responses demonstrated that they had awareness of at least one of the *Be Better* campaign ads were coded as "unaided recall." Mothers whose responses did not

provide substantial evidence of recalling any *Be Better* ads were coded as "no unaided recall."

To determine the agreement level (interrater reliability) between the two primary coders, a Cohen's (κ) analysis was conducted. Based on this analysis, there was substantial agreement between the two coders, κ = .65 (p <0.001).

Assessing Ad Awareness Through Aided Recall

Following the series of unaided recall items, Wave II respondents were presented with 11 narratives of actual television, radio, billboard/transit, and online digital ads that they "may have heard or seen recently." Descriptions of the campaign's television and radio ads were the same for mothers who completed the interview in English and Spanish. Descriptions of outdoor ads and digital ads differed between English and Spanish interviews, because the campaign's English outdoor and digital ads differed from those that were presented in Spanish.

After each description, mothers were asked, "Do you remember hearing/seeing this ad?" Mothers who responded "yes" to any of the 11 narratives were coded as "aided recall." Mothers who responded no to all the 11 narrative questions were coded as "no aided recall."

Unaided Recall, Aided Recall, No Recall

The 2017 *Be Better* media evaluation includes three levels of maternal ad awareness, which differs from the previous *Be Better* evaluations that included two levels of awareness (unaided recall and not unaided recall). The present study separated the "not unaided recall" group into two distinct groups (aided recall and no recall) to examine if varying levels of ad awareness were associated with potential changes in the outcomes of interest.

Three maternal levels of ad awareness:

1. Unaided recall mothers
    a. Those mothers whose open-ended responses demonstrated that they could recall substantive elements of at least one of the *Be Better* campaign ads were coded as "unaided recall mothers."[2]
2. Aided recall mothers
    a. Those mothers whose open-ended responses did not demonstrate recollection of at least one ad, but who demonstrated recognition of the ads as described by the interviewer were coded as "aided recall mothers" (excluding mothers who were categorized as unaided recall).

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[2] It should be noted that unaided recall mothers also responded 'yes' to one or more ad descriptions provided by the interviewer. That is, after the interviewer described the various ads, unaided recall mothers indicated that they recognized one or more of the ads (with the exception of one mother who responded 'no' to each of the 11 ad descriptions).

3. No recall mothers
   a. Those mothers whose open-ended responses did not demonstrate recall and who did not recognize any of the ads as described by the interviewers were coded as "no recall mothers."

Our unaided recall procedures likely underestimate actual ad awareness. To be scored as unaided, a mother had to quickly recollect specific and substantial details of one or more ads and articulate those details during the interview process. Mothers who provided a few details, but not sufficiently to meet the coding threshold, were not coded as unaided recall mothers.

Conversely, the aided recall measure almost certainly overestimates actual ad awareness because it is subject to biases in memory and responding, such as misattribution, acquiescence, and social desirability. Our aided recall measure is best understood as a measure of recognition, not of true recall. Although aided recall is a relatively less rigorous measure than is unaided recall, it is a commonly used metric in evaluations of advertising effectiveness.[3,4] To facilitate comparison with other evaluations, aided recall was measured and reported in the current study.

Outcome Variables

Nine outcome variables were derived from the questions appearing on both the Wave I and Wave II surveys.

Outcome 1: Fruits and Vegetables (FV) Intake

The first outcome variable estimated daily intake of FVs. This variable was computed using responses to five items asking about the number of times mothers drank 100 percent fruit juice; ate fresh, frozen, canned, or dried fruit; ate green salad; ate carrots; and ate other vegetables. Responses to each question were recorded within time frames of day, week, month, or year, as offered by each mother. Responses to each item were converted to times per day and summed.

Outcome 2: USDA FV Recommendation

Mothers' healthful eating behavior was assessed according to whether they met the USDA's recommendation that FVs fill at least half of one's plate at mealtimes. This second outcome variable allowed us to examine the proportion of mothers in our sample who met the recommendation. Specifically, mothers were asked, "When you think about your plate at mealtimes, how much of your plate is usually filled with fruit and vegetables? Would you say none, one fourth, one half, three fourths, or all?"

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[3] Romaniuk, J., Sharp, B., Paech, S., & Driesener, C. (2004). Brand and advertising awareness: A replication and extension of a known empirical generalization. *Australian Marketing Journal, 12,* 70-80.

[4] Singh, S. N., Rothschild, M. L. and Churchill, G.A. Jr. (1988). Recognition versus recall as measures of television commercial forgetting. *Journal of Marketing Research, 25,* 72-80.

Responses to this question were dichotomized as either meeting the recommendation or not meeting the recommendation.

Physical Activity (PA) Outcomes

Outcomes 3 to 6 examine maternal PA behaviors in various contexts.

Outcome 3: USDA PA Recommendation (Free Time). A series of three free-time physical activity questions began with, "In a usual week are there any days when you are physically active for at least 10 minutes at a time? Think of your free time only, not work time or work around the house." Those who responded "yes" were asked the number of days per week they were physically active and how much time per day they spent on physical activities (in hours or minutes). Minutes of weekly physical activity were computed from these questions. Finally, the free-time physical activity index was dichotomized. Mothers who engaged in 150 minutes or more were coded as meeting the recommendation. Mothers with lesser levels of free-time physical activity were coded as not meeting the recommendation.

Outcome 4: PA Work. Seven questions were used to assess the time in the previous week that was spent doing physically active work. Mothers were asked to think of all work that was done outside the home, including paid jobs, volunteer work, taking classes, and any other paid or unpaid work. Mothers were then asked the number of days per week they were physically active and how much time per day they spent on physical activities (in hours or minutes). Responses were converted to minutes for analyses.

Outcome 5: PA Walking. Three questions were used to assess walking for transportation, leisure, and work. Mothers were asked the number of days per week they were physically active and how much time per day they spent on physical activities (in hours or minutes). Responses were converted to minutes for analyses.

Outcome 6: PA Housework. Six questions addressed the time spent on physically active housework, which included work in and around the home such as gardening, yard work, general maintenance, and caring for families. Mothers were asked the number of days per week they were physically active and how much time per day they spent on physical activities (in hours or minutes). Responses were converted to minutes for analyses.

Maternal Support of Children's Healthy Eating and PA: Outcomes 7, 8, 9

Finally, three of the nine variables were designed to assess changes in mothers' support and encouragement of children's healthy eating and PA. Responses to these three questions were dichotomized for analyses.

Outcome 7: Children's FV Intake. Mothers were asked: "How often do you make it easy for (your/any of your) child/ren living in your home to eat fruit and vegetables, such as by having them washed, cut and ready to eat? Would you say not at all, less than every month, every month, every week, or every day?" Mothers who indicated they made it

easy for their child/ren to eat FVs on a daily basis were coded as providing daily maternal support for FV intake.

