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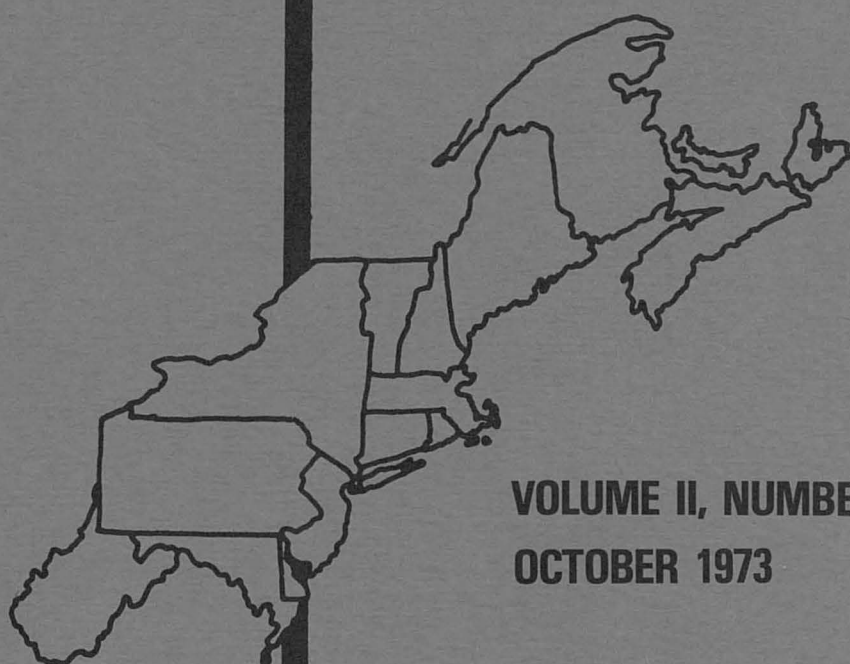
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Testing for Differences in Consumer Attitudes Toward Milk
in New York State

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Market researchers are frequently interested in determining the differences in attitudes of various groups of consumers. For example, they may want to know if significant shifts in attitudes have occurred over time or if attitudes vary by sex, income, race or market.^{1/}

In this paper a specific procedure will be outlined which can be used to test for significant differences in attitudes of groups of consumers. The procedure will be discussed in the context of comparing attitudes toward milk in selected New York Markets.

The Study

Attitude comparisons were desired for the major markets of New York State. Table 1 gives the markets selected. Eighty-two percent of the population of New York State live in the sampled markets.

The data used in this analysis were collected as part of a broader study of adult (eighteen and over) beverage consumption and attitudes in November of 1972.

Professional enumerators collected the data through personal interviews in the respondents' homes. The sample of adults in each market was selected by a directed route sampling procedure with quota constraints on sex and income.

^{1/} The New York State Dairy Advisory Board, a producer board which manages the expenditure of market order funds for advertising and promotion, is faced with many decisions requiring an understanding of New York State consumers. One area of interest is whether customers in the various markets of New York State have similar attitudes towards milk.

Sixteen different semantic differential scales^{2/} were used to measure the respondents' attitudes toward milk. The scales (see Table 2) used in this study were developed from an extensive literature review and pretest.^{3/} These are quite similar to the semantic differential scales used in a study of attitudes toward milk in eight western cities reported by Thomas and Waananen.^{4/}

Table 1
Selected New York State Markets, 1970 Population and Sample Size

Markets	1970 Population	Sample Size
New York City SMSA ^{a/}		
White	8,099,284	246
Black	1,885,303	198
Spanish	1,390,087	221
Other	197, 145	0
Buffalo SMSA	1,349,210	204
Rochester SMSA	882,667	221
Albany SMSA	721,910	189
Syracuse SMSA	636,507	200

a/ SMSA - Standard Metropolitan Statistical Area

Source: U.S. Bureau of the Census

^{2/} This scaling procedure was developed and reported by Charles E. Osgood et. al., in The Measurement of Meaning, University of Illinois Free Press, Urbana, Illinois, 1957. It is a widely used scaling technique for measuring consumer attitudes.

^{3/} For a fuller discussion of the literature and pretest see Joseph J. Mueller, "Development of a Questionnaire and Methods of Analysis for the Measurement of Consumer Attitudes and Belief Toward Other Beverages", unpublished M.S. thesis, Cornell University, January 1973.

^{4/} Monica Thomas and Martin Waananen, "Consumption, Use and Attitudes Toward Selected Fluid Milk Products in Eight Western Cities", Washington Agricultural Experiment Station Bulletin 763, October 1972, p. 4.

