

# Consumer Nutrition Knowledge and Self Reported Food Shopping Behavior

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**Abstract:** In 1975 a national sample of consumers was questioned about their knowledge of nutrition, beliefs about food, and their shopping behavior. Findings indicate a particular need for education related to facts about iron, thiamin, riboflavin, and vitamins A and D. Consumers with low knowledge tended to have less education, lower income, and less prestigious occupations. Of these variables, educational achievement lev-

el had the strongest association to low nutrition knowledge. Using an index based on the three socioeconomic variables, low knowledge was more often present among the male and older shoppers, with age having the stronger association. Association of the three indices of nutrition knowledge, food beliefs, and reported shopping behavior were found to be positive and linear. (Am. J. Public Health 67:846-850, 1977)

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## Introduction

Nutrition education should equip food shoppers with the skills needed to cope with the changing food market in a way that insures good nutrition within their financial means. Food is becoming more and more costly. In addition, new foods and food analogs are being created, and more foods are being enriched, fortified, fabricated, or processed in a greater variety of ways. Do consumers have sufficient knowledge to choose among new foods, to use the nutrient information on the label, and to substitute one food for another? Are they motivated in their food preferences by beliefs that are well informed? These questions and the implication of their answers for nutrition education programs prompted the present study.

In the past, research on nationally representative samples of the population has been directed to assessing food consumption, food purchases, and the biological aspects of nutrition.<sup>1-5, 7</sup> Some national studies have collected data on nutrition knowledge, attitudes, and food shopping.<sup>6, 8, 9</sup> However, associations between knowledge, attitudes, and practices and how such associations vary among population groups have not been examined. The present study explores these associations.

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## Methodology

A survey questionnaire was administered in the summer of 1975 to 1,664 U.S. adult respondents who did at least one-half of the food shopping for their household. A national area probability sampling technique was employed to select the households. For purposes of analyses, males were oversampled and a larger sample was taken of younger people. All data were weighted to match the population distribution of the universe which is U.S. adult food shoppers of the coterminous United States. Of the sample drawn, 71 per cent of the households sampled (N = 2,333) were represented by a usable completed questionnaire response. The non-responses from the remaining households were due to no one being at home, refusals, and other incompletes.

The details of this sampling design, the statistical significance of survey results, and other methodological details are presented elsewhere.<sup>10</sup> Sampling tolerances for the survey are within reasonable limits for the analysis. For example, an observed percentage of 6 per cent lies within 3 per cent of the true percentage for all adult shoppers in the United States at the 95 per cent level of confidence for the sample of 1,664 interviews.<sup>10</sup> The survey here reported is the second phase of a longitudinal study. Formulation of the nutrition knowledge questions underwent an extensive item analysis from data collected in 1973-74 which included Messick's adaptation of the set and content technique.<sup>11</sup> A split-half reliability test and a validity check were also conducted.<sup>12</sup> As a result, the nutrition knowledge test was refined, tested, and found to be reliable and valid.<sup>12</sup>

For knowledge about food and nutrition, shoppers were queried in the following five areas:

- how easy or difficult it is to get nutrients from foods eaten;
- whether or not the nutrients are stored in the body or have to be eaten each day;
- what foods contain certain nutrients;
- what benefits certain foods have for the body; and
- what foods can be substituted for one another.

In the first two areas of knowledge, shoppers were asked about each of three macronutrients—protein, fat, carbohydrate—and five micronutrients—thiamin (vitamin B<sub>1</sub>), riboflavin (vitamin B<sub>2</sub>), vitamin D, iron, and calcium. Vitamin A and vitamin C were omitted from the list of easy and hard-to-get nutrients since responses were not clear-cut during the testing stage of questionnaire development. They were, however, included in questions for the other areas. Respondents were asked if they knew which nutrients frequently occur in many foods or which commonly used foods contain a lot of them.

In the last three areas of knowledge, respondents were asked about four different foods selected as indicators: regular (whole) milk for the milk group; beef for the meat group; tomatoes for the fruit-vegetable group; and enriched bread for the bread-cereal group.

## Results

### Availability of Nutrients from Foods

Most food shoppers either gave the wrong answer or were not sure about the ease or difficulty of obtaining micronutrients in food. For example, only three out of ten shoppers knew that thiamin and riboflavin are easy-to-get and that iron is considered hard-to-get; only one out of seven knew that vitamin D and calcium are considered hard-to-get.