Outcome 8: Children's PA. Mothers were asked: "How often do you make it easy for (your/any of your) child/ren living in your home to be physically active, such as by taking them to sports practice, playing ball with them, or encouraging them to play outside or ride a bike? Would you say not at all, less than every month, every month, every week, or every day?" Mothers who indicated they made it easy for their child/ren to be physically active on a daily basis were coded as providing daily maternal support for PA.

Outcome 9: Family PA. Mothers were asked: "How often do you or your children do a physical activity together, such as playing ball, riding bikes, or taking a walk? Would you say not at all, less than every month, every month, every week, or every day?" Mothers who indicated they were physically active with their child/ren on a daily basis were coded as providing daily maternal support for family PA.

Analytic Plan

The analytic approach in the present media evaluation differs from the previous media evaluations in a number of ways. As previously described, three (versus two) levels of maternal ad awareness were utilized to investigate differences across varying levels of ad awareness. Changes in outcomes were examined using Generalized Estimating Equation (GEE)[5,6,7,8] models rather than generalized linear mixed regressions and logistic regressions. The GEE analysis is increasingly being utilized for repeated measures (e.g., Wave I and Wave II) designs that test hypotheses using binary (e.g., yes/no) or discrete (limited range) data (e.g., number of FVs consumed). GEEs allow for more confidence in statistical conclusions, because the method produces parameter estimates that are more efficient and unbiased than ordinary least squares (OLS) regression analyses. Moreover, GEEs permitted the inclusion of individual-level

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[5] The GEE method was developed as a means of testing hypotheses using binary and other exponentially (e.g., Poisson, Gamma, negative binomial) distributed response variables collected within subjects across time. GEEs estimate more efficient and unbiased regression parameters relative to OLS regressions, because they permit specification of a working correlation matrix that accounts for within-subject correlations on dependent variables of many different distributions. The main benefit is the production of reasonably accurate standard errors and confidence intervals with correct coverage rates.

[6] Smith, T., & Smith, B. (2006). _PROC GENMOD with GEE to analyze correlated outcomes data using SAS_. SAS Conference Proceeding, Irvine, California.

[7] Ballinger GA (2004). Using generalized estimating equations for longitudinal data analysis. _Organ Research Methods, 7_, 127–150.

[8] Imori, S. (2013). _On Properties of QIC in Generalized Estimating Equations_. Hiroshima University, 1-8.

variables (i.e., race/ethnicity, language spoken, education) across the nine outcome variables that could potentially interact with outcomes in informative ways.

The analyses begin with an examination of changes over time, without regard to maternal ad awareness, to determine how mothers' behaviors (with respect to FV consumption and PA) changed over the survey period (Wave I to Wave II). We then examine these same outcomes with the addition of maternal ad awareness to determine how ad awareness might have uniquely influenced mothers' behaviors.

Changes Over Time: Wave 1 and Wave 2 Survey Responses

To examine changes in outcomes over time, GEE models[9] were developed. Each outcome variable was entered as a dependent variable, Wave I and Wave II as the repeated measure, and Race/Ethnicity (Hispanic, White, African American, Asian/Pacific Islander), Maternal Education (less than high school, high school, some college, college graduate), Maternal Interview Language (English, Spanish) and Maternal Age as predictor variables. For these analyses, mothers' awareness of the media campaign was not considered.

Changes Over Time: Levels of Maternal Ad Awareness

To examine how maternal ad awareness may have contributed to change in outcomes over time, GEE models[10] were developed and analyzed with recall status added to the

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[9] The general GEE models for Wave I and Wave II comparisons were as follows:
    a. Count/Discrete data (i.e., number of minutes):
        i. Outcome=race/ethnicity, language, education, age, wave, wave*race/ethnicity, wave*education, wave*language, wave*age; with a poisson distribution, a log function, and an exchangeable working correlation matrix.
        ii. The initial model was estimated, evaluated, and then simplified by removing non-significant effects, with the constraint that a model could not be simplified further if it violated the hierarchy principle (i.e., lower-order factors could not be removed if a significant higher-order interaction that included the same factors was present). Each model was evaluated against the initial model using the quasi-likelihood under the independence model information criterion (QIC) measure, which is helpful in selecting the appropriate correlation structure. The correlation structure with the QIC score that is lowest (closest to zero) is judged to be the best (see Ballinger, 2004; Imori, 2013).
    b. Binary data (i.e., yes/no):
        i. Outcome=race/ethnicity, language, education, age, wave, wave*race/ethnicity, wave*education, wave*language, wave*age; with a binomial distribution, a logit function, and an exchangeable working correlation matrix.
        ii. The model building method described above for count/discrete data was utilized.

[10] The general GEE models for comparisons across levels of maternal ad awareness were as follows:

models. Each outcome variable was entered as a dependent variable, Wave I and Wave II as the repeated measures, and Recall Status (unaided recall, aided recall, no recall), Race/Ethnicity, Maternal Education, Maternal Language, and Maternal Age as predictor variables.

Statistical Significance Criterion

For all analyses, the criterion for statistical significance was set at $p < .05$. Findings with p-values greater than or equal to .05, but less than .10 are described as marginally significant. All results for which $p \geq .10$ are described as nonsignificant.

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a. Count data/Discrete:
   i. Outcome=race/ethnicity, language, education, age, wave, ad awareness, wave*race/ethnicity, wave*education, wave*language, wave*age, wave*ad awareness, ad awareness*race/ethnicity, wave*ad awareness*race/ethnicity; with a poisson distribution, a log function, and an exchangeable working correlation matrix.
   ii. The model building method described previously was utilized.
b. Binary data:
   i. Outcome=race/ethnicity, language, education, age, wave, ad-awareness, wave*race/ethnicity, wave*education, wave*language, wave*age, wave*ad awareness, ad awareness*race/ethnicity, wave*ad awareness*race/ethnicity; with a binomial distribution, a logit function, and an exchangeable working correlation matrix.
   ii. The model building method described previously was utilized.

RESULTS

Preliminary Analyses

Of the 796 mothers who completed Wave I and Wave II surveys, 143 (18.0%) were categorized as unaided recall mothers, 591 (74.2%) were categorized as aided recall mothers, and 62 (7.8%) were categorized as no recall mothers.

Preliminary Chi square analyses indicated that levels of maternal ad awareness differed by race/ethnicity (see Table 4). A larger proportion of Latina and African-American mothers were categorized as unaided-recall mothers than were White mothers (X^2 = 17.2, p = 0.002). Also, a larger proportion of White mothers were categorized as no-recall mothers than were Latina and African-American mothers. There were no significant differences in race/ethnicity among aided-recall mothers ($p > 0.05$). Maternal ad awareness did not differ significantly as a function of maternal education (X^2 = 8.7, p > 0.05). However, there was a significant language-related difference in levels of ad awareness (X^2 = 11.7, $p < 0.05$). A larger proportion of Spanish speakers were categorized as unaided-recall mothers than were English speakers, but no difference was observed among aided-recall mothers ($p > 0.05$). There were no significant differences in maternal ad awareness as a function of maternal age (t = 0.56, $p > 0.5$).

