Identifying a Reduced Set of Salient Attributes that Influence Consumer Choice among Whole, Lowfat, and Skim Milk for Beverage Use

by

Heiko Miles
Steven J. Schwager
John E. Lenz

BU-1301-M

August 1995

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HEIKO MILES
Department of Agricultural, Resource,
and Managerial Economics

STEVEN J. SCHWAGER
Biometrics Unit

JOHN E. LENZ
Department of Agricultural, Resource,
and Managerial Economics

Cornell University
Ithaca, NY 14853-7801

ABSTRACT

Fishbein's Theory of Reasoned Action models behavior as based on beliefs and evaluations on a small set of salient attributes. Two methods are proposed for reducing a large set of potentially salient attributes into a smaller set of salient attributes. The methods are based on expectancy valuation analysis and logistic regression analysis. When applied to consumer beliefs and evaluations on 59 attributes over three milk types (whole, lowfat, and skim milk), both methods identify reduced sets of attributes. The reduced attribute sets are then used to model whether or not respondents drink a particular milk type. Results indicate that the reduced models are statistically significant in explaining choice of milk type, although some information is lost compared with models using all 59 attributes. Furthermore, the data indicate that statistically imputed evaluation ratings differ from self-stated evaluation ratings.

(**Key words**: milk, preferences, consumer, model)

INTRODUCTION

Many studies of consumer preferences and behavior have used models based on Fishbein and Ajzen's Theory of Reasoned Action. [This theory was proposed by Fishbein (3) and described and extended by Fishbein and Ajzen (4) and Ajzen and Fishbein (1).] Such models have successfully predicted consumer behavior and have helped researchers to better understand the basic underlying structure of consumer preferences. In these models, the strength of an individual's preference for a given product depends on a linear combination of product-specific beliefs weighted by importance evaluations, both of which are measured on a set of salient attributes. To specify and apply such a model, the researcher must identify an appropriate set of salient attributes from among the vast number available.

In many applications of the Theory of Reasoned Action, salient attributes have been determined by the open-ended elicitation approach advocated by Ajzen and Fishbein [(1); pp.63-64]. This approach usually results in a relatively small set of salient attributes, which fits well with Ajzen and Fishbein's view that between 5 and 9 attributes should be sufficient to define a person's attitude. However, when other methods, such as expert judgment, attribute importance scores, and previous research, are also used to identify important attributes, the number of salient attributes can easily grow much larger. Most multiple-attribute models reported in the early literature used 12 or fewer attributes (21). The problem of how to analyze a larger set of attributes has only recently begun to be addressed in the literature.

Large sets of attributes appear to be arranged in a hierarchical structure. Urban and Hauser (20) discuss the "House of Quality," which arranges attributes in a three-tier hierarchy. At the top, and most important, are strategic (primary) needs of consumers. These needs tend to be rather general and are more clearly defined by sets of tactical (secondary) needs. Tactical needs can in turn comprise large numbers of detailed (tertiary) needs. Louviere (10) proposes a hierarchical information integration in which attributes are grouped *a priori* into logical, functional, or other subsets.

The problem of identifying a manageable set of salient attributes is compounded by the fact that different methods of assessing attribute importances can result in different conclusions about the attributes. Goldstein and Mitzel (5) and Reilly and Doherty (13) document a rich literature on the difference between self-stated subjective attribute importances and statistically imputed attribute importances. Jaccard et al. (8) evaluate six different attribute importance measures (open-ended elicitation, information search approach, direct ratings, conjoint measurements,

indices based on Jaccard's subjective probability approach, and a paired comparison approach) and find only relatively low convergence among measures. Such conflicting results highlight the need for further research, in particular for a method of extracting a limited set of potentially salient attributes when a much larger set is initially available, as is often the case when secondary data are used.

Identifying a limited set of salient attributes is thus a critical step in behavioral analyses of multiple attributes. Our first objective is to describe two approaches to the problem of identifying a limited set of salient attributes influencing consumer choice of competing products and to apply these attribute elimination approaches to a data set that includes 59 attributes of whole, lowfat, and skim milk. Our second objective is to apply the Fishbein framework to the reduced attribute sets to model whether or not respondents drink a particular milk type.

EXPECTANCY VALUE THEORY

Expectancy value theory is a standard technique used to assess attribute importances and to measure consumer preferences (20). In expectancy valuation, an individual's preference (P) for a specified product is defined as a linear combination of subjective product perceptions or beliefs (b_j) weighted by subjective importance evaluations (e_j), both measured on a set of salient attributes (indexed here by j):

$$P = \sum_{j=1}^{J} e_j b_j \qquad [1]$$

Expectancy value models are an application of the Theory of Reasoned Action. In these models, both beliefs and importance evaluations influence consumer behavior. Close scrutiny of evaluations of and beliefs about each attribute can provide important insights into consumer preferences. The Theory of Reasoned Action (Figure 1) postulates that behavior is a function of behavioral intention, which in turn is a function of attitude and peer pressure. (In the psychological terminology of Ajzen and Fishbein, this factor is the subjective norm.) The relative importance of attitude and peer pressure is determined by the individual. Attitude is further influenced by behavioral beliefs and outcome evaluations; peer pressure is influenced by societal beliefs and a motivation to comply with peer groups. Behavioral beliefs measure the individual's perceptions of attributes associated with a certain behavior. For example, if "refreshingness" is a potentially relevant product attribute, then an individual's strength of agreement or disagreement with a statement, e.g., "drinking whole milk is refreshing," measured on a Likert or semantic

differential scale, constitutes the behavioral belief rating for whole milk on this attribute. Evaluations measure the importance weight the individual attaches to attributes. For example, an individual's response to how "important or unimportant" refreshingness is to him or her in beverages, measured again on a Likert or semantic differential scale, constitutes the individual's importance evaluation for this attribute.

A thorough discussion of issues associated with the Fishbein model and its use in marketing research is given by Wilkie and Pessemier (21). Sheppard et al. (15) conducted two meta-analyses to examine the effectiveness of the Fishbein and Ajzen model. They found that the model's predictive utility was strong even under circumstances not satisfying its conditions, such as prediction involving explicit choice among alternatives. This finding led us to base the present study on Fishbein and Ajzen's model.