Problems of Summarization and Analysis

Frequently in summarizing and analyzing data from a semantic differential scale numerical values are assigned to each point on the scale. Then an arithmetic mean is calculated for the scale and the means are used for descriptive and comparison purposes.^{5/} Usefulness of the mean for these purposes is dependent upon some knowledge of the underlying distribution from which it is calculated.

Table 2
Semantic Differential Scales Used in Milk Attitude Survey
November 1972

High cost item ^{a/}	Low cost item
Very high in fats	Very low in fats
Good for weightwatchers	Bad for weightwatchers
Necessary for good health in adults	Not necessary for good health in adults
I like the taste	I dislike the taste
Very high in protein	Very low in protein
Good for people concerned with heart disease	Bad for people concerned with heart disease
Very high in calcium	Very low in calcium
Excellent value for the money	Poor value for the money
Man normally consumes	Man does not normally consume
Woman normally consumes	Woman does not normally consume
Very high in cholesterol	Very low in cholesterol
Excellent energy source	Poor energy source
Very high in calories	Very low in calories
Would always order in a restaurant	Would never order in a restaurant
Very high in vitamins	Very low in vitamins

^{a/} The respondents indicated their attitude on each scale by checking one of seven boxes ranged between, and including, the extreme positions.

The semantic differential data have a discrete distribution with only seven possible data points. The mean can lie between 1 and 7 and the standard deviation can range between 0 and 3. One of the difficulties of using the mean as a summary statistic is that it gives little indication

^{5/} Paper by Thomas and Waananen is an example of this. See especially pp. 15, 18-25.

of the distribution of attitudes. For example, a mean value of 4 could be obtained from many different distributions of the data (e.g., all of the observations at the mid-point or half of the observations on the other).

Using the mean value of a scale to compare the attitudes of two different groups of consumers has a related difficulty. The common statistical tests used to determine whether two means are significantly different are based on the assumption that the data are normally distributed.

Chi-Square Test

In this analysis, a statistical procedure, the chi-square test, is used to make intermarket comparisons of the distribution of responses on the attitude scales. Since this procedure examines the entire distribution of responses, a more meaningful and accurate comparison is possible than can be made through the use of means.

The chi-square test can be used to examine a two-way classification of discrete data for statistical independence.^{6/} Each of the 16 attitude scales listed in Table 2 can be examined separately, and comparisons made across the seven markets. Thus each dimension of consumer attitude toward milk can be analyzed.

To demonstrate the use of the chi-square procedure, one attitude scale, the cost of milk, is analyzed on the following page. First, a two-way contingency table is constructed for this scale (see Table 3). The absolute frequencies of various rating positions are recorded by rows and the market frequencies by columns. From this data table a corresponding table of chi-square values is calculated.^{7/} (See Table 4).

^{6/} Other less approximate procedures exist for testing contingency tables. However, the chi-square test was chosen for the ease with which dependent relationships can be identified through disaggregation of the calculated chi-square value.

^{7/} The calculating procedures can be found in R. G. D. Steel and J. H. Torrie, Principles and Procedures of Statistics, McGraw-Hill, New York, 1960, pp. 366-369.

Table 3
Attitude Rating of Milk on Cost Scale
by Adults in Seven New York Markets, Fall 1972
Absolute Frequency

Attitude Rating ^{a/}	SMSA Market							All Mar- kets
	New York City			Buff- alo	Roch- ester	Albany	Syra- cuse	
	White	Black	Spanish					
	- number -							
High Cost Item -	68	82	111	38	65	39	46	449
	30	36	39	38	34	46	34	257
	50	24	15	36	36	40	38	239
	49	22	20	40	48	32	43	254
	15	12	6	21	16	13	15	98
Low Cost Item -	7	9	4	15	13	7	9	64
	<u>27</u>	<u>11</u>	<u>25</u>	<u>16</u>	<u>9</u>	<u>10</u>	<u>15</u>	<u>113</u>
Total	246	196	220	204	221	187	200	1474

a/ The rows in the table are arranged from top to bottom in order of increasing agreement with the bottom statement and decreasing agreement with the top statement.

