Staff Paper

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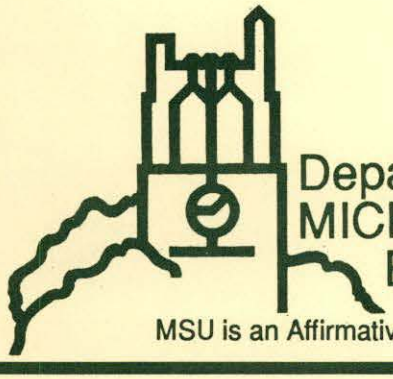

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CONSUMER WILLINGNESS TO PAY FOR REDUCING PESTICIDE RESIDUES IN FOOD

This is a summary report of a study of consumer willingness to pay for reduced pesticide residues in food. The objective of the study was to develop a method for simulating choices that consumers would make about pesticide residues in an actual market setting. Detailed descriptions of a food product with different amounts of pesticide residues and pest damage were developed. The products and market conditions under which they would be sold were described in a survey mailed to a random sample of households nationwide. These food consumers were asked how much of the different products they would buy at given prices on a typical shopping occasion in the fall. Their responses, along with other important variables that influence food purchases, were used to infer willingness to pay for reduced pesticide residues, as well as willingness to accept pest damage.

The food products presented to consumers in this study were fresh apples. Fresh apples were chosen because they are widely purchased, their quality varies with pesticide use, and the findings may be compared with estimates based on actual market data.

The market simulation approach is both a strength and a limitation of this study. The strength is that people are better able to predict their own purchase behavior when the circumstances presented to them are specific and realistic, thus increasing the accuracy and validity of the findings. The limitation is that reported purchase behaviors are contingent on the specific market conditions, making it more difficult to generalize from the findings.

The design of the market simulation survey and the selection of households for the nationwide sample are briefly described. Then the survey findings on consumers' perceptions of food safety issues, risks from pesticide residues in food, and willingness to pay for reduced pesticide residues in apples are presented. Policy and research implications are discussed in the final section.

Survey Design Procedures

The market simulation and other survey questions were designed based on consultations with agricultural experts and extensive pretesting with hundreds of consumers in focus groups, interviews, and mail questionnaires.

In the final version of the survey, the apple products were described using photographs and product labels. Each of four photographs showed a red delicious apple, all identical except for the amount of surface area with pest damage. The percent of surface area damage in each photo was 0%, 2.5%, 6%, and 24%. The types of damage portrayed were apple scab and plum curculio. (Focus groups revealed that worm damage is unacceptable to consumers.)

Three apple labels described different levels of pesticide residues relative to a "no label" apple. The apples were presented as being certified and tested to have "No Pesticide Residues," "No Detectable Pesticide Residues," and "No Pesticide Residues Above Federal Limits."

Respondents were asked the quantity of these different types of apples they would likely buy at four different prices during a typical shopping occasion in the fall. Prices ranged from $.39 to $1.49 per pound, with different respondents given different sets of prices. Respondents were asked how many apples they would buy if the quality of all apples were like that shown in each of the photos and how many they would buy if all apples were certified, tested, and labeled.

In each purchase question, respondents were told that all apples had the same price, quality, and label. Consumers could not make tradeoffs between the different quality levels or residues levels. Respondents were also told that no other fresh fruits were labeled and that all other fresh fruits were available at normal prices (no sales). Respondents would be expected to substitute into labeled apples and away from other fruits in order to reduce consumption of pesticide residues. These assumptions result in upper bound estimates of willingness to pay for reduced pesticide residues on apples.

Because apple purchases are also likely to be affected by factors such as household size, number of children, geographic location, and other demographic factors, questions were developed about these factors. In order extrapolate from the answers to the purchase questions, respondents

were also asked a series of questions about their normal apple purchases throughout the year.

It was hypothesized that people would purchase different amounts of the products offered because of differences in perceptions about health risks and the effectiveness of the labels in reducing those risks. Consequently, respondents were asked about their perceptions of the chance that a member of their household would experience health problems someday because of pesticide residues in all foods. Respondents were then asked to assess the percent reduction in risks if all foods were tested, certified and labeled.

Finally, respondents were asked a series of questions about their perceptions of food safety issues and pesticide residues in foods other than apples.