In their model specification, Fishbein and Ajzen posited that only a limited number of attributes, those determined to be salient, should be included in the model. Intuitively this appears to be reasonable, as the inclusion of every possible attribute in the decision-making process of consumers would require prohibitive investments of time and effort, resulting in severe cognitive strain. Several studies (14, 17, 18, 19) have investigated the impact of beliefs on milk consumption and choice of milk type; each of these utilized 13 or fewer attributes.

The literature provides little guidance on how to identify a limited set of salient attributes from a large set of potentially salient attributes. Olshavsky and Summers (12) applied factor analysis to reduce a set of 80 attributes to 12 distinct belief groupings. Urban and Hauser [(20); p. 211] list several pitfalls of factor analysis. One danger is the temptation to ignore the information contained in attributes with low factor loadings when results are interpreted; the total impact of many such attributes can be substantial. Furthermore, observations on all attributes are still needed to compute factor scores (9). Alpert (2) considered identifying "determinant attributes" by regression coefficient testing. After a multiple regression of overall preference on ratings was performed for 37 attributes, each partial regression coefficient was tested to see whether it differed significantly from 0. Those attributes for which this partial t test was significant were identified as determinant. This approach is difficult to use when two or more important attributes are multicollinear (11).

The methods proposing hierarchical attribute structures are limited because the analyst must determine hierarchies through either group consensus or a customer sort procedure (6). Because the customer sort procedure requires personal interviews to collect additional data, the group consensus method is more frequently used, although it is inferior because it does not depend on customer responses (6).

In practice, attribute saliency is often determined through a combination of expert judgment, in-depth interviews, open-ended elicitation, correlation with preferences, and attribute evaluation scores. This process almost always requires compromises to resolve conflicting indications arising from its components.

DATA

The data used in this study were collected during November 1991 through 1252 personal interviews conducted nationwide by Yankelovich Clancy Shulman, a market research firm employed to conduct a beverage marketing study by a consortium of dairy promotion organizations (the United Dairy Industry Association, the National Dairy Promotion and Research Board, the American Dairy Association and Dairy Council (New York), the California Milk Promotion Advisory Board, and the Wisconsin Milk Marketing Board). Respondents had been prerecruited at central locations. The sample frame was chosen to include buyers of all milk types during the last month.

Each respondent was asked about two of the three milk types — whole, lowfat, and skim — as well as other beverages. The milk types were randomly selected, and respondents were specifically instructed to consider only beverage uses of milk. Prior to the interviewing, 59 potentially salient attributes had been identified in close consultation with dairy industry specialists and through the use of focus groups. Most of the attributes that were identified as pertinent to beverage consumption describe positive elements. The chosen attributes provided balanced coverage of taste, versatility, satisfaction, health and nutrition, and packaging components; less well represented are negative health elements, age and family, social pressure, and price components. Attribute importance evaluations relative to the beverage category were measured on a nine-point scale (extremely desirable to extremely undesirable); product-specific beliefs were measured on a five-point scale ("does not describe this beverage at all" to "describes this beverage completely"). Respondents were shown a picture card for each attribute for the belief and evaluation questions to help equalize associations and normalize responses. For instance, the belief "must be cold to taste good" was accompanied by a picture showing a polar bear floating on arctic ice drifts. Type of milk consumed was measured by asking about the number of glasses of each milk type included in the last 10 glasses consumed. This question referred specifically to at home or residence use only. Our analysis included only adults who drank milk during the week prior to interview. We rearranged attributes into contextual groupings to facilitate comparisons.

METHODS

Expectancy Value Analysis

For the expectancy value analysis, mean values for beliefs and evaluations were calculated over all respondents. Belief ratings are specific for milk type and independent of milk type consumed. Evaluation scores refer to beverages as a group. Evaluations (e) were normalized with the formula:

$$e_{ij}^{*} = \frac{e_{ij}}{\sqrt{\sum_{j=1}^{J} e_{ij}^{2}}} \qquad [2]$$

where i indicates the respondent, and j indexes the attribute, ranging from 1 to J=59.

Normalization of importance evaluations addresses the issue of whether every respondent has equal importance in the model and the analysis, regardless of whether the respondent's overall tendency is to answer at or near the extremes of the measurement scale or more toward the center. To assign equal importance to every respondent, normalization was incorporated into the attribute evaluations used here. These evaluations represent (for each respondent) the relative within-consumer weighting of attributes. In the words of Wilkie and Pessemier [(21); p. 434], "normalization is always appropriate and possibly essential when cross-sectional analysis is used."

For the analyses of variance, each respondent was classified as a user of the type of milk consumed most frequently, based on the last 10 glasses consumed. For instance, a respondent whose last 10 glasses of milk consisted of 5 glasses of whole milk, 3 of lowfat, and 2 of skim was classified as a whole milk user. Respondents who could not be classified uniquely (e.g., 5 glasses of whole milk and 5 of lowfat milk) were omitted from analyses involving milk type user groups. Table 1 indicates the number of respondents who were classified into the different milk type user groups. The majority of respondents were either exclusively or partially lowfat drinkers, 41% and 65%, respectively. Exclusive whole milk drinkers accounted for almost one-fourth of all respondents. Drinkers of whole milk along with other milk types accounted for 40% of respondents. Only 10% of respondents were exclusive skim milk drinkers. Drinkers of skim milk and other milk types accounted for 23% of respondents.

Logistic Regression Analysis

As in the Fishbein model, our logistic regression analyses integrate beliefs and evaluations. Our model calculated difference values (D) for each respondent on each of the 59 attributes. Difference values measure how the product of beliefs (b) and normalized evaluations (e^*) differs between two milk types for any respondent on any specified attribute. The formula

$$D_{k,h;i,j} = (b_{ijk} - b_{ijh})e^*_{ij} \qquad [3]$$

measures the difference value between milk type k and milk type h for respondent i on attribute j. We rescaled beliefs and evaluations to have a 0 midpoint, thus setting up the responses for bipolar scoring (16). Because each respondent was asked about only 2 of the 3 milk types, only one set of 59 difference values could be calculated for each respondent. The evaluations were normalized by using Equation [2].

