ATTITUDES ABOUT WATER POLLUTION AND FISH CONSUMPTION

by

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ATTITUDES ABOUT WATER POLLUTION AND FISH CONSUMPTION

Research is being conducted under a Sea Grant Project at Kent State University* to examine consumer attitudes and preferences for fish and fish products in the midwest, and to determine the effect of water pollution on such attitudes. A study was made, therefore, to measure the impact of this variable on the consumption of fish products. Some of the conclusions of this research are:

1. Those people who show concern over the damaging effects of water pollution are more inclined to reduce their consumption of fresh rather than frozen or canned fish products.

2. A profile may be drawn for those who show concern for water pollution and reduce their consumption of a fish product. The profile of these people for one fish type is not the same as that for another fish type. Three profiles can be drawn according to whether the fish is fresh, frozen, or canned. First, those who were concerned about water pollution and reduced their consumption of fresh fish were from both higher and lower social classes, seldom had more than a high school education, were usually less than 35 years old, and were Protestant. Secondly, those who were concerned about pollution and reduced frozen fish were from a higher social class, over 54 years old, and were Protestant. Finally, those who were concerned about water pollution and reduced canned fish consumption were of a lower social class, had no more than a high school education, had less than $10,000 annual income, were more than 54 years old, were Protestant, and were Black.

3. There is evidence that a "substitution effect" may be prevalent between fresh, frozen, and

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*NOAA 2-35364, Application of Computer Technology and Advanced Physical Distribution Techniques to Seafood Marketing.

> canned fish products. That is, when a person shows concern about water pollution he may reduce his consumption of one type of fish product. At the same time, he may increase his consumption of another type of fish product. This effect was shown to exist most predominantly between fresh and canned fish.

This report will articulate the findings of the project. The first section, Methodology, contains a presentation of the central hypothesis, the sample drawn, the questionnaire, and the method of analysis used. The next section, Discussion, is composed of analysis and conclusions of this research. The final section, Summary, reviews the work done. The Appendix contains a copy of the essential parts of the questionnaire.

METHODOLOGY

Hypothesis

Consumers have been exposed to the environmental problems of water pollution. People who live near Cleveland or Lake Erie have become aware of the problem close at hand. Headlines and reports such as the following have been popular in the news media:

> "Mercury Spills Imperil Erie Fisheries" [1]

and

> Just how bad water pollution can get was dramatically illustrated last summer when the oily, chocolate-brown Cuyahoga River in Cleveland burst into flames....The Cuyahoga is so laden with industrial wastes that not even the leeches and sludge worms that thrive in many badly polluted rivers are to be found in its lower reaches [2].

Some of these news releases have directly related water pollution to some harmful effects from eating fish products. Yet some of the news reports seem to play down the severity of the problem. For example:

> "Mercury-Tuna Problem Called Less Serious Than Feared; Swordfish Tainting is as Bad" [3].

It is difficult to predict how the consumer has interpreted all of these data. He may have decided that all of this news is just to sell newspapers and that it really is not harmful to him. He may have decided that these reports do not tell the whole story and that water pollution is doing great damage to his environment. He may believe that it is seriously affecting the food he eats.

Certainly the person who has developed an attitude of concern for the detrimental effects of water pollution should be recognized by those interested in the fishing industry. It should be clear that the person who indicates he is alarmed about water pollution may take action in the market place. The question to be investigated, then, is: Once a person is concerned about the ill effects of water pollution, how will this influence his purchase of fish products?

It would seem reasonable to hypothesize that the person who shows concern for water pollution will reduce his consumption of fish products. It is this hypothesized relationship which was tested in this research.

Sample

A sample of 500 individuals was selected from the

Cleveland metropolitan area. This sample was clustered according to two geographic locations. One region in downtown Cleveland was selected because it represented a relatively low social status neighborhood. Property values were approximately $14,000; rental value about $85 per month. These data were obtained from the Census Block Statistics [4]. Research indicated these individuals average less than a high school graduate education and a family income of between $5,000 and $7,000. This part of the sample was predominantly black.