Response Rates and Sample Composition

A national random sample of 2,200 households was purchased from Survey Samples, Inc. The surveys were mailed on September 18, 1990, followed by reminder post-cards one week later. Duplicate mailings of the questionnaire packet were mailed to non-respondents on October 16th and November 6th.

Of the 2,200 households sampled, 312 or 14.2% could not be contacted by mail due to inadequate or inaccurate addresses. Thus, surveys were received by a sample of 1,888 households. After four mailings, 906 completed questions were returned for a response rate of 48% (906/1,888). Only 681 respondents had sufficiently complete questionnaires so they could be used in the estimation of willingness to pay for reduced pesticide residues. (This latter group is referred to as the respondent "subsample" in Tables 1 through 5 below.)

The average household size in the full respondent sample and the subsample is comparable to the average for the U.S. (see Table 1). The percent of households with children under 18 is also about the same as for all U.S. households. The normal range of household sizes, incomes, education levels, and ages are represented in the sample (Tables 1-4). However, the full respondent sample underrepresents single-person households and households with incomes of less than $10,000. Households with incomes greater than $50,000 are overrepresented. Respondents in both the full respondent sample and subsample have a higher level of education than is typical of adults over 25 in the U.S. Finally, females (52%) outnumbered male (44%) respondents (Table 5).

Perceptions of Risks from Pesticide Residues

1. General Perceptions of Food Safety

The first question in the survey sought respondents' general confidence in the safety of the food supply using a question similar to that used in the annual telephone surveys conducted by the Food Marketing Institute (FMI). Table 6 shows that a very small percentage of respondents expressed complete confidence that the food their household eats is safe. The majority said they were mostly confident, but almost a quarter of respondents described themselves as somewhat doubtful. A very small percentage said they were very doubtful that the food their household eats is safe.

The level of confidence expressed by the respondents is somewhat lower than that expressed by samples questioned by the Food Marketing Institute (FMI) in January of 1990, but very similar to confidence levels expressed by samples FMI questioned during April, June, and August of 1989 directly following the Alar scare. In January 1990, FMI found that 15% were completely confident, 64% were mostly confident, 18% were somewhat doubtful, and 2% were very doubtful. In contrast, in April through August of 1989, FMI found that 65% to 73% were completely or mostly confident, 19% to 27% were somewhat doubtful, and 6% to 7% were very doubtful.

While the comparison suggests that respondents had somewhat higher levels of concern about food safety than FMI's respondents in 1990, it should be noted that FMI's question is worded somewhat differently. They ask "how confident are you that the food in your supermarket is safe?" Our question allows for respondents to consider all food eaten by the household, regardless of where it is obtained or who prepared it.

The second question in the survey permits comparison of consumers' relative ranking of food risks to those of scientists and government regulators. It is often asserted that consumers rank food risks differently than do scientists, putting chemical residues before bacteria and dietary factors such as fat and cholesterol. The results in Table 7 suggest that this true of some, but not all consumers, and further, there is a great deal of diversity of opinion about the relative seriousness of food risks.

While pesticide residues was chosen by the largest percentage of respondents, the percentage ranking additives and preservatives, germs or bacteria, and fat and cholesterol as most serious were nearly just as large. Just over half of respondents rank chemicals (i.e., pesticides, additives or animal drugs) as the most serious problem while about forty percent rank germs and fat and cholesterol as most serious. Similarly, just over half rank germs and fat and cholesterol as the least serious problem while about forty percent rank germs and fat and cholesterol as least serious. Thus, at least half the sample appear to rank food risks differently than scientists and regulators do.

2. Perceptions of Pesticide Residues

Respondents reported that they believe pesticide residues are much more likely to be present on fresh fruits and vegetables than other foods (Table 8). Of four particular fresh fruits and vegetables, fresh apples were seen to have the greatest chance of having any pesticide residues. However, only fifty to sixty percent of all fresh fruits and vegetables and fifty to sixty percent of all apples were perceived to have <u>any</u> residues.

It is interesting to compare these results to the Food and Drug Administration's own findings on residues in foods (FDA, 1987). The FDA has evaluated residues in 10 of the 12 food items or categories that we asked respondents to evaluate. In 6 of these 10 items (i.e., apples, lettuce, oranges fish, cereals, and baked goods), FDA found greater percentages of foods with some residues than perceived by respondents. In 2 of the 10, FDA's estimates are similar to respondents' (fresh fruits and vegetables and dairy products). In 2 of the 10, (tomatoes and juices) FDA's estimates are much smaller than respondents' perceptions. Thus it appears that respondents' perceptions of residue incidence are somewhat optimistic.