The analysis we used to identify attributes salient in the choice of milk type consisted of three pairwise comparisons: whole versus lowfat, whole versus skim, and lowfat versus skim. This approach, rather than a single trivariate comparison, was necessary because each respondent was asked about only 2 of the 3 milk types. Each analysis employed a logistic regression procedure, using the option for all possible subsets regression that is available in SAS (14, 15). Iteratively weighted least squares were used to adjust the variance to reflect that the dependent variable was the composition of the last 10 glasses of milk consumed (a number between 0 and 10). For each number of predictor variables from 1 to 10, the 10 best models were computed. Models were ranked based on score values calculated using the score test statistic (7). Attribute prevalence in these models was used to determine saliency.

Each logistic regression analysis used only those observations containing a complete set of belief evaluations on the two milk types being compared and those respondents whose last 10 glasses of milk consisted entirely of the two milk types being compared. Using the whole versus lowfat milk comparison as an example, only respondents who had answered belief questions about whole as well as lowfat (but not skim) milk and whose last 10 glasses of milk ranged from all whole milk, through a mixture of whole and lowfat milk, to all lowfat milk (but not skim milk) were used for this analysis. Other respondents (in this case skim milk drinkers) were not included in the

whole versus lowfat milk comparison because we thought that the choice between milk types, in this case whole and lowfat, could best be explained by actual consumers of these milk types.

RESULTS

Expectancy Value Analysis

A careful examination of beliefs about and evaluations of each attribute conveys detailed insights into consumer perceptions of advantages and disadvantages of each milk type. Mean absolute and normalized mean absolute evaluation scores for the 59 attributes were recorded (right side of Figure 2). High mean absolute evaluation scores for positive attributes, such as 3.17 for the attribute "is always fresh" (1), indicated that most respondents considered this attribute at least "very desirable." A similar score for a negative attribute, e.g., the attribute "comes in a package that can have a bad effect on the flavor of the drink" (56), indicated that most respondents considered beverages that have these attributes to be "very undesirable". High mean absolute evaluation scores potentially indicate attribute saliency, but they had to occur in combination with significant differences in belief ratings to affect choice of milk type. Low mean absolute evaluation scores, such as 1.27 for the attribute "is bubbly" (59), indicated that respondents as a group did not have strong feelings about these attributes. The evaluation scale midpoint was "neither desirable nor undesirable". Low mean absolute evaluation scores might suggest nonsalience.

Table 2 displays a frequency distribution of mean absolute evaluation scores for the 59 attributes included in this study. Because these attributes were not clearly differentiated into a salient and a nonsalient group, any decision on a cut-off point would be arbitrary. We therefore decided to examine whether evaluation scores differed between milk type user groups. Attribute importance, or the degree of saliency, was likely to differ across individuals and to be reflected in their choice of milk type. Probability values associated with analyses of variance testing for statistical difference in evaluation scores by milk type (Table 3) indicated that 13 of the 59 attributes differed ($P < .05$). These attributes were: "must be cold to taste good" (8), "makes a good hot drink" (9), "has a sweet taste" (10), "is good with any type of food" (15), "is satisfyingly rich" (29), "is low in fat" (31), "has few or no calories" (32), "is for people who are into physical fitness" (34), "is part of a balanced diet" (37), "is all natural" (38), "you feel you shouldn't drink too much of" (44), "you feel you have to limit a child's consumption of" (45), and

"comes in an environmentally sound package" (58). These attributes, which are predominantly related to taste, health, and nutrition, are all promising as potentially salient influences in the consumer's milk type choice.

Average belief ratings on whole, lowfat, and skim milk, over all respondents, are shown in the body of Figure 2. As mentioned previously, each respondent reported belief ratings for only two of the three milk types. The farther apart the mean belief ratings for whole, lowfat, and skim milk, the more different the respondents believed that the three milk types were, and the more likely it was that this attribute was salient in the choice of milk type. For instance, the attribute "has a clean crisp taste" (3) indicated that respondents thought whole milk had a cleaner, crisper taste than lowfat and skim milk. Lowfat milk was also thought to have a cleaner, crisper taste than skim milk. In contrast, for the attribute "suits your own individual taste" (5), respondents indicated no noticeable difference among the three milk types. This attribute was therefore unlikely to matter in the choice of milk type.

Table 3 shows the probability values associated with one-way analyses of variance testing for statistical differences in the belief means for the three milk types. Beliefs differed significantly on 51 attributes ($P < .05$) and not on 8 others ($P \geq .05$). The 8 attributes that did not appear salient were: "suits your own individual taste/is not something for everyone" (5), "must be cold to taste good" (8), "comes in an easy to open package" (53), "is cumbersome to get out, serve, put away, etc." (54), "comes in resealable packaging so that it stays fresh for a long time" (55), "comes in a package that can have a bad effect on the flavor of the drink" (56), "comes in an attractive package" (57), and "is bubbly" (59). Interestingly, respondents perceived the three milk types as being indistinguishable along all attributes except two packaging attributes, suggesting that all packaging attributes other than size and environmentally sound packaging were not salient factors in an individual's choice of milk type. Because all three milk types are sold in the same types of packages, this result was not surprising. However, evaluation scores varied widely for these packaging attributes, suggesting that mean evaluation scores by themselves are not a sufficient indicator of salience.

When products have identical tangible attributes, subjective product beliefs may reflect this sameness or may differ. Belief responses for almost all packaging attributes indicated that respondents perceived the three milk types as indistinguishable. However, for the attributes "is always fresh" (1) and "is full of vitamins and minerals that I need" (40), beliefs differed even though the three milk types were virtually identical in these attributes. Thus, objective physical characteristics may not translate directly into subjective attribute beliefs, and perceptual attributes rather than, or in addition to, objective characteristics may significantly influence product preferences.