Table 4. Demographic characteristics and maternal levels of ad awareness (N = 796)

Characteristic	Unaided Recall	Aided Recall	No Recall
Race/Ethnicity[1]			
White	n=24 (11.2%) ▼	n=165 (76.7%)	n=26 (12.1%) ▲
Latina	n=73 (22.5%) ▲	n=233 (71.9%)	n=18 (5.6%) ▼
African American	n=41 (17.2%) ▲	n=181 (75.7%)	n=17 (7.1%) ▼
Column p Values [2]	*p < 0.05**	*p > 0.05*	*p < 0.05**
Education			
Less than High School	n=26 (21.0%)	n=94 (75.2%)	n=5 (4.0%)
High School	n=35 (19.3%)	n=128 (70.7%)	n=18 (9.9%)
Some College	n=62 (17.7%)	n=265 (75.7%)	n=23 (6.6%)
College Graduate	n=20 (14.3%)	n=104 (74.3%)	n=16 (11.4%)
Column p Values	*p > 0.05*	*p > 0.05*	*p > 0.05*

Characteristic	Unaided Recall	Aided Recall	No Recall
Language			
English	n=108 (16%) ▼	n=489 (74.5%)	n=59 (9.0%)
Spanish	n=35 (25%) ▲	n=102 (72.9%)	n=3 (2.1%)
Column p Values	p < 0.05*	p > 0.05	NA [3]
Age	m=39.8	m=39.2	m=39.4
Row p Value	p > 0.05		

* Statistically significant

▼▲ Indicate direction of significance

Notes:

1. Because of the small number of Asian/PI mothers (n=18), Asian/PI mothers were excluded from analyses that examined maternal ad awareness.
2. p-Values = Probability values
3. NA = Not Available. Unstable statistic due to small cell value (n=3).

Changes in Outcomes Over Time: Wave I and Wave II

We begin with analyses examining potential differences between mothers' responses to the Wave I survey and their responses to the Wave II survey. Table 5 shows the descriptive statistics, across the two survey periods, for the nine outcomes of interest.

Table 5. Descriptive statistics for outcomes 1-9: Wave I and Wave II responses (N=796)

	Wave I	Wave II	p Value
1: FV Intake[1,2]	m=4.1 (std.=2.3)[3,4]	m=3.9 (std.=2.4)	p>0.05
2: Met USDA – FV[5]	n=336 (42.2%)	n=340 (42.7%)	p<0.05*
3: Met USDA – PA[6,7]	n=367 (46.1%)	n=402 (50.5%)	p<0.05*
4: PA (Work[8])	m=1342.9 (std.=1744.5)	m=1287.9 (std.=1693.5)	p>0.05
5: PA (Walking[8])	m=216.9 (std.=335.1)	m=217.1 (std.=331.1)	p>0.05
6: PA (Housework[8])	m=684.0 (std.=801.6)	m=635.8 (std.=751.8)	p>0.05
7: Child's FV[9]	n=538 (67.6%)	n=557 (70.0%)	p>0.05
8: Child's PA[10]	n=481 (60.4%)	n=512 (64.3%)	p<0.05*
9: Family PA[11]	n=181 (22.7%)	n=233 (29.3%)	p<0.05*

*Statistically significant
Notes:
1. FV = Fruits and Vegetables

2. Average number of times mothers reported consuming FVs per day.
3. *m* = mean; *std.* = standard deviation
4. Mothers with counts > 3.0 standard deviations (*n*=6) were removed from outcome 1 analyses (e.g., 29 times/day, 20 times/day).
5. Number (and %) of mothers who met or exceeded the USDA FV recommendation (1/2 plate of FVs)
6. PA = Physical Activity
7. Number (and %) of mothers who met or exceeded the USDA PA recommendation (150 minutes of PA per week)
8. Average number of minutes being physically active in each context (work, walking, housework) per week.
9. Number (and %) of mothers who made it easy for child/ren to eat FVs daily.
10. Number (and %) of mothers who made it easy for child/ren to be physically active daily.
11. Number (and %) of mothers physically active with their child/ren daily.

Outcome 1: FV Intake

Significant changes in maternal FV consumption over time were not evident. However, there were significant differences between groups as a function of maternal characteristics.

There was a significant language-related difference in FV intake, such that English speakers reported consuming fewer (3.9/day; β = -0.19) FVs than did Spanish speakers (4.3/day; Z = 2.67; p = 0.01).

A significant difference with respect to education was noted. Specifically, mothers with a high school education (3.7/day; β = -0.13) reported eating fewer FVs than did mothers with some college education (4.0/day) and college graduates (4.2/day; β = -0.17; Z = 2.36, p = 0.02). Mothers with less than a high school education (4.1/day) did not differ significantly from those with a high school degree or from those with higher educations (ps > 0.05). No other significant differences were observed.

Outcome 2: Met USDA FV Recommendation

A significant between-wave difference in the number of mothers who met the USDA recommendation was observed. Proportionately, at Wave II, a greater percentage of mothers (43%; β = 0.19) met the USDA FV recommendation than at Wave I (42%; Z = 2.43, p = 0.02).

A significant interaction between wave period and race/ethnicity was also observed. A greater proportion of African-American mothers met the USDA FV recommendation at Wave I (46%; β = 0.34) than at Wave II (42%; Z = 2.93, p = 0.01).

Although not related to change over time, a significant race/ethnicity difference was observed. Proportionally, fewer Latina mothers (38%; β = -0.47) met the USDA recommendation than did White mothers (47%), Asian/PI mothers (50%), and African-American mothers (44%; Z = 4.14, p < 0.001). Additionally, significantly fewer African-American mothers met the USDA recommendation than did White mothers and Asian/PI mothers (β = -0.28; Z = 2.69; p = 0.01).

Outcome 3: Met USDA PA Recommendation (Free Time)

There was a significant difference between waves, such that there were proportionately more mothers who met the USDA recommendation for PA at Wave II (50.5%; β = 0.17) than at Wave I (46.1%; Z = 2.27; p = 0.03). No other significant differences were observed.

Outcome 4: PA (Work)

Significant changes over time, concerning the amount of time mothers' spent in physically active work, were not evident. However, there were significant differences between groups as a function of maternal characteristics.