One implication of the differences in residue perceptions across foods is that willingness to pay for residue reductions may be different for different foods. For example, a product or program aimed at reducing residues in fresh fruits and vegetables may get more support than one aimed at reducing residues in processed foods.

4. Perceptions of Pesticide Risks

Respondents' perceptions of the chance their <u>household</u> may experience health problems someday due to the current level of pesticide residues in food is shown in Table 9. About a quarter of respondents perceive virtually no risk from residues. About 45% report moderate risks (between 1 in 100,000 and 1 in 1,000). About a quarter perceive very serious risks (1 in 100 and above).

It is interesting to compare these risk perceptions with those of scientists and the regulatory community. EPA's own worst case estimate is that there would be 6,000 extra cases of cancer per year from pesticide residues in food for a rate of 2 in 100,000 (EPA, 1987). Assuming a 70 year lifespan and a linear dose-response function, this would be a lifetime risk of 1.4 in 1,000 per persons. For a household of 2.7 persons, the household risk would be 3.8 per 1,000. Similarly, the National Research Council (1987) developed a worst case estimate of lifetime cancer risk from pesticide residues in food of 5.84 in 1,000. For a household of 2.7 persons, the household risk would be 1.6 in 100. The results in Table 9 suggest that over half of food consumers do not perceive risks from pesticide residues to be as great as these worst case scenarios estimated by scientists and regulators. Less than 30% perceive the risks to be the same as these worst case scenarios. About 15% think the risks are much higher.

Table 10 shows perceptions of risk from pesticide residues for particular types of health problems. Cancer and allergies were perceived to be the greatest risk, but most respondents also

perceived moderate risks of heart disease, nervous system disorders, and impaired immune system. Lower risks were perceived for impaired child development, birth defects, and mental illness.

These results have important policy implications. Most of the attention of regulators has been on the potential of pesticide residues to cause cancer. The results of the survey suggest that consumers perceive risks of other types of health problems as well. To allay public fears, these other health problems need to be discussed.

4. Perceptions of the Effects Labels on Reducing Pesticide Risks

The survey asked respondents about actions they take to reduce residues on fresh produce and how effective those actions are. Table 11 shows that most respondents report doing something to avoid residues. Interestingly, those who reported washing fresh produce with soap and water were a different set of respondents than those who reported buying organic food. Likewise, those who bought organic were different respondents from those that buy foods tested for residues. Thus, over thirty percent of the sample reported taking major steps to reduce residues. On average, all respondents reported that they thought their own actions reduced residues on fresh produce by about a third to one half (see bottom of Table 12).

Respondents were also asked to evaluate how much they thought health risks from pesticide residues would be reduced if all foods were tested and certified to have no pesticide residues, no detectable pesticide residues, or no residues above federal limits. These three levels of residue reduction correspond to the labels on apples that respondents were later asked to evaluate. Table 12 shows that the labels were ranked in the expected order. That is, the label for no pesticide residues was reported to reduce risks the most, followed closely by the label for no detectable residues, and the label for no residues above federal limits was perceived to give the least risk reduction. Note that few respondents felt that risks would be completely reduced by any of the labels.

Willingness to Pay for Reduced Pesticide Residues

Willingness to pay for a label is the price consumers will pay for the no-label apple minus the price consumers will pay for the labeled apple at a given level of consumption. The prices consumers will pay for the different apples at different levels of consumption were estimated econometrically using the data from the purchase questions in the survey. (See van Ravenswaay and Hoehn, 1991a for details on the econometric methods used to estimate the apple demand models.)

The estimates of the average added price per pound for each label over the no-label apple are shown in Table 13. The results indicate a significant willingness to pay to reduce residues under the set of circumstances provided to respondents in the survey. These circumstances included the assumption that no other fruits would be labeled, that only one type of apple label would be available, that labeled apples would be marketed and displayed in stores as they are currently, and the prices of other fruits would be those prevailing at the time of the survey. Consequently, the estimates of added willingness to pay for the labels are upper bound estimates.

