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# The Effect of Marketer-Suggested Serving Size on Consumer Responses: The Unintended Consequences of Consumer Attention to Calorie Information

Nutritional labels are mandatory on virtually all packaged food items sold in the United States. The nutritional information on these labels is reported on a "per-serving-size" basis. However, unbeknownst to many consumers, current Food and Drug Administration regulations allow manufacturers some discretion in setting serving sizes—a factor that the authors hypothesize has implications for consumer behavior. For example, adopting a smaller serving size allows marketers to reduce the reported calories, fat, sugar, and carbohydrates in a product serving, which in turn can influence the anticipated consequences of consumption. Three studies show that manipulating the serving size, and thus calories per serving, for *equivalent consumption amounts* influences the anticipated guilt of consumption, purchase intentions, and choice behavior. However, the results also show that individual difference and context variables, which heighten consumer attention to nutritional information in general, often focus attention on calorie information but not serving size. This leads to the counterintuitive finding that more nutritionally vigilant consumers are more heavily influenced by serving size manipulations. The authors discuss the managerial and public policy implications.

*Keywords*: nutrition, serving size, calories, experiments, consumer behavior

The Nutritional Labeling and Education Act (NLEA; Pub. L. 101-535) of 1990 authorized the Food and Drug Administration (FDA) to design a mandatory nutritional label for packaged food items. The legislation stated that a nutritional label would convey information about the amount of certain nutrients (e.g., calories, fat, sodium, cholesterol) contained per single serving of the food item. The goal of the NLEA was to improve the accessibility of nutrition information at the point of sale so that consumers could make more healthful food choices and improve their diets (Moorman 1996; Neuman 2010). Consistent with this goal, research shows that some nutritional attributes (e.g., calories, fat) have indeed become salient for many consumers (Burton, Garretson, and Velliquette 1999; Keller et al. 1997; Kozup, Creyer, and Burton 2003; Moorman 1990, 1996). Thus, to the extent that manufacturers can alter consumer perceptions of a product's nutrition, they can affect purchase intentions and choice behavior (Russo et al. 1986).

There are two ways to alter consumer perceptions of the nutrition contained in a product serving. First, a manufacturer can alter the product's ingredients. Second, a manufacturer can adjust the serving size of the product without changing the nutritional profile of the product. According to FDA regulations, serving sizes can vary within a range for many product categories (see Code of Federal Regulations [CFR], § 101.9 [b][2][i][A–D][1]). For example, consider the nutritional label for the frozen pizza appearing in the top panel of the Appendix. The label reports the amount of calories, fat, sodium, and sugars, among other nutrients, per serving. The package contains a single serving that provides 400 calories of nutrition.[2] If, however, the identical

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[1]See http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div8&view=text&node=21:2.0.1.1.2.1.1.6&idno=21.

[2]We use the term "calories" for expositional purposes only. In actuality, the outcomes we investigate may result from any combination of calories, fat, sodium, and other nutrients listed on the nutritional label. We cannot discern which of the nutrients is driving behavior because the levels of all nutrients are perfectly collinear.


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pizza were to represent two servings (i.e., serving size was one-half pizza), calories per serving would be 200 (see second panel of the Appendix). Note that consuming the entire pizza, in either situation, would deliver the same amount of calories (i.e., one 280 gram serving of 400 calories = two 140 gram servings of 200 calories).

The question we address is whether the differential framing of nutritional information can lead to different consumer outcomes (e.g., anticipated guilt, purchase likelihood, product choice) and, if so, for what populations. If the way nutritional information is presented affects product choices, marketers would obviously want to present the information in a way that encourages purchase (Balasubramanian and Cole 2002). As Block and Peracchio (2006) note, the nutritional label is a crucial communication tool that manufacturers use to differentiate their products from competing products. However, from a public policy perspective, these issues are worthy of attention if the differential framing of nutritional label information influences consumer behavior owing to deficits in knowledge and/or biases in information processing. For this issue to have managerial and public policy implications, however, manufacturers must have discretion in setting serving sizes. This is the issue to which we now turn our attention.

## FDA Provisions for Nutritional Labeling

### CFR

Title 21, Section 101.12, of the CFR provides "reference amounts customarily consumed per eating occasion."[3] The amounts are based primarily on national food consumption surveys. In addition, Section 101.9b states:

> [E]xcept as provided in 101.9(h)(3), all nutrient and food component quantities shall be declared in relation to a serving (i.e., the reference amounts) as defined in this section. The term *serving* or *serving size* means an amount of food customarily consumed per eating occasion by persons 4 years of age or older which is expressed in a common household measure that is appropriate to the food.

It is critical to note that though Title 21, Section 101.12, provides reference amounts for a comprehensive list of food product categories, it does *not* provide the actual serving sizes. Rather, for the calculation of actual serving sizes, Title 21, Section 101.9, allows the manufacturer discretion in deviating from the stated reference amounts, as follows:

(A) If a unit weighs 50 percent or less of the reference amount, the serving size shall be the number of whole units that most closely approximates the reference amount for the product category;

(B) If a unit weighs more than 50 percent, but less than 67 percent of the reference amount, the manufacturer may declare one unit or two units as the serving size;

(C) If a unit weighs 67 percent or more, but less than 200 percent of the reference amount, the serving size shall be one unit;

(D) If a unit weighs 200 percent or more of the reference amount, the manufacturer may declare one unit as the serving size if the whole unit can reasonably be consumed at a single-eating occasion.

Continuing with the pizza example, the reference weight for this category is 140 grams. A pizza weighing 70 or fewer grams should be one-half serving. A pizza weighing between 70 and 93.8 grams can be one-half serving (e.g., two pizzas = one serving) or a single serving. Any pizza greater than 93.8 grams and less than 280 grams must be a single serving. Any pizza equal to or greater than 280 grams can be one serving (assuming it can reasonably be eaten on one consumption occasion) or it can be multiple servings (e.g., one-half pizza = one serving). Thus, units weighing between 50% and 67% of the reference weight, or more than 200% of the reference weight, allow for manufacturer discretion in determining the serving size. As Table 1 shows, we refer to the lower unit weight (i.e., between 50% and 67%) as the *low discretionary weight* (see column 1) and the higher unit weight (i.e., more than 200%) as the *high discretionary weight* (see column 2). Within these weight domains, we refer to the larger serving size (fewer servings per package) as the *no-frame* portion (see row 1) and the smaller serving size (more servings per package) as the *health-framed* portion (see row 2), because it results in lower levels of negative nutrients per serving.

### Manufacturer Behavior

The CFR allows manufacturers discretion in setting serving sizes. To assess whether manufactures take advantage of this opportunity, we visited a local grocer. Table 2 provides a summary of some of the serving sizes we observed. For example, granola bars have a CFR reference amount of 40 grams. Nature Valley make bars that weigh 21 grams (52.5% of the CFR amount) and chooses to list serving size as two bars (42 g, 190 calories)—an example of no health framing. In contrast, Quaker Oats makes a 24-gram bar (60% of the CFR amount) and chooses to list serving size as one bar (24 g, 90 calories)—an example of health framing. Other examples of health framing include Dannon and Yoplait, using low discretionary amounts of yogurt, and Quaker Oats and Starkist, using high discretionary amounts of oatmeal and tuna, respectively. Health framing is also used in packages that are intended to include multiple servings. For example, Campbell's uses health framing for high discretionary amounts of soup, listing a serving as one-sixteenth can instead of one-third can. In the candy bar category, Hershey's uses health framing for high discretionary amounts of chocolate, listing a serving of one-third bar instead of one-half bar.

A closer inspection of the candy bar category reveals additional health framing. Milky Way and 3 Musketeers use health framing to set the serving size of bars that weigh a low discretionary amount (e.g., 23 g, 57.5% of the CFR amount, 96/97 calories), and Chocolate Dream bar uses health framing to set the serving size of a bar that weighs a high discretionary amount (e.g., 85 g, 212.5% of the CFR amount, 350 calories). There are also examples of the *same manufacturer* using both a health frame and a no health frame for different flavors of the same product. Endangered Species Chocolate uses no health framing on one bar (e.g., Milk Chocolate & Peanut Butter) and a health framing on

[3]See http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div8&view=text&node=21:2.0.1.1.2.1.1.6&idno=21.

**TABLE 1**
**Illustration of Discretion in Determining Serving Size**

| | Weight of One Pizza (CFR Reference Value = 140 g) | |
|---|---|---|
| **Frame** | **Low Discretionary Weight; 50% < Product Weight < 67% of Reference Value (e.g., 70 g < 1 pizza < 93.8 g)** | **High Discretionary Weight; Product Weight > 200% of Reference (1 pizza > 280 g)** |
| No frame | •Unit size of pizza: 70 grams<br>•Serving size: 2 pizzas (140 g)<br>•Calories per serving: 200<br>•Serving per package: 1 | •Unit size of pizza: 280 grams<br>•Serving size: 1 pizza (280 g)<br>•Calories per serving: 400<br>•Serving per package: 1 |
| Health frame | •Unit size of pizza: 70 grams<br>•Serving size: 1 pizza (70 g)<br>•Calories per serving: 100<br>•Serving per package: 2 | •Unit size of pizza: 280 grams<br>•Serving size: 1/2 pizza (140 g)<br>•Calories per serving: 200<br>•Serving per package: 2 |

another bar (e.g., Extreme Dark Chocolate). Endangered Species also violates FDA guidelines on its Dark Chocolate with Orange bar by listing one-half bar serving size when the whole bar weighs the reference amount (e.g., 40 g). DiGiorno pizza and Clif Bar energy bar also violate FDA labeling guidelines.