Conversely, for attributes on which the three milk types exhibit tangible differences, these differences were reflected in subjective product beliefs of respondents. "Is low in fat" (31), "has few or no calories" (32), and "comes in a range of convenient sizes" (52) all have mean belief ratings that differ by milk type.

Attributes with statistically nonsignificant belief differences ($P \geq .05$) were "suits your individual taste - is not something for everyone" (5), "must be cold to taste good" (8), and "is bubbly" (59). These attributes do not appear to hold much promise as explanatory variables in future analyses that address milk type choice.

Although belief responses did not differ across milk types for "must be cold to taste good" (8), evaluation scores on this attribute did differ. We think this attribute may prove useful for further analysis.

An interesting observation can be drawn from these data regarding the issue of normalizing importance evaluations. Close scrutiny of the right two columns in Figure 2 indicates that mean absolute evaluations and normalized mean absolute evaluations are very highly correlated. In fact, the Pearson correlation coefficient for this set of 59 attributes is .99. A possible explanation for this high correlation may be the use of a picture book in the data collection process to normalize respondents' attribute associations.

Using the expectancy value approach in combination with analyses of variance on beliefs and evaluations leads to somewhat ambiguous conclusions. Although the analyses of variance on the evaluations identify 13 attributes as potentially salient, the analyses of variance on the beliefs indicate that 51 attributes are potentially salient. The results of both sets of analyses of variance could be combined and the 12 attributes identified as salient in both sets of analyses could arguably be assigned to the set of salient attributes that affect the choice of milk type. The 7 attributes that fail to indicate saliency based on analyses of variance on beliefs as well as evaluations should probably not be assigned to this set of salient attributes. The question that remains is what to do with the 40 attributes that were classified as salient in one but not both of the analyses. Including them in the set of salient attributes would not reduce the number of attributes substantially. Excluding them may discard some unknown amount of information but would leave a set of 12 attributes, a size consistent with other reported studies. It appears, then, that selection of attributes based on analyses of variance on both beliefs and evaluations provides a set of salient attributes that can be used in a Fishbein model.

Logistic Regression Analysis

Based on each attribute's prevalence in the logistic regression analyses, we classified the 59 attributes included in this study as strong, weak, or absent (Table 4). A strong classification indicates that this attribute is

salient because of its repeated and dominant appearance in the best models specified; a weak classification indicates that this attribute is potentially salient because of its repeated but not dominant appearance in the best models specified; and an absent classification indicates no suggestion of salience because of the attribute's near or complete failure to appear in the best models specified. For example, "is refreshing" (2) was classified as strong, based on the analysis involving whole and lowfat milk drinkers. It failed to indicate saliency based on the analysis involving lowfat and skim milk drinkers, but was weakly suggestive of saliency in the analysis involving whole and skim milk drinkers. Because the highest salience rating of these three comparisons determines overall saliency, "is refreshing" (2) received a strongly salient rating.

At first glance, the salience ratings in Table 4 do not appear to show much of a pattern; however, closer scrutiny reveals that the taste, versatility, satisfaction, and health and nutrition groupings contain all but one of the attributes classified as strongly salient. The negative health elements and packaging groupings contain only weakly salient attributes, the exception being "comes in a range of convenient sizes - from family to child size" (52). Age and family, social pressure, and price basically fail to indicate saliency. This last point may be caused by an underrepresentation of these attributes in their contextual groupings. Thus, the taste, versatility, satisfaction, and health and nutrition groupings apparently contain most of the explanatory variation and likely constitute the perceptual dimensions that influence the choice of milk type.

Results of the logistic regression analyses indicate that 19 attributes are strongly suggestive of being salient, 20 others are weakly suggestive of being salient, and the remaining 20 fail to suggest salience. Although most multiattribute studies in the literature have used 12 or fewer attributes, some studies have used larger attribute sets. The fact that the logistic regression analyses still identify a large number of attributes may be a result of the data structure requiring us to perform three bivariate comparisons, rather than one trivariate comparison. However, the logistic regression analyses reduce the number of attributes sufficiently for a Fishbein model to be applied. A principal components factor analysis (or some similar analysis) on the set of 19 salient attributes is possible. In fact, such an analysis would be more reasonable on statistical grounds than an analysis including the full set of 59 attributes. The set of 39 strongly and weakly salient attributes contains many attributes of groupings already represented in the smaller set; the additional attributes may enhance the existing factors or remain statistically nonsignificant.

Most physical attributes whose underlying physical characteristics were essentially identical across milk types failed to indicate strong saliency. The attributes "is always fresh" (1), "comes in an easy to open package" (53), "comes in a package that can have a bad effect on the flavor of the drink" (56), "comes in an attractive package" (57), and "is bubbly" (59) are all weakly indicative of saliency. However, the attributes "is cumbersome to get out, serve, put away, etc." (54), "comes in resealable packaging so that it stays fresh for a long time" (55), and "comes in an environmentally sound package" (58) completely fail to indicate saliency.

Attributes with underlying physical characteristics that vary across milk types were much more likely to reflect their differences in the attribute salience ratings. "Is low in fat" (31) and "comes in a range of convenient sizes - from family to child size" (52) were both strongly indicative of saliency. However, "has few or no calories" (32) failed to indicate saliency.

APPLYING THE REDUCED ATTRIBUTE DATA SETS WITHIN THE FISHBEIN FRAMEWORK

We used the two reduced attribute sets, identified in the previous section, within the Fishbein framework to predict individual decisions of whether or not to drink a particular milk type. We then compared these results to a Fishbein model with the full set of 59 attributes. Our objectives were 1) to assess the two reduced attribute sets as predictors of milk type use and 2) to compare self-stated and statistically imputed importance evaluations as predictors of milk type use.

For our analysis we estimated separate logistic regressions for each milk type. For each regression, the dependent variable was whether or not the respondent drank a particular milk type during the week prior to the interview. The data set contains only respondents who are actual milk drinkers. In models including individuals not drinking milk, the set of attributes may also need to reflect milk allergy and lactose intolerance concerns.