However, the majority of shoppers correctly rated the macronutrients fat, carbohydrate, and protein (respectively 93 per cent, 87 per cent, and 77 per cent) as easy-to-get nutrients either because they are found in many foods or because commonly used foods have a lot of the nutrient.

### Nutrient Storage in the Body

Many shoppers were unable to answer correctly companion questions on whether or not each of the ten nutrients\* is stored in the body. Incorrect or unsure answers varied from about 40 per cent for calcium to as high as 86 per cent for carbohydrate. Of the ten nutrients,\* correct answers were given by 50 per cent or more of the respondents for only three: fat (88 per cent), calcium (59 per cent), and vitamin C (55 per cent).

### Good Food Sources of Nutrients

In this study, *regular whole milk* is not identified as fortified with vitamin A (one serving of this would supply only about six per cent of the U.S. RDA† for vitamin A). Generally, good food sources of vitamin A are considered to be leafy

vegetables and orange vegetables or fruits rather than milk. Regular whole milk is considered as a good source of vitamin D (which has been added), calcium, and riboflavin.

Some consumers had misconceptions about nutrients supplied by milk: two out of five thought it a good source of vitamin C; one-third or less incorrectly thought it a good source of iron, thiamin, vitamin A, and carbohydrates; only 28 per cent knew that it was a good source of riboflavin. Other nutritive aspects of regular milk were better known. Nearly three-fourths of the food shoppers knew milk to be a good source of protein, fat, and vitamin D. Most shoppers (90 per cent) correctly identified calcium as a nutrient found in milk.

In this study *bread* is considered a good source of carbohydrate, thiamin, riboflavin, and iron. Thiamin, riboflavin, and iron are part of the enrichment program.

Over one-half the shoppers identified bread as a good source for carbohydrates, thiamin, and riboflavin but three out of five shoppers did not know that bread is also a good source of iron. From one-half to two-thirds of the shoppers were "not sure" or incorrectly identified bread as a good source of vitamins A, C, and D, and calcium. About 50 per cent of the shoppers selected fat and protein as nutrient attributes for bread.

Most consumers know that *beef* is a good source of protein, fat, and iron. Fifty per cent also knew beef is not a source of vitamin C. However, a large majority failed to identify correctly or did not know that beef is not a good source for thiamin (79 per cent), riboflavin (78 per cent), vitamin A (71 per cent), carbohydrates (63 per cent), vitamin D (63 per cent), and calcium (60 per cent).

In this study, *tomatoes* are considered a good source of vitamins A and C but not considered important sources of any other nutrient. More than two-thirds of the respondents realized that tomatoes are not a good source of fat and one-half realized they were not a good source of carbohydrate and protein. Nearly three-fourths of the shopper population selected the correct answer for tomatoes as a good source of vitamin C but over one-half did not realize tomatoes were a good source of vitamin A. About one-half of the shoppers did not know or were unsure of tomatoes' contribution to thiamin and riboflavin supplies and one-third were unsure about vitamin D, iron, and calcium.

### Benefits of Foods

Respondent knowledge about the benefits of the four indicator foods was probed for seven specific functions: body tissues, strong teeth and bones, blood cells, healthy skin, the nervous system, the eyes, and fighting infection. Knowledge was low in all areas.

A large number of shoppers wrongly selected milk as important for healthy skin (75 per cent) and building blood cells (50 per cent), enriched bread for strong teeth and bones (52 per cent), and beef as important for strong teeth and bones (59 per cent). A majority of shoppers were unable to correctly identify any of the seven functions as either important or not important in relation to tomatoes.

### Foods that Can Be Substituted for One Another

The area of substitute foods, i.e. foods from the same

\*including vitamins A and C

†U.S. Recommended Daily Allowances

food groups, was tested by using a list of 12 foods which had the same benefit as the indicator foods.

Knowledge in this area was generally more encouraging than in other areas.

The majority of shoppers correctly identified substitute foods for bread. Substitutes for tomatoes were less well known. As an illustration of how this question was phrased for the indicator foods, and since so little was known about tomatoes in all areas, these results are presented in detail in Table 1. About 80 per cent of the shoppers did not know that tomatoes have some of the same benefits as potatoes.

About 78 per cent of the shoppers did not know milk has some of the same benefits as pork and beans, 60 per cent did not know that it has some of the same benefits as chicken, and 56 per cent did not know that it has some of the same benefits as fish. Over one-half (56 per cent) did not know beef has some of the same benefits as pork and beans.