Table 2 also shows examples of the *same manufacturer* using both a health frame and no health frame for (1) essentially the same product produced under different brand names, (2) different flavors of the same product under the same brand name, and (3) even the same product under the same brand name. Specifically, Simply Asia produces virtually identical rice noodle bowls, one under the name Simply Asia and the other under the name Thai Kitchen. The nutritional label for the spring vegetable flavor of the former does not use a health frame, but the spring onion flavor of the latter does. Then, across different flavors within the Thai Kitchen subbrand itself, we found occurrences of both health framing and no health framing, and surprisingly, we also found this variance across two packages of the exact same flavor (spring onion). Not all manufacturers use health frames. As the Jif peanut butter example illustrates, larger serving sizes may be valued in certain situations (e.g., Jif Creamy To-Go is a convenience product for which larger sizes are valued).

## Health Framing

### *The Influence of Health Framing on Anticipated Guilt and Purchase Intentions*

Health framing can be used to create different serving sizes and, by extension, different levels of negative nutrients (e.g., calories) per serving. In turn, the amount of negative nutrients should influence the anticipated guilt from consuming the product. In support of this hypothesis, Rozin et al. (1999) find that food-related guilt is the dominant anticipatory consumption emotion for U.S. consumers, compared with European and Japanese consumers. Consistent with this finding, Strahilevitz and Meyers (1998) propose that the contemplated consumption of hedonic products (e.g., chocolate truffles, hot fudge sundae) influences a consumer's anticipated level of guilt from consuming the product. Thus, we posit that framing serving size in a way that presents lower levels of negative nutrients (e.g., calories) per serving will reduce the anticipated guilt of consumption.

$H_1$: Health-framed nutritional information (i.e., a smaller serving size with fewer calories per serving) results in less anticipated guilt from consuming the entire product than unframed nutritional information.

### *The Moderating Influence of Nutritional Involvement*

A manufacturer's strategic selection of serving sizes would have little impact on purchase behavior if consumers did not attend to nutritional information. Considerable evidence shows that many consumers do consider nutritional information when shopping. According to a *Cooking Light*/Roper ASW survey, 51% of U.S consumers claim they use nutritional label information when making grocery decisions (Toops 2006). Furthermore, several researchers have found that consumers attend to nutritional information and that they are significantly more likely to base their product evaluations and purchase intentions on the absence of negative nutrients (e.g., calories, fat) than on the presence of positive nutrients (e.g., fiber, protein) (Balasubramanian and Cole 2002; Burton, Garretson, and Velliquette 1999; Russo et al. 1986). Evidence also reveals that the use of nutritional label information is persistent. The NPD Group's (2007) "Eating Patterns in America" reports that 26% of women and 19% of men in the United States are on a diet during any given week.

Despite the widespread use of nutritional information, not all consumers rely on this information during decision making. Thus, it is reasonable to assume that individual differences and context factors moderate the extent to which a consumer relies on nutritional information when judging products. One potential moderator of the use of nutritional information is dietary concern, defined as a behavioral orientation toward avoiding negative eating behaviors (e.g., avoiding high-calorie foods, limiting excessive consumption of bad food) (Moorman and Matulich 1993). As a general rule, consumers who are more concerned about negative eating behaviors will have a lower evaluation of foods that include negative nutrients (Moorman and Matulich 1993). Thus, we expect that a consumer's degree of concern about negative eating behaviors should affect his or her susceptibility to the health framing of nutritional information.

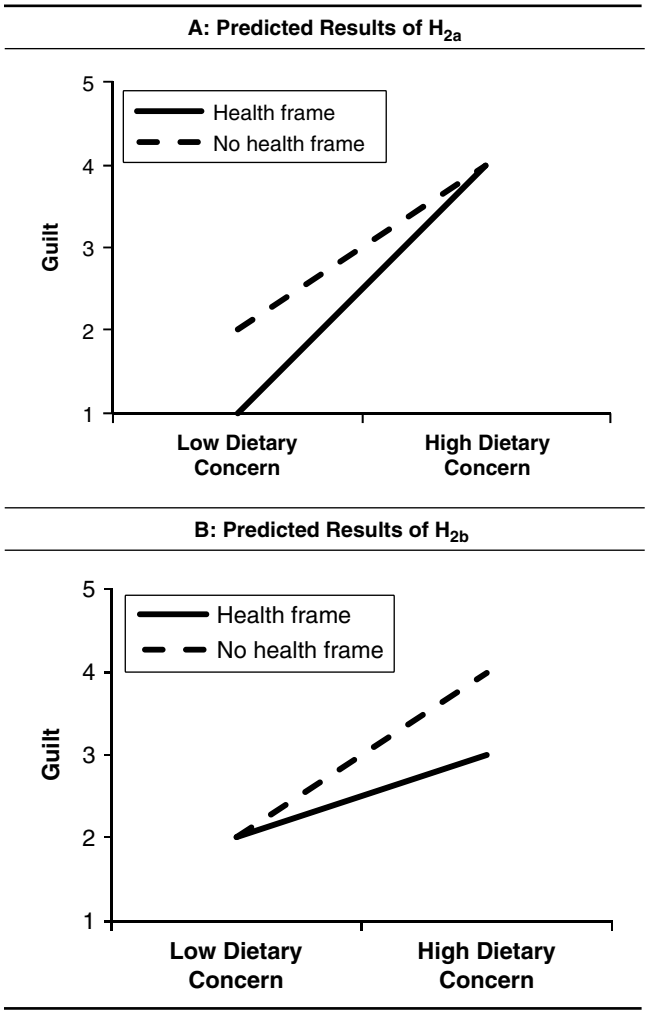
**TABLE 2**
**Examples of Health Framing**

| Product | Brand | Product Version | CFR Amount | Unit Weight | % CFR Reference Amount | Single Serving on Nutritional Label | Calories Per Serving | Manufacturer Framing Choice on Low Discretionary or High Discretionary CFR Reference Amount |
|---|---|---|---|---|---|---|---|---|
| Granola bars | Nature Valley | Crunchy Granola, Oats 'N Honey | 40 g | 21 g | 52.5 | 2 bars (42 g) | 190 | Low discretionary, no frame: Could have made serving size one bar and cut calories in half. |
| | Quaker Oats | Chewy Oatmeal Raisin | 40 g | 24 g | 60 | 1 bar (24 g) | 90 | Low discretionary, health frame: At 60% of CFR amount, serving size can be one unit. |
| Yogurt | Dannon | Light and Fit | 225 g | 113 g | 50.5 | 1 container (113 g) | 60 | Low discretionary, health frame: At 50.5% of CFR amount, serving size can be one unit. |
| | Yoplait | Yo Plus | 225 g | 113 g | 50.5 | 1 container (113 g) | 110 | Low discretionary, health frame: At 50.5% of CFR amount, serving size can be one unit. |
| Oatmeal | Quaker Oats | Quick Oats | 40 g | 80 g | 200 | 1/2 cup (40 g) | 150 | High discretionary, health frame: At 200% of CFR amount, serving size can be one-half unit. |
| Tuna | Starkist | Chunk Light Tuna in Water | 55 g | 112 g | 204 | 1/2 can (56 g) | 50 | High discretionary, health frame: At 204% of CFR amount, serving size can be one-half unit. |
| Soup | Campbell's | Family Size Chicken Noodle | 245 g | 737 g | 301 | 1/6 can (123 g) | 120 | High discretionary, health frame: At 301% of CFR amount, serving size can be from one-third to one-sixth unit. |
| Candy bar | Hershey's | Extra Dark Chocolate | 40 g | 98.5 g | 246 | 1/3 bar (33 g) | 210 | High discretionary, health frame: At 246% of CFR amount, serving size can be from one-half to one-fourth unit. |
| | 3 Musketeers | 3 Musketeers Bar | 40 g | 23 g | 57.5 | 1 bar (23 g) | 96 | Low discretionary, health frame: At 57.5% of CFR amount, serving size can be one unit. |
| | Milky Way | Milky Way Bar | 40 g | 23 g | 57.5 | 1 bar (23 g) | 97 | Low discretionary, health frame: At 57.5% of CFR amount, serving size can be one unit. |
| | Chocolate Dream Bar | Pure Dark | 40 g | 85 g | 212.5 | 1/2 bar (42.5 g) | 210 | High discretionary, health frame: At 212.5% of CFR amount, serving size can be one-half unit. |
| | Endangered Species | Milk Chocolate & Peanut Butter | 40 g | 40 g | 100 | 1 bar (40 g) | 210 | Standard labeling: Exactly equals CFR amount. |
| | Endangered Species | Extreme Dark Chocolate | 40 g | 85 g | 212.5 | 1/2 bar (42.5 g) | 210 | High discretionary, health frame: At 212.5% of CFR amount, serving size can be one-half unit. |
| | Endangered Species | Dark Chocolate with Orange | 40 g | 40 g | 100 | 1/2 bar (20 g) | 100 | High discretionary (illegally so) health frame: Per FDA rules, should have made serving size one bar. |