For the models using self-stated importance evaluations, each respondent's belief and normalized evaluation ratings were entered into Equation [1] to estimate separate preference values (P_{jk}) for each respondent (j) on each milk type (k). This preference value variable was then used as a single regressor for the dependent variable measuring use or nonuse of milk type k. For the models using statistically imputed importance evaluations, the use or nonuse of milk type k was regressed on 12, 19, and 59 belief ratings for milk type k. If statistically imputed importance evaluations were equal to self-stated importance evaluations, then the coefficient estimate for the

preference value variable was 1; if the two importance evaluations were completely different, this coefficient estimate was 0.

The Theory of Reasoned Action provides a reasonable framework through which the choice of milk type can be explained. All models reported in Tables 5 through 7 are statistically significant ($P \leq .0011$) as indicated by their likelihood ratio tests.

The results presented in Tables 5 through 7 show that models for all three milk types contain numerous variables that are statistically nonsignificant, especially in the models based on the full set of 59 attributes. This result supports the notion that only a limited number of salient attributes should be considered when individual behavior is modeled.

Interpretation of the coefficient estimates should consider that respondents' belief and evaluation ratings were all measured on bipolar scales. Thus, for instance, the coefficient estimate in the 12-attribute model for "is for people who are into physical fitness" (34) on whole milk (.2680) implies that respondents who think that this attribute describes the beverage completely have an increased likelihood of drinking whole milk, but respondents who think this attribute does not describe this beverage at all have a decreased likelihood of drinking whole milk.

Not surprisingly, the reduced attribute models based on statistically imputed evaluation ratings display less explanatory power than the models using all 59 attributes. The likelihood ratio test indicates difference in -2 log likelihood values between models with 19 and 59 attributes of 72.8 for whole, 61.0 for lowfat, and 52.7 for skim milk. The chi-square value associated with 40 degrees of freedom and $P = .05$ is 55.8, indicating that the 19 attribute whole and lowfat, but not skim milk, models are statistically different from their 59 attribute counterparts. For the 12 versus 59 attribute models, the -2 log likelihood differences are 85.0 for whole, 70.2 for lowfat, and 77.8 for skim milk, all of which are greater than the chi-square value of 65.0 at $P = .05$ and 47 degrees of freedom. However, for models using self-stated evaluation ratings, those with reduced attribute sets outperform those with all 59 attributes.

The results in Tables 5 through 7 also indicate that the models based on the reduced set of 19 attributes describe the data slightly better than models based on the reduced set of 12 attributes. With the exception of the skim milk models with self-stated evaluation ratings, the models using 19 attributes show slightly better concordance between predicted and actual values of their dependent variable than the models using 12 attributes.

A comparison between the models with statistically imputed evaluations and self-stated evaluations reveals that the two are different. If self-stated evaluations were identical to statistically imputed evaluations, the parameter

estimates for preferences would equal 1 because the statistical model is nested in the self-stated model. The closer the preference parameter estimates are to 0, the greater the difference between self-stated and statistically imputed evaluations. The results in Tables 8 through 10 reveal preference parameter estimates of between .24 (whole milk, 59 attributes) and .70 (skim milk, 12 attributes). Most of the preference parameter estimates are between .3 and .4, which suggests that self-stated and statistically imputed evaluations differ substantially.

In summary, models based on the reduced set of attributes, identified either through logistic regression analysis or the expectancy value approach, appear to be significantly different from models based on all 59 attributes. Further, statistically imputed importance evaluations differ substantially from self-stated importance evaluations.

CONCLUSIONS

The objective of this study was to identify a method for selecting salient attributes from a large pool and then to use the salient attributes in a Fishbein model. Psychological theory suggests that the number of salient attributes should not be too large because the presence of too many attributes increases the cognitive complexity for the consumer. Our results support this notion; most attributes in a full model show no statistical significance. The results of our expectancy value analysis indicate that analyses of variance on beliefs and on evaluations may be a better method than simply using mean belief values and mean evaluation scores. The analyses of variance identify 12 attributes as salient, a number consistent with most previously reported applications of the Fishbein model. The results of our logistic regression analyses suggest strongly that 19 attributes are salient, more than are used in most applications of the Fishbein model.

The attribute sets identified as salient by the two methods differ somewhat. Of the 12 attributes identified as salient in the expectancy valuation approach, only 5 were suggested strongly as being salient in the logistic regression approach. Attributes in the health and nutrition groupings were among the most likely to be selected by both methods. The expectancy value approach identified 2 additional salient attributes from the taste and negative health elements groupings and 1 each from the versatility, satisfaction, and packaging groupings. The logistic regression analyses identified 6 additional salient attributes from the satisfaction grouping, 4 from the taste grouping, 3 from the versatility grouping, and 1 from the packaging grouping. In this application, the logistic regression approach favors satisfaction more than the expectancy value approach. That different sets of salient attributes are identified by different methods is consistent with the literature.

Although the decision to look at a reduced attribute set necessarily entails some loss of information, we think that this approach is justifiable. Considering the full set of 59 attributes when modeling consumer choice of milk type is simply unrealistic. Both the expectancy value and logistic regression approaches are useful in paring the attribute set to a more manageable and realistic size. When subjected to the Theory of Reasoned Action, both reduced sets of attributes provide meaningful results.

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TABLE 1. Number of milk drinking respondents by milk type user group.

Milk type(s) used	Number	(%)
Whole	219	24.1
Whole + lowfat	107	11.8
Lowfat	375	41.3
Lowfat + skim	76	8.4
Skim	92	10.1
Whole + skim	9	1.0
Whole + lowfat + skim	29	3.2
Total	907	100.0

TABLE 2. Frequency of absolute evaluation scores for 59 attributes.

Evaluation range	Frequency
1.25-1.49	4
1.50-1.74	5
1.75-1.99	16
2.00-2.24	14
2.25-2.49	11
2.50-2.74	5
2.75-2.99	1
3.00-3.24	3
Sum	59

TABLE 3. Analysis of variance for attributes included in study.