Evidently, when asked about substitute foods, shoppers do not identify milk as a source of protein like other meats, nor do they seem to regard pork and beans as a substitute for foods with protein.

To summarize, the majority of shoppers lacked knowledge about accessibility, food sources, and storage of iron, thiamin, riboflavin, vitamins A and D, calcium, and carbohydrates. For fat, vitamin C, and protein, this information was better known.

With regard to the bodily benefits of foods, the majority of shoppers did not know the relationship of these food types to strengthening teeth and bones, nor what benefits are provided by tomatoes from the vegetable-fruit group. While food substitutes are relatively better known, some confusion and misconceptions existed about these facts in the case of milk and protein.

#### Differences in Nutrition Knowledge among Population Groups

The responses were analyzed to identify groups where the greatest lack of nutrition knowledge exists. A nutrition knowledge index was constructed from the knowledge vari-

ables that have been described. The knowledge index divided the population of shoppers into three groups of "low", "medium", and "high" nutrition knowledge according to the frequency distribution of their scores.

The low nutrition knowledge group was examined by background variables of sex, age, education, occupation, and income. Education had the strongest association with low nutrition knowledge. About 75 per cent of those with less than high school education and about one-third of those with a high school education were in the low nutrition knowledge group while less than one-fifth of those who had been to college were in the low nutrition knowledge group. Looking at the combined effects of education, income, and occupation through a socioeconomic index, over one-half of those from the low SES group were in the low nutrition knowledge group and less than one-fifth of them were in the high nutrition knowledge group.

Those with low nutrition knowledge tended to be older rather than younger and to be men rather than women. One-half of the population were age 50 or older and two-fifths of the males were in the low knowledge group. Of these two variables, age appeared to have the stronger association.

The background variables of men were examined to measure combined effects. Seventy per cent of men with low knowledge were age 50 and older and about sixty per cent of the men with low knowledge were from the lower socioeconomic status group. There was a very slight tendency for men with low nutrition knowledge to live in the Northeast and South rather than in the North Central and West.

Combined effects for age groups showed that 65 per cent of those older people with low knowledge came from the lower socioeconomic group. There was a slight tendency for more older people with low nutrition knowledge to come from the South.

#### Associations between Nutrition Knowledge, Beliefs, and Shopping Behavior

Table 2 lists responses to questions about food beliefs

**TABLE 1—Knowledge of the Fruit/Vegetable Food Group: Tomatoes\* (All food shoppers—1,664)**

Tomatoes are a Good Source of . . .		Tomatoes are Important for . . .		Foods Having a Lot of the Same Benefits as Tomatoes	
	%		%		%
Vitamin C‡	70	Building body tissue	38	Oranges‡	69
Vitamin A‡	42			Carrots‡	62
Vitamin D	31	Builds blood cells	38	Broccoli‡	54
Iron	26			White potatoes‡	22
Thiamin (B <sub>1</sub> )	22	For healthy skin‡	37	Eggs	18
Carbohydrates	20	Fights infections‡	36	Cottage cheese	18
Riboflavin (B <sub>2</sub> )	20	For the eyes‡	27	Pork & beans	16
Protein	19	For nervous system	24	Peanut butter	16
Calcium	13	Strong teeth and bones	23	Fish	12
Fat	4			Chicken	12
				Rice	10
				Macaroni	8

\*Cited in Consumer Nutrition Knowledge Report II, 1975-76.<sup>10</sup> Percentages are derived from weighted frequencies. (Weighted base—3,454).

‡Indicates the correct responses sought.

**TABLE 2—Shoppers' Responses to Food Beliefs\***

Responses	All Shoppers (1,664)*				
	Agree	Dis-agree	Depends	Not Sure	No Answer
Just eating the things you like will provide enough nourishment	13	80‡	4	1	—
Any food sold in a supermarket is good for a person	9	81‡	7	2	1
Snacks are never as good for you as regular meals	40	38‡	19	2	—
Weighing the right amount means being properly nourished	24	67‡	5	4	—
Canned or frozen food is just as nutritious as food made from scratch	18‡	70	7	4	1
				Qualified Answer	Don't Know/No Answer
	%	%	%	%	%
Added vitamins do provide the same benefit as natural vitamins.		30‡	62	2	7

‡“Depends” answer was regarded as correct because of intervening good practices.  
\*Percentages are derived from weighted frequencies (weighted base—3,454).

and shows the percentage of the shoppers holding such beliefs. Cumulative food belief scores were calculated for each shopper in the study. The cumulative scores were then dichotomized by frequency distributions. The two categories are called “well informed” and “not well informed.” Nutrition knowledge appears to be rather strongly associated with food beliefs. Table 3 shows that about two out of three of the low knowledge group are “not well informed” while only about one-third of the high knowledge group are “not well informed.” The association going across nutrition knowledge categories is positive and linear.