The other section of the sample was selected for its higher social status. These individuals lived in an exclusive residential section whose property values averaged over $35,000 and whose rental values were about $190 per month. These people had, on the average, a college education and family incomes of $15,000 to $20,000. This part of the sample was composed of whites.

Just after Thanksgiving, 1971, questionnaires were sent to 300 people in the lower class area, and to 200 in the higher class area. Twenty of the 500 were returned due to change of address, and 123 usable questionnaires were returned.

Questionnaire

The total package received by prospective respondents contained three pages and a return envelope. One page was a cover letter requesting the consumer's help. The other two pages contained questions about consumption of fresh, frozen, and canned fish products, concern for pollution, and socio-

economic data. A copy of the cover letter and the essential parts of the questionnaire may be found in the Appendix.

Change in purchases: Three scales were provided for the consumer to indicate whether he had changed his purchases of fish products. There was a scale for fresh, frozen, and canned fish. The following is an example of the scale:

> Compared to three years ago, would you say that you now eat fresh fish--
>
> | A lot less? | A little less? | The same? | A little more? | A lot more? |
> |---|---|---|---|---|
> | 1 | 2 | 3 | 4 | 5 |

Attitude of concern: To relate his concern for water pollution, the respondent was asked to check which of the following best expressed his feelings:

> Water pollution may make the fish and seafood we eat harmful to us.
>
> | Strongly agree | Agree | I don't know | Disagree | Strongly disagree |
> |---|---|---|---|---|
> | 1 | 2 | 3 | 4 | 5 |

Socioeconomic data: Other questions in the survey asked for age and level of education of the household head; family income; religious preference (Protestant, Jewish, Roman Catholic, other, none); and race (Black, White, American Indian, Oriental, Spanish-American, other).

Method of Analysis

Responses to the "attitude" and "change of fish

consumption" questions were correlated by the Kendal Tau rank correlation method. There are three pieces of information important to us in explaining the results of this project.

The first piece of data is the correlation, or r-score. If an r-score of 1.0 were shown, it would mean that there was perfect agreement. That is, the respondents would have checked that they agree that water pollution is harmful and they ate "a lot less" of the fish product in question. Or, the 1.0 could mean the persons did not agree that pollution was harmful and they checked that they ate "a lot more" of that fish product. A correlation of 0.0 means that no agreement exists between the "concern" and "change" scales. Obviously, these two cases are the extreme. This research can expect correlation scores somewhere between these two.

The second important piece of information is the sign of the correlation. A positive sign means that the respondents are checking the same end of the scales. A negative sign indicates the respondents checked opposite ends of the scale. That is, a -1.0 might imply they were concerned about pollution but increased their consumption of fish products.

The third piece of information is the significance level of the correlation. A significance level of .05 means that there is a 95 per cent chance that the correlation is more than a random occurrence.

The results of the Kendal Tau correlations may be found on Table 1.