	Pr>|T| Evaluations	Pr>|T| Beliefs
Taste		
1. Is always fresh.	.5352	.0008
2. Is refreshing.	.1273	.0001
3. Has a clean, crisp taste.	.4299	.0001
4. Has a strong taste.	.0698	.0001
5. Suits your own individual taste - is not something for everyone.	.9963	.2015
6. Can adjust flavor to suit my personal taste.	.4340	.0003
7. Comes in flavors.	.7755	.0001
8. Must be cold to taste good.	.0052	.0759
9. Makes a good hot drink.	.0256	.0027
10. Has a sweet taste.	.0083	.0001
Versatility		
11. Goes well with sweets like cookies and dessert.	.3008	.0001
12. Only goes with certain foods.	.5550	.0093
13. Is perfect with a light meal.	.0949	.0001
14. Is the perfect complement to a hearty meal.	.6986	.0001
15. Is good with any type of food.	.0016	.0001
16. Is good when you are in a hurry.	.5381	.0043
17. Can be a snack all on its own.	.2540	.0001
18. Is a good beverage when I'm eating away from home.	.0879	.0001
Satisfaction		
19. Is something you gulp when you are really thirsty.	.3075	.0001
20. Is soothing, a way to wind down.	.1971	.0001
21. Perfect for when you feel really content.	.1276	.0001
22. Brings back fond memories.	.5449	.0001
23. Is a treat or an indulgence you deserve.	.2006	.0001
24. Looks so good that you can't wait to drink it.	.3005	.0001
25. Satisfies a craving.	.8960	.0001
26. Your day wouldn't be the same without it.	.3862	.0001
27. Doesn't fill you up, so you can have other things you like.	.0585	.0001
28. Satisfies you when you are hungry.	.1836	.0001
29. Is satisfyingly rich.	.0080	.0001
30. Is a welcome change of pace.	.6914	.0001
Health and Nutrition		
31. Is low in fat.	.0001	.0001
32. Has few or no calories.	.0001	.0001
33. Gives you energy to make it through the day.	.3494	.0001
34. Is for people who are into physical fitness.	.0306	.0001
35. Makes you look and feel healthier.	.1369	.0001
36. Makes an unhealthy meal good for you.	.7062	.0168
37. Is part of a balanced diet.	.0002	.0001
38. Is all natural.	.0481	.0001

TABLE 3 (con't).

	Pr>|T| Evaluations	Pr>|T| Beliefs
Health and nutrition (con't)		
39. Makes you feel like you've done something good for yourself.	.1274	.0003
40. Is full of vitamins and minerals that I need.	.0663	.0001
41. Is the "smart" thing to drink.	.7719	.0001
Negative Health Elements		
42. Is hard to digest, or can upset your stomach.	.1002	.0001
43. May not be the best for you.	.0809	.0001
44. You feel you shouldn't drink too much.	.0219	.0001
45. You feel you have to limit a child's consumption.	.0142	.0001
Age and Family		
46. Younger children enjoy.	.6595	.0001
47. A family can enjoy together.	.5362	.0001
48. Appeals to all age groups.	.0762	.0001
49. Is for mature adults.	.5445	.0001
Social Pressure		
50. If you ask for it, others might look at you funny.	.1327	.0028
Price		
57. Is a good value for the money.	.2565	.0028
Packaging		
52. Comes in a range of convenient sizes - from family to child size.	.1655	.0001
53. Comes in an easy to open package.	.2157	.1404
54. Is cumbersome to get out, serve, put away, etc.	.1588	.0595
55. Comes in resealable packaging so that it stays fresh for a long time.	.2915	.0808
56. Comes in a package that can have a bad effect on the flavor of the drink.	.0606	.3773
57. Comes in an attractive package.	.1197	.2399
58. Comes in an environmentally sound package.	.0007	.0386
Miscellaneous		
59. Is bubbly.	.0526	.3183

TABLE 4. Salience ratings for attributes included in study.

Attribute	Salience ratings[1]		
	W vs. L	L vs. S	W vs. S
Taste			
1. Is always fresh.		weak	
2. Is refreshing.	strong		weak
3. Has a clean, crisp taste.	weak		
4. Has a strong taste.			
5. Suits your own individual taste - is not something for everyone.	weak		
6. Can adjust flavor to suit my personal taste.	strong		strong
7. Comes in flavors.			
8. Must be cold to taste good.		strong	strong
9. Makes a good hot drink.			strong
10. Has a sweet taste.			
Versatility			
11. Goes well with sweets like cookies and desert.			weak
12. Only goes with certain foods.		strong	weak
13. Is perfect with a light meal.	weak	weak	
14. Is the perfect complement to a hearty meal.			
15. Is good with any type of food.			
16. Is good when you are in a hurry.		strong	
17. Can be a snack all on its own.		weak	
18. Is a good beverage for when I'm eating away from home.	strong	weak	
Satisfaction			
19. Is something you gulp when you are really thirsty.	strong	strong	
20. Is soothing, a way to wind down.			weak
21. Perfect for when you feel really content.	strong		strong
22. Brings back fond memories.			weak
23. Is a treat or an indulgence you deserve.			
24. Looks so good that you can't wait to drink it.	weak	weak	strong
25. Satisfies a craving.			weak
26. Your day wouldn't be the same without it.	strong	weak	strong
27. Doesn't fill you up, so you can have other things you like.			
28. Satisfies you when you are hungry.	strong		strong
29. Is satisfyingly rich.	strong	strong	
30. Is a welcome change of pace.			
Health and nutrition			
31. Is low in fat.			strong
32. Has few or no calories.			
33. Gives you energy to make it through the day.	weak		
34. Is for people who are into physical fitness.			strong
35. Makes you look and feel healthier.		strong	weak
36. Makes an unhealthy meal good for you.			
37. Is part of a balanced diet.		strong	
38. Is all natural.			weak

TABLE 4. (con't).