Table 4 describes the characteristics of the “careful shopper”, showing the percentages of shoppers who said they practiced each of the activities listed.

Essentially the same scoring techniques that were used for the food beliefs index were used for categorizing the “careful shopper.” Scores were assigned to each shopper in accordance with seven shopping practices. Shoppers were stratified into three groups by frequency distribution.

When the two variables of “food beliefs” and “careful

food shopper” were cross-tabulated, a strongly positive linear association was once more demonstrated (Table 5).

Table 6 shows the comparison between knowledge and careful shopping. The association is again positive and linear but knowledge has a weaker association with careful shopping than it does with food beliefs.

Relationships were explored among the three variables—nutrition knowledge, food beliefs, and careful shopping—using each one as control in all possible combinations. The main finding was that the positive association between nutrition

**TABLE 3—Levels of Food Beliefs by Levels of Nutrition Knowledge**

Food Beliefs	Nutrition Knowledge		
	Low	Medium	High
	%	%	%
“Not well informed”	65	52	33
“Well informed”	35	48	67
Total %	100	100	100
(All food shoppers—1,664)*			

\*Percentages are derived from weighted frequencies (weighted base—3,454).

**TABLE 4—Reported Food Shopping Behavior**

	All Food Shoppers (1,664)				
	Responses*				Total
	Yes	No	Not Sure	No Answer	
	%	%	%	%	%
Made a list at home	62	37	—	—	99
Read ads at home to see what the specials were	68	32	—	—	100
Checked the list of ingredients on the cans or packages before buying last time when shopping	46	52	1	1	100
Checked the list of ingredients on cans or packages in past	78	17	1	3	99
Looked for the unit price for any of the food that was bought	41	20	1	38	100
Looked for dates the last time did main food shopping	75	22	1	1	99
Made use of nutrition labels in choosing some of the foods or beverages bought	33	63	3	1	100

\*Total percentages not equal to 100 were due to rounding of decimals. Percentages are derived from weighted frequencies (weighted base—3,454).

**TABLE 5—Levels of Food Beliefs by Levels of Careful Food Shopper**

Food Beliefs	Careful Food Shopper		
	Low	Medium	High
	%	%	%
"Not well informed"	62	52	39
"Well informed"	38	48	61
Total % (All food shoppers—1,664)*	100	100	100

\*Percentages are derived from weighted frequencies (weighted base—3,454).

knowledge and careful shopping endured even when the food beliefs index was introduced as an intervening variable.

*Discussion*

People cannot be expected to detect deficiencies in their diets, to understand nutritional labeling of foods, and to learn to shop and eat better if: 1) they do not know what nutrients they require every day, 2) they do not know the important food sources for nutrients, 3) they do not know how types of foods with different nutrients benefit the body, and 4) if they are confused about what foods have comparable benefits. If nutrition is to play a stronger role in preventive health care, more effective educational programs are required in these areas of nutrition knowledge.

While persons with varying backgrounds were in need of nutrition education, the high risk groups which tend to have the poorest nutritional knowledge were the lower socioeconomic and older age groups. With restricted food dollars and low knowledge these groups are in particular need of an educational program on food and nutrition. The long term results of an effective educational program which improves eating behavior could save tax dollars as well as out-of-pocket dollars for medical services related to disorders that arise from improper nutrition.

The findings of this survey suggest that consumer nutrition education must be stepped up if consumers are to benefit from the nutritional labeling of foods. Survey findings point up a number of specific areas toward which nutrition education efforts might be directed.

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**TABLE 6—Levels of Careful Shopping by Levels of Nutrition Knowledge\***

Careful Shopper	Nutrition Knowledge		
	Low	Medium	High
	%	%	%
Low	32	20	12
Medium	48	49	53
High	20	30	35
Total % (All food shoppers—1,664)**	100	99	100

\*Total percentages not equal to 100 were due to rounding the decimals.  
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