Table 1

Kendal Tau Correlation Matrix

Statement of Concern: "Water Pollution may make the fish and seafood we eat harmful to us."		Changed Fresh Fish Consumption	Changed Frozen Fish Consumption	Changed Canned Fish Consumption	
A-Total Sample of Respondents (N=123)		.26****	.13****	.11**	1
B-Data sorted by Social Class of Respondents	Lower social class (N=45)	.27****	.03 NS	.22***	2
	Higher social class (N=78)	.19****	.11*	-.13**	3
C-Data sorted by Education of Household Head of Respondents	High school graduates (N=46)	.35****	.12 NS	.18**	4
	College graduates (N=48)	.22****	.06 NS	.09 NS	5
	Some Graduate school (N=28)	.03 NS	-.07 NS	-.26**	6
D-Data sorted by Family Income of Respondents	Less than $10,000 (N=42)	.13 NS	.10 NS	.35****	7
	Between $10,000 and $15,000 (N=34)	.15*	.05 NS	-.06 NS	8
	Greater than 15,000 (N=42)	.12 NS	-.09 NS	-.23***	9
E-Data sorted by Age of Household Head of Respondents	Less than 35 years (N=36)	.37****	.12 NS	.08 NS	10
	Between 35 and 54 years (N=41)	.15*	.02 NS	.06 NS	11
	More than 54 years (N=46)	.08 NS	.25***	.20***	12
F-Data sorted by Religious Preference of Family of Respondents	Protestant families (N=72)	.12*	.13*	.18****	13
	Jewish families (N=18)	.00 NS	.09 NS	-.19 NS	14
	Catholic families (N=9)	.57***	.57***	-.05 NS	15
	"Other" families (N=12)	.80****	.54****	.86****	16
	Families of NO religion (N=8)	.05 NS	.00 NS	.53*	17
G-Data sorted by Race of Respondents	Blacks (N=50)	.29****	.03 NS	.19**	18
	Whites (N=70)	.15**	.07 NS	-.13**	19

Levels of Significance: NS=not significant, * p=.10, ** p=.05, *** p=.025, **** p=.01.

DISCUSSION

Analysis

The results of the correlation analysis may be found in Table 1. The "statement of concern" was correlated with each of the three "change in consumption of fish" categories. There are three columns of correlations, one for fresh, frozen, and canned fish products.

A. The first row of correlations is for the total sample of of 123 respondents; all three are significant at least to the .05 level. This supports the hypothesis that people who are concerned that "water pollution may make the fish and seafood we eat harmful to us" reduced their consumption of fresh fish ($r=.26$), frozen fish ($r=.13$), and canned fish ($r=.11$).

Row 1 of Table 1 is shown in terms of numbers of people on Table 2. This table shows the reactions of people according to the fish category in question. For those people who were concerned about pollution (checked a 1 or 2 on the pollution scale), 33 or 27 per cent of the sample reduced (checked a 1 or 2 on the change-in-consumption scale) their consumption of fresh fish. Twenty-nine or 24 per cent showed concern and reduced their consumption of canned fish products. Notice that from the entire sample of 123 respondents, 74 per cent or 91 showed concern for pollution. Yet, of those 91 persons, 58 did not reduce their consumption of fresh fish, 62 did not reduce their consumption of frozen, and 66 did not reduce canned. Why these people were not influenced to reduce their consumption of these products may be a function of various

Table 2

Total Sample of Respondents

Fresh Fish:	People who reduced consumption	People who consumed same or more	Totals:
Attitude of concern for water pollution	33/27%	58/47%	91/74%
Attitude of non-concern or no opinion	7/6%	25/20%	32/26%
Totals:	40/33%	83/67%	123/100%
Frozen Fish:			
Attitude of concern for water pollution	29/24%	62/50%	91/74%
Attitude of non-concern or no opinion	5/4%	27/22%	32/26%
Totals:	34/28%	89/72%	123/100%
Canned Fish:			
Attitude of concern for water pollution	25/20%	66/54%	91/74%
Attitude of non-concern or no opinion	5/4%	27/22%	32/26%
Totals:	30/24%	93/76%	123/100%

habits, customs, and traditions. Therefore, socioeconomic data were recorded to explore groups which might be more influenced by their concern for pollution than others.

B. Note that in row 2 and 3 of Table 1, the data were reorganized according to the social class of the respondent. On the selection of the sample, it was mentioned that two geographic locations were chosen to represent what might be considered higher and lower social class groupings. For fresh fish, both social classes seem to indicate support for the hypothesis. That is, the correlation is positive and significant and demonstrates that those who were concerned did reduce their consumption of fresh fish. No comparison can be made between .27 and .19 because the sample sizes are different (45 in the lower class and 78 in the higher class). Only meager support is shown for the hypothesis for frozen fish.