Among those mothers who reported doing some form of work outside the home (n=352), a significant education-related difference was found. College graduates (m=685.5 minutes; β = -0.46) reported significantly fewer minutes doing physically active work than did mothers with some college education (m = 1,283.0 minutes), high school graduates (m = 1,823.7 minutes), and mothers with less than a high school education (m = 2,400.2 minutes; Z = 2.99; p = 0.03). Moreover, mothers with a high school education reported a greater number of minutes doing physically active work than did mothers with some college education and college graduates (β = 0.26; Z = 2.02; p = 0.04). The difference between high school graduates and those with less than a high school education did not differ significantly (p > 0.05).

There was a marginally significant language-related difference. English speakers (m = 1,884.1 minutes; β = -0.35) tended to report fewer minutes than did Spanish speakers (m = 2,389.5 minutes; Z = 1.73, p = 0.08). No other significant differences were noted.

Outcome 5: PA (Walk)

Significant changes over time, relating to the amount of time mothers' spent walking, were not evident. However, there were significant differences between groups as a function of maternal characteristics.

There was a significant language-related difference in the number of minutes spent walking. English speakers (m = 224.0 minutes; β = 0.46) reported a greater number of minutes walking than did Spanish speakers (m = 184.4 minutes; Z = 2.55; p = 0.01).

A significant difference as a function of race/ethnicity was observed. African-American mothers (m = 259.3 minutes; β = 0.33) reported more minutes than did White mothers (m = 190.5 minutes) and Asian/PI mothers (m = 115.1 minutes; Z = 2.35, p = 0.02), but did not differ significantly from Latina mothers (m = 208.9 minutes, p > 0.05).

There was also a significant difference with respect to education. Mothers with less than a high school education (m = 251.8 minutes; β = 0.37) reported a greater number of minutes than did high school graduates (m = 225.3 minutes), mothers with some college education (m = 214.0 minutes) and college graduates (m = 182.4 minutes; Z = 2.38; p = 0.02). No other significant differences were observed.

Outcome 6: PA (Housework)

Significant changes over time, regarding the amount of time mothers' spent doing physically active housework, were not evident. However, there were significant differences between groups as a function of maternal characteristics.

There was a significant race/ethnicity-related difference in reported minutes spent doing physically active housework. African-American mothers (m = 530.1 minutes; β = -0.28) reported significantly fewer minutes than did White (m = 682.1 minutes) and Latina mothers (m = 749.4 minutes; Z = 2.47; p = 0.01), but did not differ significantly from Asian/PI mothers (m = 505.4 minutes, p > 0.05).

There was also a significant age-related difference. The number of minutes reported decreased with increasing age (β = -0.01; Z = 2.12, p = 0.03). A significant difference as a function of education was also noted. College graduates (m = 522.6 minutes; β = -0.39) reported fewer minutes doing physically active housework than mothers with some college education (m = 666.3 minutes), a high school education (m = 659.9 minutes) and those with less than a high school education (m = 797.9 minutes; Z = 3.39; p = 0.001). No other significant differences were noted.

Outcome 7: Children's FV Intake

Significant changes over time in the proportion of mothers who were supportive of their children's FV intake were not evident. However, there were significant differences between groups as a function of maternal characteristics.

There was a significant language-related difference in the number of mothers who reported making it easy for their child/ren to eat FVs. Proportionately, fewer English speakers (68%; β = -0.17) reported providing support for their children's FV intake than did Spanish speakers (71%; Z = 2.27, p = 0.02).

A significant difference was also observed for race/ethnicity. Proportionately, fewer

Asian/PI mothers (64%; β = -0.54) stated that they provided support than did White mothers (73%; *Z* = 2.47, *p* = 0.01). Moreover, fewer African-American mothers (65%; β = -0.17) provided FV support than did White and Latina mothers (69%; *Z* = 2.70; *p* = 0.01). The race/ethnicity difference was modified by a significant wave by race/ethnicity interaction. Specifically, Asian/PI mothers were more likely to state they were supportive of their children's' FV intake at Wave I (72%) than at Wave II (56%; β = 0.52; *Z* = 2.21, *p* = 0.03). No other significant differences were found.

Outcome 8: Children's Physical Activity

There was a significant difference as a function of wave period. A greater proportion of mothers reported providing support for their children's PA at Wave II (64.3%; β = 0.17) than at Wave I (60.4%; *Z* = 3.05, *p* = 0.002). In addition to this change over time, there were between-group differences as a function of maternal characteristics.

There was a significant language-related difference in the percentage of mothers who indicated that they made it easy for their child/ren to be physically active. Proportionately, a greater number of English speakers (66.7%; β = 0.41) indicated they provided support for their children's PA than did Spanish speakers (42.8%; *Z* = 4.19, *p* < 0.001).

There was also a significant difference with respect to race/ethnicity. Proportionately, fewer African-American mothers (62.1%; β = -0.31) reported they were supportive of their children's PA than White mothers (70.1%) and Asian/PI mothers (75.0%; Z = 4.81, *p* < 0.001). Additionally, fewer Latina mothers (57.1%; β = -0.26) reported supporting their children's PA than Asian/PI mothers and White mothers (*Z* = 4.06, *p* < 0.001).

A significant difference with respect to age was noted. As age increased, fewer mothers reported that they made it easy for their children to be physically active (β = -0.01; *Z* = 2.30, *p* = 0.02). No other differences were statistically significant.

Outcome 9: Family Physical Activity

A significant difference was observed for wave period. A greater percentage of mothers reported being physically active with their children at Wave II (29.3%; β = 0.86) than at Wave I (22.7%; *Z* = 2.67, *p* = 0.01). In addition to this change over time, there were between-group differences as a function of maternal characteristics.

There was a significant race/ethnicity-related difference in the number of mothers who stated that they were physically active with their children. Proportionately, fewer African-American mothers (22.4%; β = -0.44) reported being physically active with their children than Asian/PI mothers (33.3%), White mothers (26.7%) and

Latina mothers (27.8%; *Z*= 2.94; *p* = 0.003).

There was also significant difference as a function of age. The number of mothers who reported being physically active with their children decreased with increasing age (β = -0.02; *Z* = 4.46, *p* < 0.001).

Comparisons Across Levels of Maternal Ad Awareness

For these analyses, maternal ad awareness was added to the GEE models. Only those differences that arose when ad awareness was added to each model are described. Significant differences that were already reported are not repeated in this section. Table 6 provides descriptive statistics for maternal levels of ad awareness.