Attribute	Salience ratings[1]		
	W vs. L	L vs. S	W vs. S
Health and nutrition (con't.)			
39. Makes you feel like you've done something good for yourself.			
40. Is full of vitamins and minerals that I need.		strong	
41. Is the "smart" thing to drink.	weak		weak
Negative health elements			
42. Is hard to digest, or can upset your stomach.	weak		
43. May not be the best for you.			
44. You feel you shouldn't drink too much of.	weak		weak
45. You feel you have to limit a child's consumption of.	weak		
Age and family			
46. Younger children enjoy.		weak	
47. A family can enjoy together.			
48. Appeals to all age groups.			
49. Is for mature adults.			
Social pressure			
50. If you ask for it, others might look at you funny.			
Price			
51. Is a good value for the money.			
Packaging			
52. Comes in a range of convenient sizes - from family to child size.	strong		
53. Comes in an easy to open package.			weak
54. Is cumbersome to get out, serve, put away, etc.			
55. Comes in resealable packaging so that it stays fresh for a long time.			
56. Comes in a package that can have a bad effect on the flavor of the drink.		weak	
57. Comes in an attractive package.	weak	weak	
58. Comes in an environmentally sound package.			
Other			
59. Is bubbly.		weak	

[1]W = whole milk, L = lowfat milk, and S = skim milk. strong = strong indication of saliency, weak = weak indication of saliency, and blank = no indication of saliency.

TABLE 5. Parameter estimates of models predicting likelihood of whole milk use (statistically imputed evaluation ratings)*

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
Intercept	-.1976	.3161	.0056	.9805	-.1914	.5934
1					-.2118	.0428
2			.0300	.7707	.0640	.6005
3					-.1309	.1848
4					-.2171	.0177
5					.0333	.7122
6			-.0456	.5366	-.0056	.9489
7					.0317	.7234
8			-.1815	.0937	-.1184	.3270
9	.1076	.0970	.0978	.1499	.0836	.2945
10	.1001	.2044			.1222	.2011
11					.3640	.0148
12			.0764	.2871	.0952	.2687
13					.1595	.1440
14					-.0037	.9736
15	-.1262	.1531			-.3674	.0033
16			.0035	.9710	.0506	.6668
17					-.1179	.2677
18			-.1474	.1287	-.1999	.0731
19			.0671	.4457	.0023	.9826
20					.1064	.3081
21			.0495	.6257	.0442	.7204
22					-.0992	.2396
23					.1590	.1356
24			.1257	.1867	.1907	.0988
25					-.0092	.9386
26			.3550	.0001	.3751	.0007
27					-.0924	.3836
28			-.0715	.4452	-.1306	.2735
29	.1689	.0286	.0079	.9232	.0989	.3337
30					-.1372	.2514
31	.0990	.3287	.0320	.7276	.0733	.5525
32	.1695	.0928			.0180	.8822
33					-.1500	.2114
34	.2680	.0005	.1859	.0182	.1227	.1859
35			.1470	.1268	.1773	.1566
36					-.1039	.2627
37	.1623	.0652	.1531	.0898	.0495	.6451
38	-.1239	.1680			-.0617	.5793
39					.0748	.5777
40			-.0599	.5816	-.1025	.4561
41					.2064	.0738
42					-.1035	.2646
43					-.1032	.2877
44	-.1575	.0390			-.0034	.9721

TABLE 5 (con't).

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
45	-.1457	.0834			-.0429	.6720
45	-.1457	.0834			-.0429	.6720
46					-.0294	.8258
47					.2279	.0734
48					.0961	.4016
49					.1611	.0572
50					-.2048	.0583
51					-.0492	.6985
52			-.0750	.3846	-.0205	.8386
53					-.1565	.1939
54					.0232	.7899
55					-.0290	.7554
56					.1055	.3399
57					.0382	.7112
58	-.0538	.4633			.0062	.9465
59					.0849	.5913
-2 log likelihood						
Intercept	702.3		702.3		702.3	
Int + covariates	626.8		614.6		541.8	
χ^2 Covariates	75.5		87.7		160.5	
Covariates	12		19		59	
$P > \chi^2$	.0001		.0001		.0001	
Observations	520		520		520	
Concordant %	72.4		73.1		80.4	
Discordant %	27.3		26.7		19.4	

* Numbers in Variable column correspond to the Attribute numbers in Tables 3 and 4.

TABLE 6. Parameter estimates of models predicting likelihood of lowfat milk use (statistically imputed evaluation ratings)*

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
Intercept	.4975	.0237	.3334	.1181	.4467	.2518
1					-.1787	.0858
2			.0549	.5797	.0291	.8000
3					.0475	.6299
4					.0805	.4491
5					.1732	.0651
6			.0655	.4170	.1154	.2354
7					-.0201	.8413
8			.1464	.1477	.2320	.0568
9	.1392	.0429	.0625	.3756	.0791	.3571
10	-.0211	.8260			.0693	.5515
11					.0677	.5885
12			-.0841	.2634	-.0837	.3409
13					.2070	.0615
14					-.0022	.9854
15	.1576	.0563			-.0326	.7832
16			-.0930	.3440	-.1412	.2360
17					.0987	.3145
18			.0313	.7356	.0817	.4553
19			-.1146	.2067	-.1298	.2140
20					-.0489	.6498
21			-.0233	.8238	.0445	.7154
22					-.2096	.0396
23					.0783	.4759
24			.1400	.1528	.2174	.0636
25					-.0263	.8165
26			.0990	.2497	.1302	.2004
27					-.0554	.6034
28			.2490	.0061	.1640	.1349
29	.0481	.5470	-.0375	.6647	-.0165	.8720
30					-.1586	.1473
31	.0210	.8298	-.0301	.7544	.0414	.7199
32	-.1101	.2041			-.0685.	.5044
33					-.1213	.3121
34	.0918	.3190	.0296	.7538	.0977	.3931
35			.0423	.6625	.0997	.4280
36					-.0095	.9161
37	.2653	.0102	.1852	.0951	.2447	.0772
38	.0903	.2752			.0316	.7543
39					.1345	.2922
40			-.0268	.8065	-.1716	.2290
41					.1136	.3871
42					-.0003	.9980
43					-.0830	.4707
44	.0054	.9508			.1342	.1917
45	.1624	.1161			.2206	.0724

TABLE 6 (con't).