Table 4
Table of Chi-Square Values for Attitude Rating of Milk on Cost Scale
by Adults in Seven New York Markets, Fall 1972

Attitude Rating ^{b/}	SMSA Market							All Mar- kets
	New York City			Buff- alo	Roch- ester	Albany	Syra- cuse	
	White	Black	Spanish					
- Chi-Square Values -								
High Cost Item -	0.6	8.3	28.9	9.4	0.1	5.7	3.7	56.7
	3.9	0.1	0.0	0.2	0.5	5.5	0.0	10.2
	2.6	1.9	12.0	0.3	0.0	3.1	1.0	20.9
	1.0	4.1	8.5	0.7	2.6	0.0	2.1	19.0
	0.1	0.1	5.1	4.1	0.1	0.0	0.2	9.7
Low Cost Item -	1.3	0.0	3.2	4.3	1.2	0.1	0.0	10.1
	<u>3.5</u>	<u>1.1</u>	<u>3.9</u>	<u>0.0</u>	<u>3.7</u>	<u>1.3</u>	<u>0.0</u>	<u>13.5</u>
Total	13.0	15.6	61.6	19.0	8.2	15.7	7.0	140.1

a/ Calculated using data in Table 3.

b/ The rows in the table are arranged from top to bottom in order of increasing agreement with the bottom statement and decreasing agreement with the top statement.

The null hypothesis of the chi-square test is that the distribution of responses on the attitude scale is independent of the markets in which they occur. If the null hypothesis is correct, consumers in the various markets have the same attitudes about the cost of milk. The alternative hypothesis is that the distribution of responses is related to the markets in which they occur. If the alternative hypothesis is correct, consumers in some of the markets have different attitudes than consumers in some of the other markets. In order to reject the null hypothesis and accept the alternative hypothesis, the calculated chi-square value for the entire table must be greater than the tabular value of chi-square for the appropriate degrees of freedom at the desired level of confidence. With 36 degrees of freedom at the 99 percent level of confidence, the tabular chi-square value is 58.6. From Table 4, the calculated value is 140.1. Thus, the null hypothesis is rejected, and it can be inferred that there are significant differences in attitude toward the cost of milk in the various New York State markets.

Once it has been concluded that a significant difference exists in the attitudes toward the cost of milk among the various markets, a further step can be taken to analyze the source of the differences. First, the market chi-square values can be compared to determine which markets are different from that expected. Using a 95 percent confidence level, the critical value of the chi-square at 6 degrees of freedom is 12.6. A market (column) which has a calculated chi-square greater than the critical value has a significantly different distribution of attitudes toward the cost of milk than the average distribution for all markets.

The data show that five of the markets are significantly different from the overall sample of markets. They are New York City Spanish-speaking market, Buffalo, Albany, New York City Black, and New York City White markets.

The percentage distribution of attitudes (Table 5) and individual chi-square elements (Table 4) can be compared to determine the differences in distribution that occur. For example, the calculated chi-square of 28.9 in the first row (milk is a high cost item) and third column (New York City Spanish-speaking) indicates that the New York City Spanish-speaking market checked this box on this scale a significantly (95 percent confidence level) different number of times than we would expect based on the average.

The higher numbers throughout that column indicate a different distribution than the average for all markets. The higher the number the greater the divergence between the actual and the expected number of individuals that checked that box on the scale.

Table 5: Attitude Rating of Milk on Cost Scale by Adults in Seven New York Markets, Fall 1972, Relative Frequency.

Attitude Rating ^{a/}	SMSA Markets							Aver- age
	New York City			Buff- alo	Roch- ester	Albany	Syra- cuse	
	White	Black	Spanish					
- percent -								
High cost item	27.6	41.9	50.5	18.7	29.4	20.9	23.0	30.5
	12.2	18.4	17.7	18.6	15.4	24.6	17.0	17.4
	20.3	12.2	6.8	17.6	16.3	21.4	19.0	16.2
	19.9	11.2	9.1	19.6	21.7	17.1	21.5	17.2
	6.1	6.1	2.7	10.3	7.2	6.9	7.5	6.7
Low cost item	2.9	4.6	1.8	7.4	5.9	3.7	4.5	4.3
	11.0	5.6	11.4	7.8	4.1	5.4	7.5	7.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

^{a/} The rows in the table are arranged from top to bottom in order of increasing agreement with the bottom statement and decreasing agreement with the top statement.

The percentage frequency distribution table for the cost attitude scale provides an indication of the exact way in which the distributions vary among markets (Table 5). Those data show that the majority of consumers sampled felt milk was a high cost item. But the blacks and the Spanish-speaking samples in New York City felt milk was even higher in cost than did respondents in the other markets, and the New York City Spanish-speaking group viewed milk as being more expensive than did the blacks. While none of the markets viewed milk as a low cost item, respondents in Albany, Buffalo, and the New York City whites viewed milk as more moderate in cost than did the average of all respondents in all markets.