Table 6. Descriptive statistics for outcomes 1-9: Comparisons as a function of maternal ad awareness (N=778)

Outcomes	Wave I	Wave II	*Row p Values*	
Outcome 1: FV Intake [1,2,3]			**Recall**	
Unaided Recall	*m*=4.4 (*std.*=2.7) [4]	*m*=4.3 (*std.*=2.7)	▲	*p* = 0.06*
Aided Recall	*m*=4.2 (*std.*=2.5)	*m*=3.9 (*std.*=2.6)	▼	
No Recall	*m*=4.3 (*std.*=2.3)	*m*=3.9 (*std.*=2.3)	▼	
Wave p Values	p > 0.05			
Outcome 2: Met USDA FV [5]				
Unaided Recall	*n*=57 (41.3%)	*n*=58 (42.0%)		
Aided Recall	*n*=239 (41.3%)	*n*=245 (42.3%)	*p > 0.05*	
No Recall	*n*=32 (53.3%)	*n*=27 (44.3%)		
Wave p Values	p > 0.05			
Outcome 3: Met USDA PA [6,7]				
Unaided Recall	*n*=71 (51.4%)	*n*=84 (60.9%)	▲	*p* < 0.05**
Aided Recall	*n*=255 (44.0%)	*n*=278 (48.0%)	▼	
No Recall	*n*=32 (52.5%)	*n*=31 (50.8%)	▼	
Wave p Values	p > 0.05			
Outcome 4: PA (Work) [8]				
Unaided Recall	*m*=1197.6 (*std.*=1359.7) ▼	*m*=1371.3 (*std.*=1260.6)		
Aided Recall	*m*=1431.4 (*std.*=1841.6) ▲	*m*=1219.2 (*std.*=1571.1)	*p > 0.05*	
No Recall	*m* = 1608.7 std.=2178.8 ▲	*m* = 1371.3 std.=1359.7		
Wave p Values	p < 0.05**	p > 0.05		

Outcomes	Wave I	Wave II	*Row p Values*
Outcome 5: PA (Walk) [8]			
Unaided Recall	*m*=231.3 (*std.*=387.0)	*m*=257.5 (*std.*=354.1)	
Aided Recall	*m*=218.7 (*std.*=330.0)	*m*=211.8 (*std.*=324.1)	p > 0.05
No Recall	*m*=198.6 (*std.*=298.0)	*m*=204.3 (*std.*=379.6)	
Wave p Values	p > 0.05		
Outcome 6: PA (Housework) [8]			
Unaided Recall	*m*=827.9 (*std.*=1022.1)	*m*=699.6 (*std.*=934.4)	
Aided Recall	*m*=659.6 (*std.*=752.1)	*m*=634.1 (*std.*=713.6)	p > 0.05
No Recall	*m*=651.1 (*std.*=735.3)	*m*=534.0 (*std.*=693.0)	
Wave p Values	p > 0.05		
Outcome 7: Children's FV Intake [9]			
Unaided Recall	*n*=101 (73.1%) ▲	*n*=95 (68.8%)	
Aided Recall	*n*=384 (66.3%) ▼	*n*=408 (70.5%)	p > 0.05
No Recall	*n*=40 (65.6%) ▼	*n*=44 (72.1%)	
Wave p Values	p < 0.05*	p > 0.05	
Outcome 8: Children's PA [10]			
Unaided Recall	*n*=80 (58.0%)	*n*=93 (67.4%)	
Aided Recall	*n*=346 (60.0%)	*n*=366 (63.2%)	p > 0.05
No Recall	*n*=42 (68.9%)	*n*=39 (63.9%)	
Wave p Values	p > 0.05		
Outcome 9: Family PA [11]			
Unaided Recall	*n*=34 (24.6%)	*n*=51 (37.0%)	▲ p < 0.05**
Aided Recall	*n*=135 (23.3%)	*n*=162 (28.0%)	▼
No Recall	*n*=7 (11.5%)	*n*=13 (21.3%)	▼
Wave p Values	p > 0.05		

▼▲ Indicate direction of significance

* Marginally significant

** Statistically significant

Notes:

1. FV = Fruits and Vegetables
2. Average number of times mothers reported consuming FVs each day.
3. Mothers with counts > 3.0 standard deviations (n = 6) were removed from

outcome 1 analyses 1 (e.g., 29 times/day, 20 times/day).

4. *m* = mean; *std.* = standard deviation
5. Number (and %) of mothers who met or exceeded the USDA FV recommendation (1/2 plate of FV).
6. PA = Physical Activity
7. Number (and %) of mothers who met or exceeded the USDA PA recommendation (150 minutes of PA per week).
8. Average number of minutes being physically active in each context (work, walking, housework) per week.
9. Number (and %) of mothers who made it easy for child/ren to eat FVs daily.
10. Number (and %) of mothers who made it easy for child/ren to be physically active daily.
11. Number (and %) of mothers who were physically active with their child/ren daily.

Outcome 1: FV Intake

Significant differences over time, as a function of maternal ad awareness, were not observed. However, a significant between-group difference unrelated to time was found. A marginally significant maternal ad awareness difference was observed. Unaided recall mothers (4.4/day; β = 0.09) tended to report eating more FVs than did aided recall mothers (4.1/day) and no-recall mothers (4.1/day; Z = 1.86; p = 0.06). No other differences were observed.

Outcome 2: Met USDA FV Recommendation

Significant differences over time, as a function of maternal ad awareness, were not evident. However, a significant between-group difference, as a function of ad awareness and a maternal characteristic, was found.

There was a marginally significant interaction between race/ethnicity and maternal ad awareness. Among Latina mothers, unaided recall mothers (42.5%; β = 0.57) were more likely to have met the USDA recommendation than Latina aided mothers (35.8%), but not more likely than Latina no-recall mothers (42.8%; Z = 1.99, p = 0.05). No other differences were noted.

Outcome 3: Met USDA PA Recommendation (Free Time)

There was a significant wave by race/ethnicity by ad awareness interaction. At Wave I, fewer African-American no-recall mothers (41%; β = -0.72) met the USDA recommendation than African-American aided mothers (46%) and African-American unaided mothers (56%; Z = 2.03, p = 0.04). These differences, however, were no longer evident at Wave II (p > 0.05).

Although not related to change over time, a significant difference with respect to maternal ad awareness was found. Unaided recall mothers (56%; β = 0.35) were more likely to have met the USDA recommendation than were aided-recall (46%) and no-recall mothers (51%; Z = 2.29, p = 0.02). No other significant differences were noted.

Outcome 4: PA (Work)

There was a significant wave by ad awareness interaction. At Wave I, unaided recall mothers (1,197.6 minutes; β = -0.39) reported fewer minutes than did no-recall mothers (1,608.7 minutes), but did not differ significantly from aided recall mothers (1,431.4 minutes; Z = 2.29, p = 0.02). This difference, however, was not evident at Wave II (p > 0.05), because unaided recall mothers increased their PA over the survey period, whereas aided- and no-recall mothers' decreased their PA over time eliminating the between-group difference.

Although not related to changes over time, there were significant between-group differences as a function of ad awareness and race/ethnicity. There was a race/ethnicity by ad awareness interaction. Latina no-recall mothers (430.4 minutes; β = -1.60) reported fewer minutes than did Latina aided mothers (1,841.8 minutes) and Latina unaided recall mothers (1,364.0 minutes; Z = 3.35, p = 0.001).