An interesting contrast is shown for canned fish. Recall that a positive correlation means respondents could be saying they are concerned and are reducing their consumption. A negative correlation could indicate that people are concerned but are increasing their consumption. More will be said about this opposite activity later.

C. The next section on Table 1 contains the sample of 123 respondents organized according to three groupings of educational level. The sample size for high school and college graduates is very close so a positive comparison can be made.

Again, fresh fish is shown to give the best support for the hypothesis. People who are concerned tend to eat less

fresh fish. Yet the college graduates seem to give less support (.22 compared to .35). Those with some graduate study did not show the same behavior. None of the three education groups showed support for a reduction in frozen fish.

Another interesting contrast appears with canned fish. The lower educated respondents seem to reduce canned fish consumption when concerned. The higher educated respondents may have increased their consumption.

D. The next section on Table 1 sorts the sample according to family income. Notice the less than $10,000 and greater than $15,000 respondents have the same sample size, thus direct comparison can be made between the correlations for each.

Fresh fish is reduced only in the middle income class. No support is given by the lower and higher income groups. No support is given for the hypothesis for frozen fish.

An exactly opposite reaction is shown between the lower and higher income groups for canned fish. The lower income group gives one of the strongest correlations in support of the hypothesis that those who are concerned will reduce their consumption. The higher income group gives an opposite sign, if somewhat lower absolute correlation score. Again, this could imply that higher income people increased their consumption of canned fish when concerned about water pollution.

E. The next section of Table 1 organizes the sample according to age of household heads. For fresh fish products, it is the younger respondents who support the hypothesis.

Less support is given by the middle age group and no support is given by the older group.

For frozen fish products, the older respondents support the relationship. This same group supports the relationship for canned fish products.

F. The next section categorizes the sample respondents by religious preference. The individual categories range widely in sample size, so no attempt can be made to compare one category with another.

For fresh fish, the main supporters of the hypothesis are Protestants, Catholics, and members of what were termed "other" religious preferences. It may be important to note that no support was given by the Jewish families. That is, the Jewish respondents could have shown concern for water pollution but did not change their purchase behavior of fresh fish. The same three groups support the hypothesis for frozen fish products.

Protestants increased their support for the hypothesis in the canned fish products. This means that this group more often reduces consumption of canned than fresh or frozen fish products when concerned about water pollution.

G. The last section sorts the sample of respondents according to race. This part does not have all 123 members because three did not respond to the question of race.

Both whites and blacks demonstrate that those concerned about pollution reduce their consumption of fresh fish products. Neither group supports this hypothesis for frozen fish.

The canned fish products category again shows a contrast in correlations. Blacks support the hypothesis while whites contradict it with a negative correlation. Again, this could imply that the whites who showed concern for water pollution increased their consumption of canned fish products.

Conclusions

In reviewing the findings, some important points can be brought out about the products considered as well as the behavior of the questionnaire respondents.

First, for those concerned about water pollution, fresh fish consumption was reduced most often. The correlation for fresh fish was almost twice as high as for frozen or canned fish.

The second point is to review who supported this correlation. For fresh fish, this issue cannot be divided easily by social class or race because of the difference in sample size. But the education variable shows clearly that the high school graduate respondents who showed concern for water pollution reduced fresh fish consumption more so than did the college graduates. Also, the age variable shows strong support among younger respondents. The religious variable shows very strong support among Catholic families and families who showed preference for "other" religions, yet it is difficult to generalize about the effect of some religions with such a small sample.

With regard to frozen fish products, the socioeconomic

data show mixed support for the total sample score. Main support comes from the higher social class and older respondents. Families of Protestants, Catholics, and "other" religious preferences also support this behavior with frozen fish products. Detracting from the correlation for the total sample are some negative, although "not significant" r-scores. These negative scores will be dealt with shortly.