Table 6
Markets with Significantly Different Attitudes Toward Milk
Seven New York Markets, Fall 1972

Attitude Scales a/	SMSA Markets						
	New York City			Buff- alo	Roch- ester	Albany	Syra- cuse
	White	Black	Spanish				
Cost	x ^{b/}	x	x	x		x	
Fat			x				
Weight			x			x	
Health	x		x	x		x	
Taste							
Protein						x	
Heart	x	x	x	x			
Calcium		x	x	x			
Value		x	x		x		
Man			x				
Woman	x		x			x	
Cholesterol	x	x	x			x	
Energy		x	x			x	x
Calories			x			x	
Restaurant	x		x			x	
Vitamins		x	x			x	

a/ For a complete statement see Table 2

b/ The x indicates that the distribution of responses for this attitude scale (row) in this market (column) were significantly different from the distribution for all markets. The level of confidence used was .95.

Intermarket Comparisons - Attitude Scales

A summary of significant chi-square test results for all attitude scales is given in Table 6. Further investigation of the individual frequency distribution tables (Table 7 to 21) indicates that the New York City Spanish-speaking sample views milk more favorably than do any of the other groups. They view it as more nutritious and better for one's health and appearance. They also would be much more willing to order milk in a restaurant and felt it was an excellent value for the money. On the negative side, they viewed milk as being more costly.

The New York City Black respondents appear to have a somewhat more favorable attitude toward milk than the average but not quite as favorable as the New York City Spanish. Like the Spanish-speaking sample, they view it as a relatively high cost but nutritious beverage. They seem even less concerned than the Spanish about the cholesterol content or the effect on the heart.

The group that appears to have the most unfavorable set of attitudes toward milk is the New York City White sample: they would not order it in a restaurant, they consider it bad for the heart, not necessary for good health, and less of a woman's drink. They are also concerned about the cholesterol content.

The Buffalo respondents' attitudes were also different from the average, but not as markedly different as those in New York City. They view milk as less necessary for good health and bad for the heart. Fewer Buffalo respondents, however, viewed milk as being low in calcium.

Of the Upstate group, the Albany respondents showed the greatest difference from the average distributions. They viewed milk as being poorer for weightwatchers, not as necessary for good health, and somewhat higher in cholesterol. However, on the positive side, they viewed milk as higher in vitamins and in protein content.

To summarize, the only attitude scale on which there was no difference among the markets was the one for taste. Attitudes in Rochester and Syracuse markets were similar to each other and to the average, except for some deviation by Syracuse on the energy scale. In the other markets there were substantial differences in the attitude of consumers toward milk.

Conclusions

The chi-square test appears to be a useful test to identify differences in attitude among different groups. A comparison of the attitudes toward milk of seven New York markets indicated significant differences in all attitude scales except taste.

Table 7
Attitude Rating of Milk on Fat Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 8
Attitude Rating of Milk on Weightwatchers Scale
by Adults in Seven New York Markets, Fall 1972

Attitude Rating	SMSA Markets							
	New York City			Buff- alo	Roch- ester	Albany	Syra- cuse	Aver- age
	White	Black	Spanish					
Good for				-percent-				
Weight- watchers	7.0	10.9	26.8	7.9	6.4	4.2	7.0	10.2
	1.2	3.1	4.1	3.0	4.1	2.7	6.0	3.4
	5.3	6.2	6.8	8.3	4.6	6.3	5.5	6.1
	11.4	14.5	17.7	8.8	14.6	11.6	13.5	13.2
	10.2	11.9	4.6	10.3	10.0	12.2	8.5	9.6
Bad for	15.1	17.1	10.5	18.6	15.1	22.8	18.0	16.5
Weight- watchers	<u>49.8</u>	<u>36.3</u>	<u>29.5</u>	<u>43.1</u>	<u>45.2</u>	<u>40.2</u>	<u>41.5</u>	<u>41.0</u>
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 9
Attitude Rating of Milk on Health Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 10
Attitude Rating of Milk on Taste Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 11
Attitude Rating of Milk on Protein Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 12
Attitude Rating of Milk on Heart Disease Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 13
Attitude Rating of Milk on Calcium Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 14
Attitude Rating of Milk on Value Scale
by Adults in Seven New York Markets, Fall 1973

[illegible]

Table 15
Attitude Rating of Milk on Man Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 16
Attitude Rating of Milk on Woman Consumption Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 17

Attitude Rating of Milk on Cholesterol Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 18
Attitude Rating of Milk on Energy Scale
By Adults in Seven New York Markets, Fall 1972

[illegible]

Table 19
Attitude Rating of Milk on Calories Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 20
Attitude Rating of Milk on Restaurant Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]

Table 21
Attitude Rating of Milk on Vitamins Scale
by Adults in Seven New York Markets, Fall 1972

[illegible]