A marginally significant difference as a function of race/ethnicity was also found. African-American mothers (1,398.4 minutes; β = 0.34) tended to report a greater number of minutes than did White mothers (1,002.5 minutes; Z = 1.92, p = 0.06), but did not differ significantly from Latina mothers (1,618.0 minutes; p > 0.05). Additionally, Latina mothers tended to report a greater number of minutes than did White mothers (β = 0.34; Z = 1.77, p = 0.07). No other differences were noted.

Outcome 5: PA (Walk)

There was a significant three-way interaction: wave by race/ethnicity by ad awareness. At Wave I, African-American no-recall mothers (138.2 minutes; β = -1.17) reported fewer minutes spent walking than did aided-recall mothers (262.4 minutes) and unaided-recall mothers (297.4 minutes; Z = 2.21, p = 0.03). This difference, among African-American mothers, was no longer significant at Wave II (ps > 0.05).

One more (marginally) significant three-way interaction was found: a wave by race/ethnicity by ad awareness interaction. At Wave I, Latina no-recall mothers (138.2 minutes; β = -1.31) reported fewer minutes than did aided-recall mothers (206.8 minutes) and unaided-recall mothers (202.2 minutes; Z = 1.90, p = 0.06). This difference, among Latina mothers, was no longer significant at Wave II (ps > 0.05). No other differences were observed.

Outcome 6: PA (Housework)

Significant differences over time as a function of maternal ad awareness were not observed. However, a significant between-wave difference, not previously evident,

emerged for physically active housework. There was a significant wave by education interaction for physically active housework. College graduates (602.8 minutes; β = 0.30) reported more minutes at Wave I than at Wave II (449.2 minutes; Z = 2.24, p = 0.03). No other significant differences were noted.

Outcome 7: Children's FV Intake

A significant wave by maternal ad awareness interaction was observed. At Wave I, a greater proportion of unaided recall mothers (73%; β = 0.13) stated they were supportive of their children's FV intake than aided recall mothers (66%) and no-recall mothers (66%; Z = 2.05, p = 0.04). This difference, however, was no longer evident at Wave II (p > 0.05). This is partly explained by an increase in the percentage of aided- and no-recall mothers who stated they were supportive of their children's FV intake, which eliminated the between-group differences.

Although not related to maternal ad awareness, there were significant between-group differences over time, as a function of maternal characteristics. There was a significant wave by race/ethnicity interaction. At Wave I, fewer African-American mothers (64%; β = -0.09) reported that they made it easy for their child to eat FVs than at Wave II (67%; Z = 2.58, p = 0.01).

Outcome 8: Children's Physical Activity

Significant differences over time as a function of maternal ad awareness were not observed. However, a significant wave by race/ethnicity interaction was noted. At Wave I, fewer African-American mothers (64.0%; β = -0.16) reported providing support for their children's PA than at Wave II (62.8%; Z = 2.07, p = 0.04). No other differences were observed.

Outcome 9: Family Physical Activity

Significant differences over time as a function of maternal ad awareness were not observed. However, a significant between-group differences as a function of maternal ad awareness was observed. Unaided recall mothers (30.8%; β = 0.30) were more likely to report that they were active with their children than aided recall mothers (25.7%) and no-recall mothers (16.4%; Z = 2.28, p = 0.02).

Discussion

The *Be Better* campaign was intended to support the efforts of local health departments to increase healthy eating and physical activity among low-income California families. Campaign ads were developed for a multicultural audience and primarily targeted Latina, African American, and White, low-income mothers. The television, radio, and outdoor ads were presented in 12 DMAs, with eight receiving ads in English and ten receiving ads in Spanish. Four of the DMAs were selected for the evaluation.

Randomly selected mothers from SNAP households were interviewed at two time points, Wave I and Wave II. The Wave I interview was conducted before the *Be Better* ads appeared in the four evaluation DMAs. A total of 1,202 low-income mothers participated in Wave I, and of these 796 mothers participated in Wave II (three months into the campaign).

Using the same methodology from previous *Be Better* evaluations, mothers' responses to open-ended questions were analyzed to determine if they could recall one or more campaign ads without assistance (unaided). Of the 796 mothers who participated in both Waves, 143 (18%) provided enough details to be categorized as unaided recall mothers. An additional 591 mothers (74.2%; aided mothers) indicated that they had seen or heard one or more campaign ads as described by the interviewer during Wave II. In contrast to previous evaluations, a third group was included, a group of no-recall mothers. These were mothers who neither recalled any campaigns ads unaided nor recognized ads with interviewer assistance. Sixty-two mothers (7.8%) were thus categorized as no-recall mothers.

From the two interviews, nine outcome variables were selected to assess mothers' FV consumption, PA, and their children's FV intake and PA. The evaluation was designed to address three research topics:

- Extent of mothers' awareness of campaign ads
- Changes in maternal responses over time
- Associations between maternal ad awareness and dietary behaviors
- Associations between maternal ad awareness and physical activity

In contrast to previous *Be Better* media evaluations, a different analytic approach to answering these research questions was adopted. Previous evaluations utilized generalized linear mixed model analyses and logistic regressions. For this evaluation, GEE modeling was chosen as the overall analytic approach, because GEEs produce parameter estimates that are efficient and unbiased relative to ordinary least squares (OLS) regression. Moreover, GEEs permitted the inclusion of individual-level variables (i.e., race/ethnicity, language spoken, education, and age) across the nine outcome variables that could potentially interact with ad awareness and survey period (Wave I to

Wave II) in informative ways. Although the analytic approach differed from previous evaluations, the overall methodology was unchanged.

Analyses were first conducted to examine changes in mothers' responses over the interview period, with the inference that changes in maternal responses over time correspond to possible changes in maternal behavior. Following these analyses, maternal ad awareness was then examined to determine if ad awareness made unique contributions to the findings.

Extent of Mothers' Awareness of Campaign Ads

During the 26-week campaign, nearly 15,000 30-second television ads were run, over 30,000 30- and 60-second radio ads aired, and almost 4,000 billboard ads and over 2,000 interior transit ads appeared in low-income neighborhoods. This degree of exposure is consistent with a level of campaign impact that is sufficient to affect health behaviors over time[11],[12].

Our results suggest that the media campaign successfully reached the intended population, namely SNAP-eligible, low-income California households. Of those who participated in both survey periods, 18 percent evinced recall of one or more campaign ads and 74 percent demonstrated recognition of one or more campaign ads. Thus, a total of 734 mothers, or 92 percent, had some level of awareness of the *Be Better* ads.