Those who supported the correlation for reducing canned fish are not the sample people who supported the hypothesis for fresh fish. These people are lower class, lower educated, have lower incomes, are over 54 years old, and are Protestant. In fact, the Protestants supported the relationship for canned more than for fresh or frozen fish (.18 as opposed to .12 or .13). These people are also predominantly black. In summary, the following profiles can be drawn of those respondents who supported the hypothesis that those who are concerned about pollution will reduce their consumption of fish:

Fresh fish - Those who showed concern about water pollution and reduced fresh fish consumption were lower educated (but several had college degrees), younger, and Protestant.

Frozen fish - Those who showed concern and reduced frozen fish consumption were from a higher social class, older, and Protestant.

Canned fish - Those who showed concern and reduced canned fish consumption were of a lower social class, lower educated, lower income, older, Protestant, and Black.

The third point is to explore why the frozen and canned fish products show a lower correlation than fresh fish. There

are some feasible explanations for this difference. One could be that consumers actually perceive fresh fish as having more possibilities of being polluted. They could think of frozen and canned fish as packaged and therefore coming under closer inspection than fresh fish. Also, the Lake Erie region has had much news reporting the damage of pollution. Cleveland consumers may look on fresh fish as coming from close by while the packaged items come from some more distant, less polluted area. The following discussion of the substitution effect should demonstrate that the above explanation may not be implausible.

Correlations on Table 1 for higher social class respondents for fresh and canned fish products show a change from a positive to a negative correlation. As was explained before, the positive correlation supports the hypothesis that those respondents who were concerned about water pollution reduced their consumption of that fish product. The negative correlation could mean that those respondents were concerned but increased their consumption. A reasonable suggestion for explaining this change could be that these consumers may look at canned fish as less polluted than fresh fish; but instead of reducing their consumption of canned, they could increase it. In a sense, they could be substituting canned fish for fresh. This same "substitution effect" also could help explain the negative correlations prevalent in the frozen and canned columns.

These conclusions should indicate that research on

attitudes as predictors of behavior in this area should not be dismissed. This project gives evidence that the relationship between the attitude of concern for water pollution and the change in purchase behavior does exist.

The fact remains that correlations for the relationship of "concern" to "change in purchases" were low. There may be several explanations for this.

The first should be placed on the criticism of the sampling technique. This clustering method was used to facilitate calling on nonrespondents in person. But, because of the proximity to the holiday season, recalling was not done. This meant that only 26 per cent of the sample was usable. This is a lower response than would have been desirable. It is possible that, with this low return, a representative number of potential respondents did not receive the attention they should have received. It is not clear whether this sampling technique directly affected the low correlations; but it is a limitation of this research which should be mentioned.

Other factors which may have led to low r-scores could be due to parameters not controlled by this project. One would be the "substitution effect" explained earlier. These negative correlations detract from the total sample correlations for frozen and canned food. Another reason could be due to the possibility that concern for water pollution as an influence on the purchase of fish products is on the wane. Research by Peckham and Glaser indicates that the reduction in purchases of tuna is not as great now as when the news first

hit the market in January, 1971 [5]. A third factor to be considered is that attitudes do not provide the total picture of the thought processes involved in a consumer purchase. Work by Howard, as presented before a Senate subcommittee in June, indicated that memory and confidence influence the consumer's comprehension, attitude, and intention to buy [6]. Since attitude is only part of the decision process, it can not be a totally reliable predictor of behavior.

SUMMARY

A pretest was made of Cleveland area residents to investigate the link between attitude about water pollution and change in purchases of three types of fish products: fresh, frozen, and canned. The responses to the "concern" and "change" questions were correlated by the Kendal Tau rank correlation procedure.

The correlations produced were not high but were positive for all three fish types. This indicates support for the hypothesis that those who are concerned about water pollution will reduce their consumption of fish. The strongest correlation from the total sample was for fresh fish. This would seem to indicate that these people perceive fresh fish to be more harmed by water pollution than frozen or canned fish.