These estimates indicate that consumers are willing to pay more for testing and certification that residues are within federal limits. This willingness to pay implies that consumers believe that federal standards give them significant risk reductions. However, it also implies that consumers would like guarantees that the standards are being closely monitored and enforced. For example, they may have heard of contamination incidents such as aldicarb contamination of watermelons in California, heptachlor contamination of milk in Hawaii, and EDB contamination of grain, and, thus, be willing to pay to avoid cases where these standards are not met.

Since sample data on actual residues (FDA, 1987) show that virtually no apples have residues above federal limits, this would be an easy standard for apples produced today to meet. If the cost of testing and certification were substantially less than 23 cents per pound, it may be worthwhile to perform this service for consumers. However, developing appropriate labels and educating consumers about them would undoubtedly require a large marketing effort.

There was no statistically significant difference in willingness to pay between the federal limit apples and the no detectable residue apples. Apparently, most respondents did not consider lack of detection to provide them any additional risk reduction beyond what a federal standard would provide. Given that it is likely to be much more costly to produce this type of apple (FDA residue data indicate that over 50% of apples have detectable residues), but added willingness to pay is no greater than for the federal label, this alternative is unlikely to be promising.

However, Table 13 also shows that some consumers do not think that federal standards give them all the risk reduction they desire. This may be because they think the standards are set too low or because they think that scientists do not yet fully understand the effects of pesticide residues on health. Consequently, there is an additional willingness to pay of 37.5 cents over the no-label apple or nearly 14 cents over the federal limit apple.

The measurement of risk perception used in this study explains little of the willingness to pay for the labels. There is less than a penny difference in the estimates of willingness to pay for the labels for people seeing no risks and people who perceived large risks. The perceived change in risk must be 1 in 100 or greater to add a penny to the estimate of willingness to pay for the labels.

What did respondents think they would be paying for in purchasing labeled apples if they did not expect much risk reduction? The way risk perception was measured in this study may reflect what consumers think the risks of pesticide residues are most of the time, but not their uncertainty about what the risks could be. Some may think the regulatory system works most of the time, thus believing that risks from pesticide residues are fairly low on average. However, they may also believe that the system breaks down sometimes--perhaps due to lack of enforcement of standards or perhaps due to lack of information during standard setting--and they may be willing to pay to reduce these errors. In other words they may believe that the labels would reduce the variance in, rather than just the average of, risks from pesticide residues in food. Alternatively, respondents may have thought that they could achieve some other purpose--such as protecting the environment--by buying the labeled apples. However, the high willingness to pay for the federal label indicates that consumers are willing to see pesticides used so long as the residues meet federal safety standards.

The estimates of the added willingness to pay for each label provides information about how consumers value residue reduction. However, they do not tell us how many consumers would actually purchase a particular label in the market. First, all the market conditions outlined in the willingness to pay questions would have to prevail. Second, purchases depend on the total price of the apples, not just the added price of the label. As the "base" price of apples increases, purchases decline, and some individuals may discontinue purchasing altogether.

This point is illustrated in Table 14 which shows the estimated probabilities of purchase at different prices for the no-label and labeled apples. For example, at $.79 per pound, the probability of purchase of a no-label apple was estimated to be .59. The probability increases to .69 for the Federal label and .74 for the No Pesticide label. Similarly, at $1.49, the probability of purchase was .3 for the no-label apple, .4 for the Federal apple, and .45 for the No Pesticide apple.

The quantity of apples purchased also declines as the total apple price increases, regardless of the type of label involved. This relationship is expressed by the price elasticity of demand. For example, at the average fall price and level of consumption, the price elasticity was estimated to be -1.86. That is, as price increases by 1%, the quantity of apples purchased declines by 1.86%. This elasticity estimate is very similar to estimates based on actual market data on apple purchases (van Ravenswaay and Hoehn, 1991b).

At the time the survey was conducted, average apple prices were about 79 cents per pound. The added willingness to pay for the federal apple would amount to 29% more; for the no pesticide apple that would be 45.5% more. This is comparable to the organic price premiums estimated by Hammitt, Rae, and Jolly et al. However, it is higher than the percentage willingness to pay for

pesticide-free fresh produce reported by Ott and Maligaya and willingness to pay for pesticide-free food reported by Atkin. It is important to keep in mind that these studies asked people what they would be willing to pay in a very general situation across a range of different foods.