Moreover, as intended, the campaign successfully reached mothers from various racial/ethnic groups. Among African-American mothers, 93 percent indicated that they either recalled or recognized one or more ads. Similarly, 94 percent of Latina mothers demonstrated some level of recall or recognition. White mothers evinced an 88 percent recall/recognition rate. Finally, a small group of Asian/PI mothers also demonstrated awareness of the *Be Better* campaign (94%). Mothers of varying educational levels appeared to be equally reached by the campaign ads, but Spanish speakers were more likely to provide sufficient detail of the ads to be categorized as unaided recall mothers than were English speakers.

It must be noted that the estimated awareness rate is largely based on mothers who indicated they recognized the ads (aided recall mothers, 74%). The aided recall measure likely overestimates actual ad awareness. Memory, particularly recognition memory, is subject to biases in memory and responding, with some individuals demonstrating a tendency to say "yes" regardless of actual memory. This may be

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[11] Wakefield M.A., Spittal M.J., Yong, H. H., Durkin, S.J., & Borland, R. (2011). Effects of mass media campaign exposure intensity and durability on quit attempts in a population-based cohort study. *Health Education Research, 26*, 988-997.

[12] Reger-Nash, B., Bauman, A., Booth-Butterfield, S., Cooper, L, Smith, H., Chey, T., & Simon, K.J. (2005). Wheeling Walks: Evaluation of a media-based community intervention. *Family and Community Health, 28*, 64-78.

somewhat mitigated by the inclusion of sham questions in future evaluations to select out those individuals who may have a tendency to answer "yes" even when it is not possible to have a recollection. Identifying and removing such respondents from the analyses would increase our confidence in mothers' actual awareness of the media campaign.

Nonetheless, even if the aided recall group overestimates awareness of the *Be Better* campaign, the three ad awareness groups had varying response patterns, which increases our confidence that the aided-recall group (even if imprecise) contributed to the findings.

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Maternal Dietary Behaviors:

Changes Over Time and Maternal Ad Awareness

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We began with an examination of the possible changes in maternal responses over time, followed by analyses to determine how ad awareness contributed to these changes. The initial analyses revealed that language, education, and race/ethnicity were associated with differences in maternal responses and to some extent to changes over time.

Changes Over Time: FV Consumption

Three of the nine outcomes (1, 2, and 7) concern mothers' FV consumption (outcome 1), mothers' meeting or exceeding the USDA FV recommendation (outcome 2), and maternal support in children's FV intake (outcome 7).

Changes in dietary behavior over time were observed for outcome 2 (USDA FV recommendation). Results indicated that the proportion of mothers who met the USDA's recommendation for at least ½ plate of FVs increased from Wave I to Wave II. The change over time differed somewhat by race/ethnicity. For example, Latina mothers were less likely to have met the USDA recommendation than African-American, White, and Asian/PI mothers. Moreover, African-American mothers were also less likely to have met the USDA recommendation than White and Asian/PI mothers.

Change in mothers' FV intake (outcome 1) and changes in maternal support for children's FV intake (outcome 7) did not appear to change over time. However, maternal language, education, and race/ethnicity influenced maternal response patterns.

With regard to language, English speakers reported eating fewer FVs than Spanish speakers and were less likely to reported supporting their children's FV intake. Assuming that Spanish speakers are most likely immigrants, this finding would be consistent with research that shows that first-generation Latinos tend to have better

diets than later-generation Latinos[13], in part because first-generation Latinos follow a diet more consistent with their home countries (e.g., heavy on fruits and vegetables) and are less likely to be obese[14].

Education played a role, such that high school graduates reported eating fewer FVs than mothers with higher educational backgrounds, although mothers with less than a high school education did not differ from mothers with a high school education.

Similar to the findings for outcome 2, race/ethnicity was related to mothers' support of their children's FV intake. Specifically, fewer Asian/PI mothers and fewer African-American mothers reported making it easy for their children to eat FVs, relative to White and Latina mothers.

Maternal Levels of Ad Awareness and FV Consumption

Maternal ad awareness, when added to the analyses, resulted in some new findings not previously observed. These findings were more complex because of the interactions among levels of ad awareness, survey period, and maternal characteristics.

Outcome 7 was the only one of the three FV-related outcomes that changed as a function of maternal ad awareness over time. A greater proportion of unaided recall mothers (at Wave I) stated they were supportive of their children's FV intake than aided- and no-recall mothers. This difference, however, was no longer evident at Wave II. This is partly explained by an increase in the percentage of aided- and no-recall mothers who stated they were supportive of their children's FV intake (while unaided recall mothers remained relatively unchanged). The increases seen among the aided- and no-recall mothers eliminated the between-group differences.

Although not related to changes over time, several other findings with respect to maternal ad awareness were observed. For instance, mothers' FV consumption (outcome 1) was found to be marginally associated with their level of ad awareness. Specifically, unaided recall mothers tended to report eating more FVs than did aided recall mothers and no-recall mothers. The influence of ad awareness was also evident for outcome 2, but was modified by an interaction with race/ethnicity. Among Latina mothers, unaided recall mothers were more likely to have met the USDA FV recommendation than aided recall, but not more likely than no-recall mothers.

A wave by race/ethnicity interaction emerged for outcome 7 that was not previously evident. A greater proportion of African-American mothers reported being supportive of

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[13] Campbell, K., Garcia D. M., Granillo C.V., & Chavez, D.V. (2012). Exploring the Latino paradox: How economic and citizenship status impact health. *Hispanic Journal of Behavioral Sciences, 34(2),* 187-207.

[14] Pérez- Escamilla, R., & Putnik, P. (2007). The role of acculturation in nutrition, lifestyle, and incidence of Type 2 diabetes among Latinos. *Journal of Nutrition, 137,* 860-870.

their children's FV intake at Wave II than at Wave I. This change over time was unrelated to maternal awareness, however.

Maternal PA: Changes Over Time and Maternal Ad Awareness

Six of the nine outcomes concerned maternal PA and maternal support of their children's PA (outcomes 3, 4, 5, 6, 8, and 9). As was found for analyses relating FV behaviors, language, education, and race/ethnic differences influenced mothers' PA behavior. Additionally, maternal age emerged as significant predictor for PA. We first review changes in PA behavior over time and then examine how maternal ad awareness contributed to the findings.

Changes Over Time: Maternal PA

Changes in PA behavior over time were observed for outcomes 3, 8, and 9. Results indicated that, over time, mothers were more likely to meet the USDA recommendation of 150 minutes of PA per week (outcome 3), more likely to support their children's PA (outcome 8), and more likely to be physically active with their children (outcome 9).

Maternal age emerged as a significant predictor for outcomes 8 and 9. As the mothers' age increased, there was a corresponding decrease in the proportion of mothers who reported making it easy for their children to be physically active and in the proportion of mothers who reported being physically active with their children.