It was also possible to draw profiles from the socio-economic data gathered. It was shown that those who were concerned about pollution and reduced their consumption of

fresh fish were not the same people who reduced their consumption of canned fish.

A by-product of this research was evidence that there may exist a "substitution effect" among fresh, frozen, and canned fish products. Further research should be undertaken to support this hypothesis.

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APPENDIX

KENT STATE UNIVERSITY
Kent, Ohio
44240

216 672-4608

Sea Grant Project
131 Rockwell Hall

November 22, 1971

Dear Consumer:

The jobs of thousands of people depend on the catching, packaging, distributing, and selling of fish and seafood. These products are becoming, to more and more Americans, an important source of protein.

However, recently much has been reported in your newspaper, on television and radio, about the effects of certain pollutants which may contaminate the fish we eat. These reports have often been conflicting as to whether eating fish products is or is not harmful.

The Sea Grant Office, at Kent State University, is conducting research into this problem. We have randomly selected your name from the telephone directory in hopes that we may understand the attitudes of you, the consumer. The questionnaire enclosed will require no more than 5 minutes of your time. When you return your answers, in the envelope provided, you need not sign your name. All the questionnaires are confidential.

We need your help. This project can be a success only with your support. Please return your completed questionnaire by the end of the week. Thank you.

Yours truly,

J. Steven Kelly

J. Steven Kelly
Consumer Opinion Survey

JSK:jd

Enclosure

SEA GRANT CONSUMER SURVEY

1. In regard to fresh fish or seafood:

I do like it	Don't know	I don't like it
__	__	__

2. In regard to frozen fish or seafood:

I do like it	Don't know	I don't like it
__	__	__

3. In regard to canned fish or seafood:

I do like it	Don't know	I don't like it
__	__	__

The following questions ask you to tell how often you eat the products mentioned above. Please check one.

4. How often do you eat fresh fish or seafood?

Once per week	Two or three times per month	About once per month	Every one to three months	Seldom or Never
1	2	3	4	5

5. Compared to three years ago, would you say that you now eat fresh fish ---

A lot less?	A little less?	The same?	A little more?	A lot more?
1	2	3	4	5

6. How often do you eat frozen fish or seafood?

Once per week	Two or three times per month	About once per month	Every one to three months	Seldom or Never
1	2	3	4	5

7. Compared to three years ago, would you say that you now eat frozen fish ---

A lot less?	A little less?	The same?	A little more?	A lot more?
1	2	3	4	5

8. How often do you eat canned fish or seafood?

Once per week	Two or three times per month	About once per month	Every one to three months	Seldom or Never
1	2	3	4	5

9. Compared to three years ago, would you say that you now eat canned fish ---

A lot less?	A little less?	The same?	A little more?	A lot more?
1	2	3	4	5

Please place a check in the blank which best expresses how you feel about the following statement:

***

11. Water pollution may make the fish and seafood we eat harmful to us.

Strongly Agree	Agree	I don't know	Disagree	Strongly Disagree
1	2	3	4	5

***

Now we would like to know a little about you. All information will, of course, be kept confidential.

13. How many persons live in your household?

1 person	2-3 persons	4-5 persons	6-7 persons	8 or more

14. About what age is the head of the household?

18-19 years	20-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65 or over

15. Please indicate the level of schooling reached by the head of the household.

___Grammar School ___Some High School ___High School Graduate

___Some College ___College Graduate ___Some Graduate School

16. Do you: own___ or rent___your home?

17. Please check the space which best states your approximate annual income.

Under $3,000	$5,000 -5,999	$10,000 -14,999	Over $20,000
___$3,000 -4,999	___$7,000 -9,999	___$15,000 -19,999	

***

18. Please indicate your religious preference. (This is optional).

__Protestant __Jewish __Roman Catholic __Other __None

19. Please check the blank which pertains to you. (This is also optional).

__Black __Caucasian __American Indian __Oriental

__Spanish-American __Other