**TABLE 2**
**Continued**

| Product | Brand | Product Version | CFR Amount | Unit Weight | % CFR Reference Amount | Single Serving on Nutritional Label | Calories Per Serving | Manufacturer Framing Choice on Low Discretionary or High Discretionary CFR Reference Amount |
|---|---|---|---|---|---|---|---|---|
| Pizza | DiGiorno | 200 Calorie Portions | 140 g | 170 g | 121 | 1/2 pizza (85 g) | | High discretionary (illegally so) health frame: Per FDA rules, should have made serving size one pizza. |
| Energy bar | Clif Bar | Luna Mini: Peanut Butter Cookie | 40 g | 20 g | 50 | 1 bar (20 g) | 80 | Low discretionary (illegally so), health frame: Per FDA rules, should have made serving size two bars. |
| Rice noodle soup bowl | Simply Asia | Spring Vegetable | 245 g | 490 g | 200 | 1 bowl (490 g) | 250 | High discretionary, no health frame: Could have made serving size one-half bowl and cut calories in half. |
| | Thai Kitchen | Spring Onion #1 | 245 g | 490 g | 200 | 1/2 bowl (245 g) | 110 | High discretionary, health frame: At 200% of CFR amount, serving size can be one-half unit. |
| | Thai Kitchen | Spring Onion #2 | 245 g | 490 g | 200 | 1 bowl (490 g) | 250 | High discretionary, no health frame: Could have made serving size one-half bowl and cut calories in half. |
| | Thai Kitchen | Lemongrass & Chili | 245 g | 490 g | 200 | 1 bowl (490 g) | 250 | High discretionary, no health frame: Could have made serving size one-half bowl and cut calories in half. |
| | Thai Kitchen | Mushroom | 245 g | 490 g | 200 | 1/2 bowl (245 g) | 110 | High discretionary, health frame: At 200% of CFR amount, serving size can be one-half unit. |
| Peanut butter | Jif | Creamy To-Go | 32 g | 64 g | 200 | 4 tbs. (64 g) | 380 | High discretionary, no health frame: Could have made serving size 2 tbs. and cut calories in half. |
| | Jif | Creamy | 32 g | 32 g | 100 | 2 tbs. (32 g) | 190 | Standard labeling: Exactly equals CFR amount. |

**FIGURE 1**
**Possible Moderating Influences of Dietary Concern on the Relationship Between Health Framing and Guilt**




There are two possible ways concerns about negative eating behaviors might moderate the influence of health framing on the perceived guilt of consumption and, by extension, purchase behavior. The first is that health framing will influence consumers who are less concerned about their diet the most (i.e., those less involved in and vigilant about their dietary choices). As Figure 1, Panel A, shows, this means that health framing would mitigate guilt more for consumers with low rather than high dietary concern. In support of this possibility, Burton, Garretson, and Velliquette (1999) contend that use of information contained in nutritional labels represents a complex decision task. As such, they suggest that most consumers probably engage in some type of simplifying heuristic or shortcut to minimize the cognitive effort of analyzing information contained in the nutritional label. Only consumers who are very involved in their dietary choices will have the motivation or knowledge necessary to adjust for health-framed nutritional labels.

The second possibility is that a manufacturer's strategic selection of serving sizes will influence consumers who are more concerned about negative eating behaviors the most. As Figure 1, Panel B, shows, this means that health framing would mitigate guilt more for consumers with high rather than low dietary concern. This may occur for various reasons. First, people who are more concerned about negative eating behaviors are likely to weight nutritional information more when judging the appeal of a product (Moorman and Matulich 1993). Second, people who are concerned about their diet may not be able to adjust for framing effects. Consistent with this claim, LeBoeuf and Shafir (2003) show that people with high need for cognition (i.e., people who are engaged in the processing of information) cannot adjust for framing effects. In addition, Block and Peracchio (2006) note that accurate processing of nutritional label information often requires mathematical computation and numerical transformation, tasks that consumers typically perform poorly. Thus, consumers with high dietary concern may be more sensitive to nutritional information but incapable of adjusting for the health framing of the information. Given these possibilities, we offer two competing hypothesis as a qualification to $H_1$.

$H_2$: The effect of presenting health-framed (vs. unframed) nutritional information on anticipated guilt is moderated by individual differences in concern about dietary choices. Compared with people with low dietary concern, people with high dietary concern are (a) less susceptible to health-framed nutritional labels and (b) more susceptible to health-framed nutritional labels.

### *The Mediating Influence of Anticipated Guilt on Purchase Intention*

Our interest in health framing effects ($H_1$) and the moderation of these effects ($H_2$) on anticipated guilt is based on the premise that anticipated guilt is an antecedent to purchase intention, purchase, and consumption. In support of this hypothesis, Wansink and Chandon (2006) show that "low-fat" labels increase consumption because they reduce the anticipated guilt of consumption. They also find that anticipated guilt influences the consumption of hedonic (e.g., chocolate candy) and utilitarian (e.g., granola) products. Thus, we posit that framing serving size so as to present lower levels of negative nutrients (e.g., calories) per serving will reduce the anticipated guilt of consumption and thus increase purchase intentions.

$H_3$: Concern about dietary choices moderates the influence of health framing on purchase intention. This moderating influence parallels that for anticipated guilt ($H_2$).

$H_4$: The anticipated guilt of consuming a product mediates the relationship between the health framing × dietary concern interaction ($H_2$) and purchase intention.

## Study 1

Study 1 was an initial test of $H_1$–$H_4$. As an overview, participants were asked to read a nutritional label for either an unhealthful product (frozen pizza) or a healthful product (vegetable soup) and to report their perceptions of the guilt they would experience if they were to eat the entire pizza or full can of soup. Participants then responded to measures of anticipated guilt, their dietary concerns about negative eating behavior (i.e., negative diet restriction), purchase intention, and covariate

and demographic questions. No hypothesis was offered about the unhealthful and healthful product categories. We included both types of categories because prior research has shown that the perceived healthfulness of the product category sometimes moderates the processing of nutritional label information (Balasubramanian and Cole 2002; Block and Peracchio 2006; Brucks, Mitchell, and Staelin 1984; Burton, Garretson, and Velliquette 1999; Levy et al. 1985; Moorman 1990, 1996).

### Method

*Design.* The experiment used a 2 (health frame: no vs. yes) × 2 (reference level: low vs. high discretionary weight) × 2 (product category replicate: frozen pizza vs. vegetable soup) between-subjects design with a measured moderator (dietary concern). Table 1 shows the study design for pizza.

*Participants.* One hundred sixty-eight panel members from the general Qualtrics Internet survey panel (http://www.qualtrics.com/survey-panels/) served as participants and were randomly assigned to one of eight experimental conditions. We excluded 17 participants from the analysis because they failed to pass attention filters, yielding an effective sample size of 151. Participants were 53.6% female, the average age was 46 years, and the median and modal education level was "some college."

*Stimuli.* The stimuli were accurate representations of nutritional labels. In the high discretionary weight, no-frame pizza condition (top panel in the Appendix), one pizza equaled a single serving of 280 grams (twice the CFR reference amount of 140 g) and 400 calories. In the high discretionary weight, health-frame condition (second panel in the Appendix), one-half pizza equaled a single serving of 140 grams and 200 calories. In the low discretionary weight, no-frame condition (third panel in the Appendix), two pizzas equaled a single serving of 140 grams and 200 calories. In the low discretionary weight, health-frame condition (bottom panel of the Appendix), one pizza equaled a single serving of 70 grams and 100 calories. The soup replicate used equivalent manipulations (see the section "Stimuli Used in Experiment 1" in the Web Appendix [http://www.marketingpower.com/jm_webappendix]), with weights adjusted to reflect the CFR reference amounts for soup (245 g). Note that the serving sizes manipulations were consistent with FDA regulations.

*Procedure.* The first computer screen consisted of instructions and a nutritional label that represented one of the eight cells (containing the product, reference level, and health-frame manipulations). The instructions asked participants to review the nutritional label for a new brand of frozen pizza (vegetable soup). After reading the instructions and viewing the nutritional label, participants proceeded to the next screen. The nutritional label remained on the top portion of the screen as participants responded to two seven-point scales measuring anticipated guilt ("How guilty would you feel after eating a whole pizza [a can of this vegetable soup]?" "not guilty/very guilty") and purchase intention ("I would consider purchasing this pizza [this soup] next time I needed a convenient snack or meal"; "strongly disagree/strongly agree"). Participants then responded to the single consumption frequency scale ("How often do you eat frozen pizza [vegetable soup]?") with five response categories ("never," "a few times a year," "a few times a month," "a few times a week," and "daily") for use as a covariate. Next, because a person's actual weight compared with his or her desired weight might affect sensitivity to nutrition-related information, we assessed participants' desired weight ("As I sit here today, I would like to weigh . . .") with seven response categories ranging from "30 or more pounds less than I currently weigh" to "20 or more pounds than I currently weigh." Then, participants responded to three items from the negative diet restriction scale of Moorman and Matulich (1993) plus one additional item. Participants were asked, "How often do you watch the amount of calories you consume?" "How often do you moderate your sugar intake?" "How often do you cut back on snacks and treats?" and "How often do you watch the amount of fat you consume?" using a six-point ("none of the time/all of the time") scale. These four items constituted the dietary concern scale (Cronbach's $\alpha = .83$). Finally, participants provided demographic information.