Change over time was not evident for outcomes 4, 5, and 6. However, education, language, race/ethnicity, and age were significant predictors in maternal response patterns across most of the six PA outcomes.

With regard to education, college graduates reported less time doing physically active work (outcome 4), less time walking (outcome 5), and less time doing physically active housework (6) than mothers with some college, high school graduates, and mothers with less than high school. In fact, the patterns across these outcomes suggests that, as education increased, physical activity decreased. This may be related to the finding that, as a workers education levels increase, women are less likely to be employed in low-wage jobs; jobs that are typically more physically demanding[15].

English speakers reported fewer minutes doing physically active work than Spanish speakers (outcome 4), but reported spending more time walking (outcome 5) and were more likely to state that they were supportive of their children's PA than Spanish speakers (outcome 8).

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[15] Kim, Marlene. "Women paid low wages: who they are and where they work." *Monthly Labor Review*, *123(9)*, 26.

With regard to race/ethnicity, African-American and (to a lesser extent) Latina mothers reported spending more time walking than did White mothers and Asian/PI mothers (outcome 5). Asian/PI and African-American mothers reported spending less time doing physically active housework than White and Latina mothers (outcome 6). Fewer African-American and Latina mothers reported being supportive of their children's PA than White and Asian/PI mothers (outcome 8). Moreover, fewer African-American mothers reported being physically active with their children than White, Asian/PI, and Latina mothers (outcome 9).

Finally, maternal age emerged as a predictor in maternal PA. As mothers' age increased, there was a corresponding decrease in physically active housework (outcome 6), mothers support for their children's PA (outcome 8), and mothers report of being physically active with their children (outcome 9).

Maternal Levels of Ad Awareness and PA Behavior

Maternal ad awareness was associated, in varying ways, with PA outcomes 3, 4, 5, and 9. Three PA outcomes were associated with between-group differences over time (outcomes 3, 4, and 5).

With respect to outcome 4, unaided recall mothers (at Wave I) spent less time doing physically active work than no-recall mothers (but did not differ from aided recall mothers). The difference between unaided- and no-recall mothers was not evident at Wave II however. This lack of difference at Wave II is partly explained by an increase in physical activity among unaided recall mothers. Aided- and no-recall mothers', in contrast, decreased their PA over time, which eliminated the between-group difference. In short, unaided mothers improved over time, aided- and no-recall mothers did not.

Outcomes 3 and 5 were also related to ad awareness, but concerned interactions among no-recall mothers and race/ethnicity. Fewer African-American mothers met the USDA PA recommendation at Wave I than aided- and unaided-recall mothers. This difference was not evident at Wave II (outcome 3). African-American and Latina no-recall mothers reported walking less than aided- and unaided-recall African-American ad Latina mothers, but only at Wave I. This difference was no longer evident at Wave II (outcome 5). In part, the lack of differences at Wave II were explained by increases in PA among the no-recall mothers, while responses among aided- and unaided-recall mothers' remained relatively constant.

Other between-group differences associated with maternal ad awareness were observed, but were not related to change over time. Unaided recall mothers were more likely to have met the USDA recommendation for PA (outcome 3) and more likely to state that they were supportive of their children's PA than aided- and no-recall mothers (outcome 9).

There were also between-group differences as a function of maternal ad awareness and race/ethnicity. Unaided recall African-American mothers, and to a lesser extent, aided recall African-American mothers were more likely to have met the USDA PA recommendation than no-recall African-American mothers (outcome 3). Similarly, aided- and unaided-recall Latina mothers were more likely to spend time doing physically active work than no-recall Latina mothers (outcome 4).

Pre-Existing Between-Group Differences in Maternal Ad Awareness

As noted in the previous sections, maternal ad awareness was associated with positive between-group differences in FV and PA. Among unaided recall mothers, some of these differences were evident at Wave I (but not at Wave II), and some of these differences were evident at both Wave I and Wave II (unrelated to changes over time). That is, prior to exposure to the 2017 media campaign, unaided recall mothers were already responding differently from no-recall and, to an extent, from aided-recall mothers. What may account for these seemingly pre-existing group differences in outcomes as a function of maternal ad awareness?

One possible explanation may be that the *Be Better* media campaign is multi-year project, which was in its second year of implementation in 2017. The media campaign had already been shown, over the course of several months, in the four evaluation DMAs the previous year. It is quite likely that at least some (if not more) of the 2017 sample had been exposed the 2016 *Be Better* ads. Differences between unaided recall, aided recall, and no-recall mothers at Wave I (in 2017) could be carry-over effects from the 2016 media exposure. It is not possible to draw conclusions, with respect to any carry-over effects, in this evaluation. However, if the 2018 evaluation finds similar patterns, or even stronger effects, this would provide some support for the supposition. Stronger inferences about possible carry-over effects of the *Be Better* media campaign may be possible at the completion of the media campaign when analyses across the three years can be examined.

Summary

The 2017 *Be Better* media campaign successfully reached SNAP low-income California households. Approximately 92 percent of the surveyed mothers demonstrated some level of campaign awareness through either recall or recognition.

Aided recall (or recognition) is a commonly used metric in evaluations of advertising effectiveness. However, it should be noted that the high rate of aided recall (74%) may overestimate to some extent the true level of maternal awareness. Recognition responses that arise from yes/no questions can be subject to biases in memory and responding. These biases, to an extent, can be mitigated by the inclusion of sham questions that can identify individuals who have a tendency to 'yes' responses. Future evaluations should include a small number of mock questions to identify such individuals to increase the precision of the recognition measure. Nevertheless, results

suggest that unaided-, aided-, and no-recall mothers responded in differing ways, increasing our confidence that that aided-recall contributed to the findings.

Positive changes in maternal responses, over the survey period, were noted for several outcomes, including increases in the number of mothers who met the USDA recommendations for FV and PA, the number of mothers who provided support for their children's FV intake and PA, and an increase in the number of mothers who stated they were active with their children. These changes in maternal responses may correspond to changes in behavior, although the present evaluation cannot evaluate that association.

Maternal awareness was associated with positive differences in outcomes. For instance, mothers' FV consumption (outcome 1) was found have an association with their level of ad awareness, such that unaided recall mothers tended to report eating more FVs than did aided recall mothers and no-recall mothers. Where an association with maternal ad awareness was found, ad awareness often interacted with the mothers' race/ethnicity.

Mothers' demographic characteristics influenced maternal responses and changes in responses over time. These differences highlight the need to more precisely target interventions and media campaigns to address the needs of families at different stages of their life (e.g., age, education) and culture. Disparities in dietary and physical activity behaviors were evident by the interaction of mothers' race/ethnicity over the course of the evaluation. In those instances where the mother's race/ethnicity interacted with ad awareness, minority mothers evinced small, but positive changes over time.