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
46					.2259	.0321
47					-.0640	.5814
48					.0565	.5665
49					.2332	.0087
50					-.1532	.1258
51					-.0192	.8777
52			.0499	.5240	.0441	.6210
53					-.1793	.1477
54					.0213	.8195
55					-.1991	.0295
56					-.0397	.6856
57					.0795	.4502
58	-.1893	.0110			-.2034	.0282
59					.0343	.8515
-2 log likelihood						
Intercept	633.9		633.9		633.9	
Int + covariates	599.4		590.2		529.2	
χ^2 Covariates	34.5		43.6		104.6	
Covariates	12		19		59	
$P > \chi^2$	.0006		.0011		.0002	
Observations	493		493		493	
Concordant %	64.5		67.0		76.5	
Discordant %	35.0		32.7		23.3	

* Numbers in Variable column correspond to the Attribute numbers in Tables 3 and 4.

TABLE 7. Parameter estimates of models predicting likelihood of skim milk use (statistically imputed evaluation ratings)*

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
Intercept	-1.5200	.0001	-1.2773	.0001	-1.4634	.0001
1					.0968	.4115
2			-.0232	.8350	-.0966	.4599
3					-.0545	.6381
4					-.0106	.9273
5					.2548	.0116
6			-.0492	.6075	-.0228	.8449
7					-.0495	.6842
8			-.1097	.3480	-.0699	.6097
9	-.1813	.0218	-.2333	.0063	-.2133	.0293
10	-.0054	.9592			.0551	.6910
11					.3074	.0479
12			.2037	.0133	.2844	.0056
13					.1051	.3852
14					-.0231	.8607
15	.2572	.0033			.1860	.1281
16			-.1160	.2862	-.0832	.5237
17					-.1360	.2188
18			.0619	.5643	.0376	.7578
19			-.0330	.7497	-.0530	.6580
20					.0989	.4364
21			.0332	.7642	-.0699	.5909
22					.2480	.0435
23					-.0677	.6183
24			.1105	.3059	.1099	.3992
25					.0034	.9784
26			.4375	.0001	.4629	.0001
27					-.1108	.3591
28			.0954	.3670	.0890	.4877
29	.0451	.6068	-.1101	.2678	-.1227	.3014
30					-.1704	.1908
31	-.0188	.8685	-.0917	.4207	-.0622	.6453
32	-.1018	.2618			-.1174	.2954
33					-.2523	.0500
34	.1849	.1089	.1525	.2174	.1295	.3892
35			.0443	.6855	-.0162	.9057
36					-.0382	.7002
37	.2042	.0883	.1517	.2385	.1077	.4919
38	.1146	.2168			.0893	.4218
39					.1605	.2331
40			.1506	.2040	.1186	.3905
41					-.0281	.8326
42					-.3168	.0087
43					.0519	.6895
44	.1069	.2537			.1151	.3249
45	.1088	.2484			.0978	.4161

TABLE 7 (con't).

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
46					.0555	.6097
47					-.0571	.6519
48					-.0197	.8540
49					-.0789	.4043
50					-.0717	.5138
51					.1077	.4305
52			.0405	.6457	-.0298	.7721
53					.0673	.6119
54					-.0318	.7682
55					-.1734	.0995
56					-.0560	.6060
57					.0004	.9971
58	.0805	.3231			.0492	.6277
59					.2364	.2383
-2 log likelihood						
Intercept	570.8		570.8		570.8	
Int + covariates	525.9		500.8		448.1	
χ^2 Covariates	44.9		70.0		122.7	
Covariates	12		19		59	
$P > \chi^2$	.0001		.0001		.0001	
Observations	511		511		511	
Concordant %	69.1		73.7		80.9	
Discordant %	30.5		25.9		18.9	

* Numbers in Variable column correspond to the Attribute numbers in Tables 3 and 4.

TABLE 8. Parameter estimates of models predicting likelihood of whole milk use (self-stated evaluation ratings)

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
Intercept	-.5144	.0968	-.6633	.1062	-.9195	.2799
P(WHOLE)	.5603	.0001	.4146	.0001	.2373	.0404
-2 log likelihood						
Intercept	702.3		702.3		702.3	
Int + covariates	678.6		659.2		698.1	
χ^2 Covariates	23.7		43.1		4.2	
Covariates	1		1		1	
$P > \chi^2$	.0001		.0001		.0001	
Observations	520		520		520	
Concordant %	62.9		66.5		54.5	
Discordant %	36.5		33.2		44.3	

TABLE 9. Parameter estimates of models predicting likelihood of lowfat milk use (self-stated evaluation ratings)

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
Intercept	.4869	.1141	.4291	.1048	1.5130	.3082
P(LOWFAT)	.2983	.0128	.3409	.0001	-.3730	.0028
-2 log likelihood						
Intercept	633.9		633.9		633.9	
Int + covariates	627.6		606.1		624.8	
χ^2 Covariates	6.3		27.8		9.1	
Covariates	1		1		1	
$P > \chi^2$	.0122		.0001		.0026	
Observations	493		493		493	
Concordant %	57.2		62.9		57.4	
Discordant %	41.8		36.6		41.8	

TABLE 10. Parameter estimates of models predicting likelihood of skim milk use (self-stated evaluation ratings)

	Attributes					
	12		19		59	
Variable	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$	Parameter estimate	$P > \chi^2$
Intercept	-1.5738	.1471	-1.2388	.1121	-.3928	.3223
P(SKIM)	.7044	.0001	.3076	.0001	-.3006	.0201
-2 log likelihood						
Intercept	570.8		570.8		570.8	
Int + covariates	540.3		550.3		565.3	
χ^2 Covariates	30.5		20.5		5.5	
Covariates	1		1		1	
$P > \chi^2$	.0001		.0001		.0192	
Observations	511		511		511	
Concordant %	65.8		63.3		56.6	
Discordant %	33.7		36.1		42.2	