### Analysis and Results

*Testing $H_1$.* $H_1$ predicted that the health framing manipulation would reduce the guilt associated with consuming the product. Initial tests showed no health frame × reference level × product category interaction ($F(1, 143) = 1.24$, $p > .1$), no health frame × reference level interaction ($F(1, 143) = 3.70$, $p > .05$), and no health frame × product category interaction ($F(1, 143) = .06$, $p > .1$). The test for the hypothesized health frame main effect was significant ($M_{No\ Frame} = 3.90$, $M_{Frame} = 3.00$; $F(1, 143) = 7.49$, $p < .05$).[4]

*Testing $H_2$.* $H_2$ predicted that the influence of health framing on anticipated guilt would be moderated by a consumer's dietary concern. To test for moderation, we regressed anticipated guilt on the appropriate control variables, health frame, dietary concern (i.e., negative diet restriction), and the health frame × dietary concern interaction. Consistent with the $H_2$, we observe a significant effect of the health frame × dietary concern interaction ($\beta = -.175$, $t(143) = -2.04$, $p < .05$) on anticipated guilt (see Equation 2, Table 3). We graph this interaction in Figure 2, Panel A, using the Johnson–Neyman technique for identifying regions in the range of the moderator variable in which the effect of the independent variable on the dependent variable is and is not significant (Hayes and Matthes 2009; Johnson and Neyman 1936). The Johnson–Neyman point for $p < .05$ ($t = 1.98$) for the dietary concern moderator occurs at a value of 3.21, or .44 standard deviations below the mean of 3.74. This indicates that the unframed serving size results in significantly higher levels of guilt than the framed serving size for all values of dietary concern above 3.21. In addition, there are no significant differences between the framed and unframed conditions below the Johnson–Neyman point, owing to the larger confidence intervals at lower levels of dietary concern.[5] As such, these data are consistent with the conclusion that people with high dietary concern are influenced more by health framing ($H_{2b}$).

[4]Because health framing is involved in the interaction predicted in $H_2$, this test should be interpreted with caution.

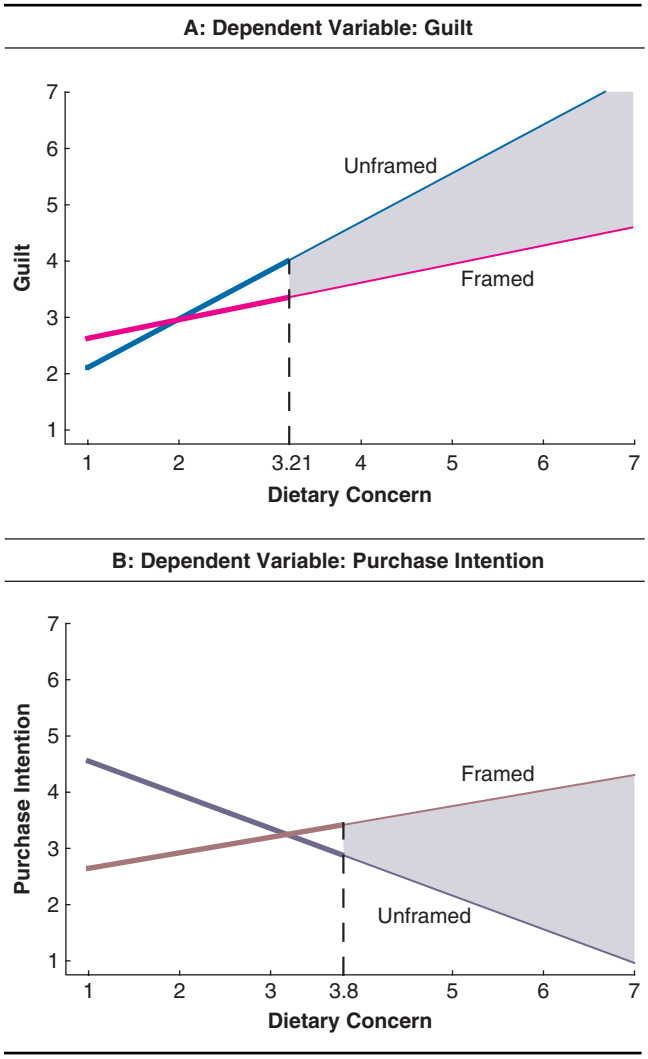
[5]We are grateful to Gary McClelland for bringing the Johnson–Neyman point to our attention.

**TABLE 3**
**Least Means Squares Regression Results for Mediated Moderation in Study 1**

| | Equation 1 | | Equation 2 | | Equation 3 | |
|---|---|---|---|---|---|---|
| | Criterion | | Criterion | | Criterion | |
| | Purchase Intention | | Guilt | | Purchase Intention | |
| **Study 1 Predictors** | **Beta** | **t(143)** | **Beta** | **t(143)** | **Beta** | **t(142)** |
| Product category | .140 | 1.400 | .033 | .340 | .156 | 1.819* |
| Reference level | –.204 | –2.030** | .390 | 3.950** | .000 | .000 |
| Product × level | .025 | .200 | –.110 | –.910 | –.033 | –.306 |
| Consumption frequency | .343 | 4.850** | –.141 | –2.030** | .270 | 4.354** |
| Health frame | .124 | 1.760* | –.216 | –3.130** | .012 | .184 |
| Dietary concern | –.370 | –4.240** | .481 | 5.610** | –.119 | –1.437 |
| Health frame × diet concern | .318 | 3.650** | –.175 | –2.040** | .227 | 2.977** |
| Guilt | | | | | –.521 | –7.100** |

*$p < .10$.
**$p < .05$.

**FIGURE 2**
**Study 1: Dietary Concern Moderates the Influence of a Nutritional Health Frame**




*Testing $H_3$ and $H_4$.* $H_3$ predicted that the health framing × dietary concern interaction would affect purchase intention across product categories (pizza, soup) and reference levels (above, below FDA reference levels), and $H_4$ predicted that this relationship would be mediated by the anticipated guilt of consumption. Thus, our hypothesized model is one of mediated moderation in which the moderating effect of dietary concern exerts an influence on the health frame–guilt relationship (as opposed to the second possibility for mediated moderation, in which dietary concern would moderate the influence of guilt on purchase intention) (see Muller, Judd, and Yzerbyt 2005). Therefore, we mean-centered the dietary concern moderator (Irwin and McClelland 2001) and then tested the model using the procedures Muller, Judd, and Yzerbyt (2005) and Preacher and Hayes (2008) suggest.

Table 3 shows the three estimated equations. To test for mediated moderation, we regressed purchase intention (Equation 1) and then guilt (Equation 2) on the appropriate control variables, health frame, dietary concern, and the health frame × dietary concern interaction. Then, we regressed purchase intention on the same variables plus guilt (Equation 3).[6] Consistent with $H_3$, we observe a significant effect of the health frame × dietary concern interaction ($\beta = .318$, $t(143) = 3.65$, $p < .05$) on purchase intention (Equation 1). We graph this interaction in Figure 2, Panel B, again depicting the Johnson–Neyman point. The Johnson–Neyman point for $p < .05$ ($t = 1.98$) for the diet concern moderator occurs at a value of 3.80, or .05 standard deviations above the mean of 3.74. This indicates that the health-frame label results in significantly higher purchase intentions than the unframed label for all values of dietary concern above 3.80. In addition, there are no significant differences between the framed and unframed conditions below the Johnson–Neyman point. As such, these data are consistent with $H_3$.

$H_4$ predicted that guilt would mediate the influence of health framing on purchase intention for participants with

[6]We do not include the guilt × diet concern interaction in the model because we are not testing for a moderation of the mediator's influence on the outcome variable (Muller, Judd, and Yzerbyt 2005).

high dietary concern. We tested for mediated moderation ($H_4$) using the procedures Muller, Judd, and Yzerbyt (2005) and Preacher and Hayes (2008) recommend. First, the influence of the health frame (treatment variable) on guilt (mediator) is moderated by dietary concern if there is a significant health frame × dietary concern interaction effect on guilt ($\beta = -.175$, $t(143) = -2.04$, $p < .05$; see Equation 2). Second, mediated moderation occurs if there is a significant guilt effect on purchase intention in the full model ($\beta = -.521$, $t(142) = -7.10$, $p < .05$; see Equation 3) and a significant indirect effect of the health frame × dietary concern interaction on purchase intentions. A bootstrap analysis (using the INDIRECT SPSS macro; Preacher and Hayes 2008) using a .05 confidence level and a bootstrap sample of n = 1,000 confirmed a positive (.26) and significant (confidence interval: .02 to .52) indirect effect of the health frame × dietary concern interaction on purchase intentions. These results provide support for $H_4$.

### Discussion

Study 1 provides two insights into how consumers respond to the health framing of nutritional label information. First, health framing reduced the anticipated guilt of consuming the product and increased the intent to purchase the product. Second, the influence of health framing on anticipated guilt and purchase intention was moderated by a consumer's concern about the negative nutrients in the product. Health framing influenced consumers who were more concerned about their diet. Health framing removed the anticipated guilt associated with consuming calories, thus enabling consumers who were concerned about their diet to form stronger purchase intentions. For people with low dietary concern, health framing had little influence on anticipated guilt and thus had little impact on purchase intention.

Study 1 placed a strong emphasis on external validity. The nutritional labels were identical to what would appear on a product package, the health framing was consistent with what is permissible by the FDA, the sample of consumers was fairly representative of U.S. shoppers, and dietary concern was an established individual difference variable with respect to food consumption. Given that the most pertinent finding involved the moderating influence of concern about negative nutrients on the anticipated guilt of consumption, it would be beneficial to manipulate (instead of measure) this dietary concern. If a manipulation of the concern about ingesting negative nutrients produces similar results to Study 1, we would be more confident in the moderating consequences of the construct.

A theory of goal-directed behavior that recognizes concern about negative outcomes is regulatory focus theory (Higgins 1997). Regulatory focus theory posits two means by which people attain their goals. First, people who pursue a prevention focus are more likely to perceive goals as duties and obligations, making them more vigilant and motivated to avoid negative outcomes (Zhu and Meyers-Levy 2007). Second, people who pursue a promotion focus perceive their goals as hopes and aspirations and thus are more motivated to pursue positive outcomes. Given the measures used to operationalize dietary concern (avoiding calories, sugar, fat, snacks, and treats), the construct aligns with a prevention focus. Therefore, we expect that a prevention focus will create dietary concern and moderate the influence of the health frame on guilt and purchase intention.

## Study 2

We designed Study 2 to replicate and extend the findings of Study 1 by formally manipulating consumers' regulatory focus with respect to food consumption. Regulatory focus is commonly conceptualized as a malleable attribute that can be manipulated for a particular task, goal, or context (Cesario, Grant, and Higgins 2004; Cesario, Higgins, and Scholer 2008; Kees, Burton, and Tangari 2010). For example, Kees, Burton, and Tangari (2010) manipulate a persuasive health appeal using either a promotion-based appeal (e.g., "Seek healthy foods and exercise to manage body weight") or a prevention-based appeal (e.g., "Avoid unhealthy foods and inactivity to manage body weight"). Indeed, several researchers have framed nutrition/health messages using a regulatory focus (Jain, Agrawal, and Maheswaran 2006; Keller 2006; Kim 2006). Consequently, we expect that to the extent that participants have a prevention (vs. promotion) orientation, they will pay more attention to negative nutrient (calorie) information, making them more susceptible to health framing effects.

### Method

*Design.* The experiment used a 2 (health frame: no vs. yes) × 2 (regulatory focus: prevention vs. promotion) × 2 (reference level: low discretionary weight vs. high discretionary weight) between-subjects design for the pizza product category.

*Participants.* Eighty-eight participants from the general Qualtrics Internet survey panel again served as participants and were randomly assigned to one of eight experimental conditions. We excluded one participant from the analysis because of failure to pass attention filters, yielding an effective sample size of 87. Participants were 56% female, the average age was 48 years, and the median and modal education level was "some college."

*Stimuli.* We used the same four nutritional labels that operationalized health frame and reference level for the pizza category in Study 1. We operationalized regulatory focus using a manipulation patterned after that used by Kees, Burton, and Tangari (2010). Specifically, participants in the prevention (promotion) condition were exposed to a set of research findings sponsored by the "U.S. Council on Health and Fitness" that provided five behaviors that were important in managing body weight. In the prevention condition, the behaviors involved rejecting a bad diet and avoiding high-calorie sweeteners, high-fat options, unhealthful foods, and inactivity. In the promotion condition, the behaviors involved embracing a good diet and choosing low-calorie sweeteners, low-fat options, healthful foods, and activity. Both manipulations appear in the section "Experiment 2 Regulatory Focus Manipulations" in the Web Appendix (http://www.marketingpower.com/jm_webappendix).

We used a pretest to confirm that the regulatory focus manipulation influenced dietary concern. One hundred sixty-six female participants from an online panel were

told that we were interested in their reactions to a new product and that they would first be provided with some recent research findings about health and nutrition. Then, participants were exposed to one of the eight experimental conditions. Next, participants responded to the dietary concern scale used in Study 1 (Cronbach's $\alpha = .78$); questions about their frequency of pizza consumption and whether they wanted to gain, maintain, or lose weight; and demographics. After we excluded seven participants who wanted to gain weight, and controlling for purchase frequency, there was a regulatory focus main effect on dietary concern ($M_{Prevention} = 3.92$, $M_{Promotion} = 3.52$; $F(1, 156) = 7.18$, $p < .01$). The health frame, reference level, and all two-way and three-way interactions did not significantly influence dietary concern (all $p > .1$).

*Procedure.* Participants were given the following instructions: "We would like to get your reactions to a new pizza to be sold in grocery stores. The nutritional information for the pizza is provided on the next couple of screens. However, before going to the next screen, we would like to provide you with some recent research findings about health and nutrition." Then, participants were exposed to either the prevention or the promotion manipulation. Specifically, participants in the prevention (promotion) condition read, "In line with the Council's recommendations, a new pizza is being marketed that is targeted toward people who want to manage their weight by avoiding unhealthy foods and avoiding inactivity (seeking to eat healthy and stay physically active). Please go to the next screen to view information about the pizza and answer a few questions." Participants then viewed one of the four nutritional labels.

Using the same measures as in Study 1, we assessed anticipated guilt, purchase likelihood, consumption frequency, and desired weight. We also assessed a covariate that was needed to adjust for individual differences in participants' sensitivity to promotion or prevention-based information. Specifically, Lee, Aaker, and Gardner (2000) and Aaker and Lee (2001) show that a person's self-construal (i.e., independent and interdependent) is related to the weight he or she gives to promotion-focused or prevention-focused information. Consumers with an independent (interdependent) self-construal are more promotion (prevention) focused (Aaker and Lee 2001; Lee, Aaker, and Gardner 2000). From these theoretical insights and consistent with Lee, Aaker, and Gardner's (2000) procedures, we use the eight-item reduced form of the self-construal scale (Singelis 1994) as a covariate to assess both an interdependent and an independent self-construal to account for these differences. A principal components analysis using Varimax rotation showed that four items loaded on the independent factor (Cronbach's $\alpha = .72$), three items loaded on the interdependent factor (Cronbach's $\alpha = .53$), and one item failed to show evidence of simple structure. However, when we tested the hypotheses, only the interdependent self-construal construct was a significant covariate. The three-item interdependent self-construal comprised "I will sacrifice my self-interest for the benefit of the group I am in"; "My happiness depends on the happiness of those around me"; and "Even when I strongly disagree with group members, I often stay quiet."[7] Although Cronbach's alpha for the interdependent subscale may seem low, the average interitem correlation was .28, which falls in the range of .15–.50 that Clark and Watson (1995) advocate and is close to the .30 level that Robinson, Shaver, and Wrightsman (1991) note as exemplary.

### Analysis and Results

*Testing $H_1$.* $H_1$ predicted that the health framing manipulation would reduce the anticipated guilt associated with consuming the product. Initial tests showed no health frame × reference level interaction ($F(1, 79) = .22$, $p > .1$). The test for the hypothesized health frame main effect was significant ($M_{No\ Frame} = 3.82$, $M_{Frame} = 2.81$; $F(1, 79) = 4.37$, $p < .05$). However, because this relationship is qualified by the interaction in $H_2$, caution should be exercised in interpreting this result.

*Testing $H_2$.* $H_2$ predicted that the influence of health framing on anticipated guilt would be moderated by a consumer's dietary concern (regulatory focus). To test for moderation, we regressed guilt on the appropriate control variables, health frame, dietary concern (i.e., regulatory focus), and the health frame × dietary concern interaction. Consistent with the $H_2$, we observe a significant effect of the health frame × dietary concern interaction ($\beta = -.36$, $t(79) = -2.23$, $p < .05$) on anticipated guilt (see Equation 2, Table 4). We graph this interaction in the left-hand-side panel of Figure 3. Under low dietary concern, health framing did not influence anticipated guilt ($M_{No\ Frame} = 3.22$, $M_{Frame} = 3.37$; $F(1, 79) = .17$, $p > .05$). However, as we hypothesized, under high dietary concern, health framing significantly reduced anticipated guilt ($M_{No\ Frame} = 4.43$, $M_{Frame} = 2.68$; $F(1, 79) = 10.74$, $p < .05$). These data are consistent with $H_{2b}$.

*Testing $H_3$ and $H_4$.* We analyzed $H_3$ and $H_4$ in a manner similar to Study 1. Table 4 shows the three estimated equations. To test for mediated moderation, we regressed purchase intention (Equation 1) and then guilt (Equation 2) on the appropriate control variables, health frame, dietary concern (regulatory focus), and the health frame × dietary concern interaction. Then, we regressed purchase intention on the same variables plus guilt (Equation 3). Consistent with $H_3$, we observe a significant health frame × dietary concern interaction ($\beta = .299$, $t(79) = 1.99$, $p < .05$) on purchase intention (Equation 1). We graph this interaction in the right-hand-side panel of Figure 3. Under low dietary concern, health framing did not influence purchase intentions ($M_{No\ Frame} = 4.08$, $M_{Frame} = 4.09$; $F(1, 79) = 0$, $p > .05$). However, as we hypothesized, under high dietary concern, health framing significantly increased purchase intentions ($M_{No\ Frame} = 3.71$, $M_{Frame} = 5.11$; $F(1, 79) = 8.96$, $p < .05$). These data are consistent with the pattern found in testing $H_2$ and thus support $H_3$.

We then tested for mediated moderation consistent with $H_4$. First, the influence of the health frame (treatment

[7]This item from Singelis (1994) reads, "Even when I strongly disagree with group members, I avoid an argument." We chose to revise the wording of this sentence to improve clarity of the item.

**TABLE 4**
**Least Means Squares for Regression Results for Mediated Moderation in Study 2**

| | Equation 1 | | Equation 2 | | Equation 3 | |
|---|---|---|---|---|---|---|
| | Criterion | | Criterion | | Criterion | |
| | Purchase Intention | | Guilt | | Purchase Intention | |
| **Study 2 Predictors** | **Beta** | **t(79)** | **Beta** | **t(79)** | **Beta** | **t(78)** |
| Reference level | −.100 | −1.010 | −.204 | −.220 | −.112 | −1.340 |
| Interdependent self-construal | −.112 | −1.150 | .203 | 1.940* | −.009 | −.110 |
| Consumption frequency | .449 | 4.700** | −.185 | −1.800* | .356 | 4.320** |
| Desired weight | −.092 | −.950 | −.227 | −2.180** | −.207 | −2.470** |
| Health frame | .393 | 2.990** | −.462 | −3.280** | −.159 | −1.340 |
| Dietary concern | −.106 | −.790 | .301 | 2.100** | −.201 | −1.620 |
| Health frame × dietary concern | .299 | 1.990** | −.360 | −2.230** | .141 | .890 |
| Guilt | | | | | −.507 | −5.740** |

*$p < .10$.
**$p < .05$.

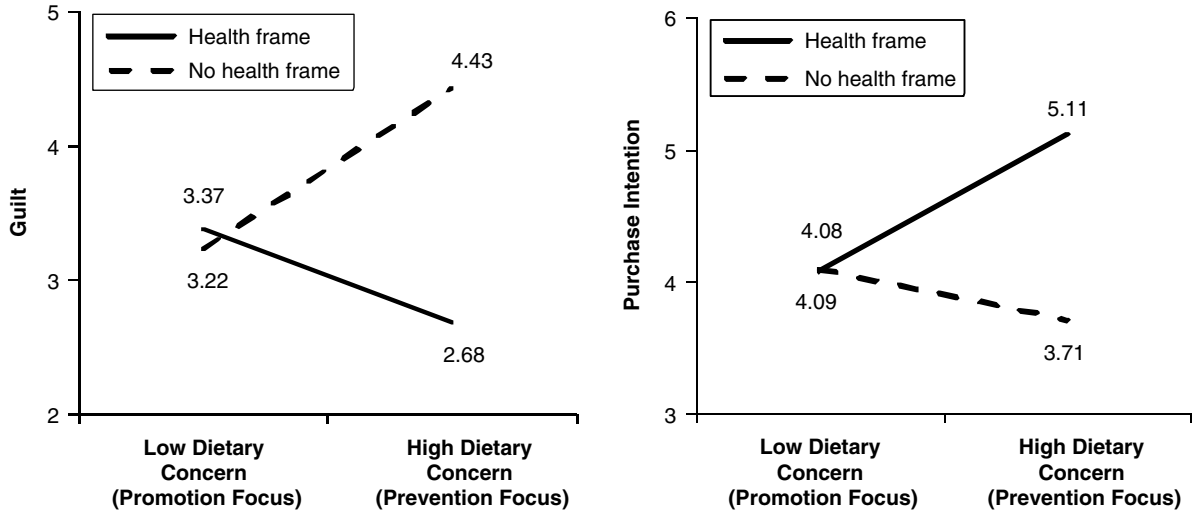
variable) on guilt (mediator) is moderated by dietary concern if there is a significant health frame × dietary concern interaction effect on guilt ($\beta = -.36$, $t(79) = -2.23$, $p < .05$; see Equation 2). This moderation is mediated by purchase intentions if there is a significant guilt effect on purchase intention in the full model ($\beta = -.507$, $t(78) = -5.74$, $p < .05$; see Equation 3) and, further, if the indirect effect of the interaction on purchase intention is significant (confidence interval: −1.78 to −.21; INDIRECT SPSS macro; Preacher and Hayes 2008). Thus, guilt mediated the influence of health framing on purchase intention for participants with high dietary concern ($H_4$).

### *Discussion*

Study 2 manipulated dietary concern by giving people a nutritional health message that was promotion (low dietary concern) or prevention (high dietary concern) focused. Similar to Study 1, dietary concern moderated the influence of health framing on the anticipated guilt of consumption and purchase intention. Consumers with a prevention focus with respect to eating anticipated more guilt from consuming a product. The health framing of nutritional information removed the guilt of consumption for these consumers, making it easier for them to form stronger purchase intentions. These results suggest that prevention-oriented consumers attend to calorie information, without considering or processing the accompanying serving size information, to make inferences about the health of the food and then form purchase intentions accordingly.

The first two studies show that consumers with the greatest concerns about their diet are influenced the most by the health framing of nutritional information. More important, prevention-oriented communications about healthful eating can increase the dietary concerns of all consumers, in effect making a significant portion of the population susceptible to health framing. This raises two issues: (1) How confident are we that health framing affects actual choice? and (2) Can the influence of health framing be mitigated? The impact of health framing on choice is a concern because the first two studies were survey based. Thus, although

**FIGURE 3**
**Study 2: Dietary Concern Moderates the Influence of a Nutritional Health Frame**



participant attention was specifically directed at the nutritional label, the context was otherwise one in which participant involvement may have been relatively low. In other words, participants with a dietary concern may have been involved enough to process and consider calorie information but not motivated enough to adjust for serving sizes when contemplating the purchase of the product. Making a choice between two alternatives should create a processing motivation that is similar to what might be experienced in a typical shopping context.

A second issue is how to mitigate the influence of health framing. As the first two studies show, health framing only influences consumers who are concerned about negative eating behaviors. Thus, it is unlikely that standard approaches to reducing framing effects (e.g., accountability, justification, increased motivation) will be effective (see Larrick 2004; LeBoeuf and Shafir 2003). Instead, consumers should be made aware of the source of the framing effect, so that they can attempt to adjust for the frame. Warnings about cognitive biases have been used to mitigate the anchoring effect (Block and Harper 1991; George, Duffy, and Ahuja 2000), the hindsight bias (Hasher, Attig, and Alba 1981; Reimers and Butler 1992), and mood misattribution effects (Schwarz and Clore 1983). Thus, a warning should also be able to mitigate health framing effects.

The best place to locate warning information may be in the communications that create a consumer's concern about negative eating behaviors. Consumers develop dietary concerns because of health communications, among other things. Ironically, this increased attention to calories makes diet conscious consumers more susceptible to the health framing effects than the consumers who ignore health communications. Supplementing health communications with messages about the potential for health framing effects should be an effective way to mitigate this bias. Warnings about the variability in serving sizes should focus consumer attention on calories for a reasonable serving size.

$H_5$: Health communications that focus consumer attention on calorie and serving size information should mitigate health framing effects.

## Study 3

Study 3 investigated health framing effects in the context of a product choice. Study 3 assessed whether a prevention-focused health message would increase consumer susceptibility to health framing effects whereas a prevention-focused health message with a warning about potential framing effects would increase consumer sensitivity to negative nutrients without an accompanying increase in susceptibility to health framing. The procedure used health communications that were similar to popular press articles that provide advice on how to make healthy food choices. The procedure involved exposure to a health communication and a naturalistic choice of a product. We used two granola bars to investigate serving sizes that characterize low discretionary weights and two chocolate bars to investigate serving sizes that characterize high discretionary weights.

### Method

*Design.* The experiment used a single factor design that manipulated the focus of the health communication at three levels (control, prevention focused, and prevention focused with warning) and two product replicates (low discretionary weight serving size profile: granola bars; high discretionary weight serving size profile: chocolate bars).

*Participants.* Six hundred twenty-five undergraduate students participated in exchange for extra credit. The low discretionary weight replicate had 408 participants, and the high discretionary weight replicate had 217 participants. We ran the replicates in separate sessions owing to logistical requirements.

*Stimuli.* We selected two products for each replicate. First, we chose the stimuli with the low discretionary weight serving size profile so that (1) serving sizes were two versus one unit, (2) the single-unit serving had lower calories than the two-unit serving, and (3) half of the two-unit serving had fewer calories than the single-unit serving. Two granola bars met these requirements. The Oats 'N Honey package weighed 42 grams and contained one serving of two units. The nutritional label indicated that one serving was two bars, 200 calories, 6 grams of fat, 29 grams of carbohydrates, 2 grams of fiber, and 11 grams of sugar. The Trail Mix Mixed Berry package weighed 35 grams and contained one serving of one unit. The nutritional label indicated that one serving was one bar, 140 calories, 3.5 grams of fat, 26 grams of carbohydrates, 1 gram of fiber, and 14 grams of sugar. Thus, the Mixed Berry bar should be preferred when participants were exposed to a prevention-focused health message, whereas the Oats 'N Honey bar should be preferred when participants were exposed to a prevention-focused health message with a warning about serving size (health) framing.

Second, we chose the stimuli with the high discretionary weight serving size profile so that (1) serving sizes were one versus one-half unit, (2) the one-half unit serving had lower calories than the one-unit serving, and (3) half of the one unit had fewer calories than the one-half unit serving. Two chocolate bars met these requirements. The Chocolov Chocolate Bar "Orange Peel in Dark Chocolate" package weighed 34 grams and contained one serving of one bar. The nutritional label indicated that one serving was one bar, 170 calories, 11 grams of fat, 17 grams of carbohydrates, 5 gram of fiber, and 15 grams of sugar. The Endangered Species Chocolate Bar "Smooth Organic Dark Chocolate with Orange" package weighed 40 grams and contained two servings of one-half bar. The nutritional label indicated that one serving was one-half bar, 100 calories, 6 grams of fat, 12 grams of carbohydrates, 1 gram of fiber, and 10 grams of sugar. Thus, the Endangered Species bar should be preferred when participants were exposed to a prevention-focused health message, whereas the Chocolov bar should be preferred when participants were exposed to a prevention-focused health message with a warning about serving size (health) framing.

*Procedure.* Participants entered a behavioral lab and were seated at individual carrels. Participants were instructed to turn over a questionnaire that had been placed facedown in the upper-left-hand corner of their carrel. On turning

over the questionnaire, the participant saw the two chocolate bars (two granola bars) that had been placed underneath. In the two treatment conditions, the first page of the questionnaire consisted of a mock newspaper article titled "Why We Underestimate Our Calorie Intake." The newspaper article was copied from a popular press article and had been slightly modified for each condition. In the control condition, the newspaper article was not included in the questionnaire.

In the prevention-focused communication condition, consumers were told that the best way to control their weight was to be vigilant about calorie consumption (see text without underline in the section "Experiment 2 Health Concern Manipulation" in the Web Appendix [http://www.marketingpower.com/jm_webappendix]). For example, the opening sentence stated that "people often underestimate how many calories they are consuming per day." Subsequent paragraphs warned about the many sources of calories. In the prevention-focused with warning communication condition, each of the four paragraphs in the newspaper article ended with information that emphasized understanding the number of calories per serving (see text with underline in the section "Experiment 2 Health Concern Manipulation" in the Web Appendix). The article stated that "it is critical to understand how many calories you are consuming per serving," "be mindful of what is considered 'one serving' when assessing the total number of calories you are eating," and "these women would have been more successful at maintaining their weight had they read labels and calculated serving sizes."

After reading the respective newspaper articles, participants completed a brief (15-item) survey containing scale items related to health (e.g., "I'm constantly examining my health") and exercise (e.g., "How many times do you typically exercise per week?"). After participants completed the survey, they were invited to select one of the two chocolate bars (granola bars). The written instructions stated, "As a token of our appreciation, you are welcome to take one of the candy (granola) bars that have been placed before you!" The choice of the chocolate (granola) bar was the dependent variable in the study.

### Analysis and Results

Table 5 shows the raw choice shares. Of the 408 participants, 138 decided not to take a granola bar or took both granola bars, leaving 270 valid responses. Of the 217 participants exposed to the chocolate bar replicate, 37 decided not to take a chocolate bar or took both chocolate bars, leaving 182 valid responses. The focus of the health communication did not interact with discretionary weight profile ($p > .40$), so we collapsed the data across the two replicates for analysis purposes. The health communication manipulation was significant ($\chi^2 = 27.52$). Participants exposed to the prevention-focused health communication preferred the health-framed product (65.9%) more than the control group (50.3%; $z = 2.79$, $p < .01$). Participants exposed to the prevention-focused health communication with a warning about framing preferred the health-framed product (34.3%) less than the control group (50.3%; $z = -2.83$, $p < .01$).

### Discussion

Study 3 confirms the influence of health communications on the processing of nutritional label information and, ultimately, choice. When a health communication encouraged participants to be prevention focused, they were more likely to select the health-framed product. When participants were prompted to consider calories consumed, their subsequent choice was based on the listed calorie count, even though serving size information was available. It was only when the health communication encouraged participants to be diligent about their diet, but wary of health framing, that they were able to adjust for serving sizes and select the product with the lowest negative nutrients. We view this finding as particularly meaningful because public policy initiatives try to teach consumers to be vigilant about consumption but often fail to anticipate that manufacturers adjust serving sizes to influence the perceived caloric con-

**TABLE 5**
**Study 3 Results**

| Discretionary Weight Profile | Health Framing | Label Information | Health Information Prime: Control | Health Information Prime: Prevention Focus | Health Information Prime: Prevention Focus and Warning About Framing |
|---|---|---|---|---|---|
| Low | No | Oats 'N Honey<br>• Serving size: 2 bars (42 g)<br>• Calories 200 | 55 (49.1%) | 27 (35.5%) | 53 (64.6%) |
| Low | Yes | Trail Mix Mixed Berry<br>• Serving size: 1 bar (35 g)<br>• Calories 140 | 57 (50.9%) | 49 (64.5%) | 29 (35.4%) |
| High | No | Chocolov<br>• Serving size: 1 bar (34 g)<br>• Calories 170 | 33 (50.8%) | 20 (32.3%) | 37 (67.3%) |
| High | Yes | Endangered Species<br>• Serving size: 1/2 bar (20 g)<br>• Calories 100 | 32 (49.2%) | 42 (67.7%) | 18 (32.7%) |

Notes: Cell values represent choice frequencies (percentages) for each product. Participants chose between an unframed and a health-framed product of the same type (e.g., Oats 'N Honey vs. Trail Mix Mixed Berry, Chocolov vs. Endangered Species).

tent of a product. These results show that educational materials may need to include warnings about differences in serving sizes and the need to create comparable serving sizes when comparing products.

## General Discussion

The studies provide both important and counterintuitive insights. First, unbeknownst to many consumers, manufacturers have latitude in setting serving sizes. Many manufacturers take advantage of this latitude and even exceed it. As we mentioned previously, there is no benefit of adjusting serving sizes if consumers do not attend to calorie information or if they attend to calorie and serving size information and "do the math." Manufacturers using health frames benefit when consumers attend to calorie information but do not attend to the accompanying serving size information. Study 1 showed that using a health frame to present nutritional information reduced the anticipated guilt of consumption and increased purchase intentions. This effect was found for both healthful and unhealthful product categories and for manipulations of product weight both above and below the FDA reference values. Moreover, people who were *most focused* on avoiding negative nutrients (calories) were influenced the most by the health framing of nutritional information. Health framing removed the anticipated guilt associated with consuming calories, thus enabling consumers concerned about their diet to form intentions to purchase the product. For people with low dietary concern, health framing had little influence on anticipated guilt and thus had little impact on purchase intention.

Study 2 demonstrated how health communications can make people vigilant about avoiding negative nutrients, thus making them more susceptible to health framing effects. Participants were exposed to a prevention-focused or promotion-focused health appeal. Those in the prevention-focused condition were more likely to be influenced by a health frame, for product weights both above and below FDA reference values. Furthermore, as in Study 1, we found this interaction effect on anticipated guilt and purchase intentions, with the effect on the latter mediated by the former.

We designed Study 3 to enhance the external validity of our findings using actual product choice as a dependent variable, again for an unhealthful (e.g., candy bar) and healthful (e.g., granola bar) product category for serving sizes that characterize product weights both above and below the FDA reference value. Participants were exposed to a prevention-focused health communication designed to make them more vigilant about negative nutritional information. In effect, the prevention-focused health communication sensitized participants to calorie information, making them more prone to health framing effects than if they had received no communication at all. The irony is that communications that have the best goals (i.e., pay attention to nutrition) may actually have an adverse effect on consumer nutritional choices. It was only when respondents were warned about how serving sizes can be manipulated by manufacturers that they made adjustments for serving sizes. As such, our findings put an exclamation point on the perspective of Neuman (2010, p. A1):

> [The] problem is important because the standard serving size shown on the package determines all the other nutritional values on the label, including calorie counts. If the serving size is smaller than they [consumers] really eat, unless they study the label carefully, they may think they are getting fewer calories or other nutrients than they are.

### *Managerial Implications*

Our findings have important managerial implications. However, before discussing these implications, we note that the managerial implications assume a goal of consumer persuasion within the current marketplace environment—an environment that we believe is likely characterized by complexity and consumer confusion about the processing of nutritional information. As such, we recognize that some of the implications for marketer behavior may not be in the general interest of consumer welfare. With this caveat, we provide implications for marketers given the current marketplace environment.

First, with the consistent finding that health framing influences consumption guilt, purchase intentions, and choice (and more so when calorie consciousness is higher), marketers should consider reducing serving sizes (health framing), especially in product categories or segments in which consumers are calorie conscious. This strategy is likely to be most effective when packages contain multiple servings. For example, consider a manufacturer of candy or snacks that sells multiunit packs. The manufacturer has discretion in setting the size of a unit within the pack. Ideally, the manufacturer should make the weight of a unit 51% of the CFR reference amount. This would allow the manufacturer to maximize the number of servings per package, while minimizing the number of calories per serving, without altering the aggregate weight of the package. This strategy should increase the market share of the manufacturer's brand (Study 3) and be particularly effective among consumers concerned about their diet (Study 1).

Second, we chose the manipulated levels in our studies to comply with FDA parameters regarding where manufacturers have legal discretion in setting serving sizes, thereby enhancing the external validity of our findings. With our results, manufacturers should consider packaging large units that are in excess of 200% of the CFR amount. A large unit provides manufacturers discretion in setting the serving size and encourages increased consumption (Wansink 1996). For example, consider a family-sized can of Campbell's soup (737 g). Campbell's lists a serving as one-sixth can (51% of the CFR amount) and, consequently, minimizes the calories for one serving. Yet it is unlikely that many consumers would consider 4.35 ounces of soup (about one-fourth cup) an adequate serving. Thus, large-unit sizes allow manufactures to encourage additional consumption because of (1) excess availability, (2) miscalibration with respect to the size of a serving, and (3) miscalibration with respect to calories consumed. We note that the large-unit strategy is effectively used in many snack categories.

Third, manufacturers should also consider promoting healthful eating through calorie consciousness, especially

in product categories in which consumers are concerned about their diet (Study 2). Calorie consciousness can be encouraged through promotional campaigns (e.g., "Emerald Balance has just 52 calories per serving"; http://www.sgnnutrition.com/-pressroom.html) or general interest articles (e.g., "Coke Makes Calorie Information More Prominent"; http://www.usatoday.com/money/industries/food/2009-09-30-coca-cola-calorie-count-visibility_N.htm). Increasing consumer sensitivity to calories may also be achieved as part of an industrywide effort. For example, consider the currently planned, voluntary, industrywide nutritional labeling program in which calorie, fat, sodium, and sugar information will be prominently displayed on the front of food packages on a per-serving-size basis (for the proposed label format, see Neuman 2011). In announcing the initiatives, industry executives are noted to have "repeatedly invoked the campaign against obesity initiated by Michelle Obama, the first lady, saying they had developed the voluntary labeling plan after she challenged them to help consumers make more healthful food choices" (Neuman 2011). According to our findings, this initiative will likely have the opposite effect; it will cause consumers to be more susceptible to health framing effects by making them more calorie conscious without encouraging an adjustment for serving sizes. Thus, manufacturers that use health frames are likely to garner even larger market shares by making the framed nutritional information more salient (Study 3).

Calorie consciousness can also be encouraged through promotional material and packaging, as is the case in the 100-calories serving sizes that Hershey, Hostess, Keebler, Nabisco, and Pepperidge Farm offer. In each of these cases, the "100 calorie" claim is prominently displayed on the package. Moreover, promotional material avoids the mention of the weight of a serving. Thus, the goal is to encourage consumers to focus on the calories in a packaged serving and discourage them from considering the size of the serving or how many of the packages might be consumed at one time.

### *Public Policy Implications*

Our findings also have several implications from a public policy perspective, some of which, if addressed, would reduce the latitude for marketer behaviors noted previously. First, we provided evidence that the FDA guidelines give marketers enough latitude to manipulate the presentation of equivalent serving sizes in a way that affects consumer responses ($H_1$ and $H_2$), including choice ($H_5$). Neuman (2010, p. A1) notes that though "companies have leeway in how they label smaller packages, in 2004 the F.D.A. urged manufacturers to label them as single-serving containers." We question the value of merely *urging* compliance when financial incentives favor labeling products at smaller serving sizes.

Second, from our cursory review of packaged good products (Table 2), it seems that several manufacturers are going even further than the FDA-afforded discretion and operating outside FDA rules. In addition to what we find, Neuman (2010) cites occurrences of marketers increasing the number of servings per container beyond FDA regulations such that the calories per serving are less. As our manipulations were within FDA rules, this may suggest even larger effect sizes than those found in our studies. In any event, from a public policy perspective, to the extent that the FDA, through its guidelines, lack of enforcement, or both, gives marketers latitude to manipulate nutritional information in a way that affects consumers' ability to accurately process nutritional information and make interbrand comparisons, the result is that consumers may be injured.

Another issue worthy of public policy attention is the confusion surrounding the question, "Just what is standardized?" As we noted previously, despite the wording of the NLEA (which states that it is the reference values—used as a basis for calculating serving size—that are standardized), marketing researchers have stated that it is the serving sizes themselves that are standardized (Balasubramanian and Cole 2002). We suspect that the origin of this confusion may lie with the FDA itself, as reflected in its educational materials in which, in conflict with its own policy (NLEA), it notes that "serving sizes are standardized."

Perhaps the rationale underlying this educational statement is the FDA's belief that there is not enough allowable deviation from reference values to make an appreciable difference in serving sizes, and so in essence, the serving sizes are standardized. If so, our research provides evidence to the contrary; there is ample room within the NLEA's allowable deviations from reference values that differences in stated serving sizes for the same amount of product can significantly affect consumer responses. As such, to the extent that educational materials are used in health classes with elementary school children, consumers grow up learning that serving sizes are standardized, when in actuality they are not, which can lead to errors in decision making with respect to nutritional choices.

Finally, if public policy makers are indeed allowing variance from reference values in setting serving sizes, why not mandate that nutritional information based on a unit of weight or volume also be reported? Currently, manufacturers can vary both the size of their offering and the size of the suggested serving, and thus consumers desiring to compare nutritional information across product choices are confronted with a complex task. As such, they are encouraged to revert to comparing brands in a way that often lacks validity (e.g., bars). If the FDA were to mandate that nutritional information be presented on a common metric (e.g., grams, ounces), comparisons across product versions would be simpler for consumers. An analogy is unit-price information. All unit prices are presented on a "price-per-ounce" basis, making comparisons across brands easy. Our research indicates that if the FDA continues to give marketers latitude in setting servings sizes, marketers should also report nutritional information on a per unit of weight/volume basis. Reporting calories on a per unit of weight, per serving size, and on a per package basis (assuming a package is less than 200% of the reference standard) might provide consumers with the flexibility they need to make nutritional choices.

## APPENDIX
## Stimuli from Study 1

**Nutrition Facts**

| Amount/Serving | %DV* | Amount/Serving | %Dv* |
|---|---|---|---|
| Serving Size 1 Pizza (280 g) | **Total Fat** 17.8g | **28%** | **Total Carb** 42.8 g | **14%** |
| **Amount per serving** | Sat Fat 7.4 g | **36%** | Dietary Fiber 4 g | **8%** |
| Calories 400 | **Cholest**. 40 mg | **14%** | Sugars 4 g | |
| Calories from Fat 144 | **Sodium**1360 mg | **56%** | **Protein** 16.8 g | |

Vit. A 15%*Vit C 100%*Calcium 25%*Iron 25%.Vit E 100%*Vit K 25%*Thiamin(B1)25%*Riboflavin(B2)15%*Niacin(B3)15%*Vit B6 20%*Folate 20%*Vit B12 15%*Phosphorus 20%*Iodine 15%*Magnesium 25%* Zinc 29%*Seleriam 20%*Copper 15%*Manganese 35%*Chromium

*Percent Dail Values (DV) are based on a 2,000 calorie diet

**Nutrition Facts**

| Amount/Serving | %DV* | Amount/Serving | %Dv* |
|---|---|---|---|
| Serving Size 1/2 Pizza (140 g) | **Total Fat** 8.9g | **14%** | **Total Carb** 21.4 g | **7%** |
| **Amount per serving** | Sat Fat 3.7 g | **19%** | Dietary Fiber 2 g | **4%** |
| Calories 200 | **Cholest**. 20 mg | **7%** | Sugars 2 g | |
| Calories from Fat 72 | **Sodium** 680 mg | **28%** | **Protein** 8.4 g | |

Vit. A 15%*Vit C 100%*Calcium 25%*Iron 25%.Vit E 100%*Vit K 25%*Thiamin(B1)25%*Riboflavin(B2)15%*Niacin(B3)15%*Vit B6 20%*Folate 20%*Vit B12 15%*Phosphorus 20%*Iodine 15%*Magnesium 25%* Zinc 29%*Seleriam 20%*Copper 15%*Manganese 35%*Chromium

*Percent Dail Values (DV) are based on a 2,000 calorie diet

**Nutrition Facts**

| Amount/Serving | %DV* | Amount/Serving | %Dv* |
|---|---|---|---|
| Serving Size 2 Pizzas (140 g) | **Total Fat** 8.9g | **14%** | **Total Carb** 21.4 g | **7%** |
| **Amount per serving** | Sat Fat 3.7 g | **19%** | Dietary Fiber 2 g | **4%** |
| Calories 200 | **Cholest**. 20 mg | **7%** | Sugars 2 g | |
| Calories from Fat 72 | **Sodium** 680 mg | **28%** | **Protein** 8.4 g | |

Vit. A 15%*Vit C 100%*Calcium 25%*Iron 25%.Vit E 100%*Vit K 25%*Thiamin(B1)25%*Riboflavin(B2)15%*Niacin(B3)15%*Vit B6 20%*Folate 20%*Vit B12 15%*Phosphorus 20%*Iodine 15%*Magnesium 25%* Zinc 29%*Seleriam 20%*Copper 15%*Manganese 35%*Chromium

*Percent Dail Values (DV) are based on a 2,000 calorie diet

**Nutrition Facts**

| Amount/Serving | %DV* | Amount/Serving | %Dv* |
|---|---|---|---|
| Serving Size 1 Pizza (70 g) | **Total Fat** 4.5g | **7%** | **Total Carb** 10.7 g | **4%** |
| **Amount per serving** | Sat Fat 1.9 g | **9%** | Dietary Fiber 1 g | **4%** |
| Calories 100 | **Cholest**. 10 mg | **4%** | Sugars 1 g | |
| Calories from Fat 36 | **Sodium** 340 mg | **14%** | **Protein** 4.2 g | |

Vit. A 15%*Vit C 100%*Calcium 25%*Iron 25%.Vit E 100%*Vit K 25%*Thiamin(B1)25%*Riboflavin(B2)15%*Niacin(B3)15%*Vit B6 20%*Folate 20%*Vit B12 15%*Phosphorus 20%*Iodine 15%*Magnesium 25%* Zinc 29%*Seleriam 20%*Copper 15%*Manganese 35%*Chromium

*Percent Dail Values (DV) are based on a 2,000 calorie diet

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