The estimates are also comparable to the estimates obtained in a study of the impact of the Alar incident on actual apple sales (van Ravenswaay and Hoehn, 1991b). In the Alar case, it was estimated that people would have been willing to pay 31.3% more for Alar-free apples--approximately 21.5 cents more per pound in 1983 dollars, which is 28.7 cents more per pound in 1990 dollars.

It is important to keep in mind that comparing the present results with other studies can only be done in a very rough and inexact fashion. Each study differs in sampling procedures, survey design, and the stated characteristics of the choice context. For instance, in the Ott and Maligaya study, respondents were asked their willingness to pay in terms of a percentage increase in all food prices for residue reduction on all foods. In this study, willingness to pay was elicited in terms of an apple price increase for residue reduction only on apples. Given these different choice contexts, one would expect differences in willingness to pay due to product substitution alone.

Willingness to Accept Pest Damage

Table 15 shows estimates of acceptable pest damage for each of the labels, given no difference in price. This tradeoff between residue reduction and pest damage is measured by the amount of pest damage that offsets the added willingness to pay for a labeled apple.

The estimates require careful interpretation. Pest damage was measured as the amount of surface area on an apple in a photograph. The photograph, of course, is only two dimensional, whereas a real apple is a sphere. Thus, in reality, surface area would be measured over the entire apple surface. This means that the estimates of surface area in Table 15 are at least twice as large as what would be acceptable on a real apple.

With these caveats in mind, the results suggest that consumers would accept only very minor amounts of pest damage in order to obtain reductions in pesticide residues. There is a three cent price penalty for each 1% increase in surface area damaged in the photo. This penalty is even larger when the entire surface area of an apple is considered.

In the federal label case there would probably be no need for pest damage to occur since the currently allowed level of pesticide use would be acceptable. All that would change would be monitoring and enforcement of the current standards. However, the same thing may not be true for the no pesticide residue label--at least for apples. Many horticulturalists claim that unblemished apples cannot be grown without pesticides--at least for the varieties of apples grown today. Thus, willingness to pay for the no pesticide label may not offset the benefits of pesticide use to the consumer in this case. However, the development of apple varieties that can be grown without pesticides is likely to have public support.

The results are similar to those of Ott and Maligaya. They found that over 60% of respondents would accept no cosmetic damage to obtain pesticide-free produce. It is also consistent with the findings of the Bunn et al. study of thrips damage on oranges. Their survey found that 63% of respondents would prefer to buy an orange with scarring rather than a perfect orange to get reduced pesticides. The scarring was measured as 10% of the surface area of a photo. For a photo with 20% scarring, 58% said they would buy. (Since these are photos, it should be remembered that comparable surface areas on real oranges would be much smaller.)

Conclusions

The survey findings suggest that the market simulation approach is an effective tool for examining consumer demand for changes in product characteristics such as safety and quality. The estimates obtained compare favorably with estimates based on actual market data, indicating that the contingent market approach is likely to provide more accurate results than survey questions which ask people if they would prefer lower pesticide residues in food. At the same time, the contingent market

approach offers substantially more flexibility than analysis of past purchases since it permits examination of tradeoffs not presently available in actual markets.

The survey results indicate that consumers are willing to pay significant price premia for foods certified and tested to meet federal limits. This finding suggests that consumers believe federal standards give them significant risk reductions, but they are uncertain that federal standards are being met. The implication is that consumers would obtain significant value from learning that virtually all foods do meet federal standards. They would also see significant benefit from learning the results from monitoring and testing programs which provide proof that the standards are being met. Finally, this finding suggests that consumers would see significant benefit from learning that the present system is designed to prevent errors in standard setting, pesticide use, and enforcement.

While consumers may see value in learning that residue standards are being met, information about the percentage of foods with detectable level so of residues would be unlikely to improve the confidence of many consumers. The average consumer perceives the percentage of foods with any residues to be very similar to what is actually detected by the FDA's monitoring program.

Consumers are willing to pay even higher price premia for foods certified and tested to have no pesticide residues, but not for "no detectable" residues. This finding suggests that consumers believe that federal standards do not eliminate all the risks from pesticide residues.

However, the additional willingness to pay may not be high enough to cover the costs--both in terms of higher food prices and pest damage--of eliminating all pesticides. This is an important point because consumers appear unwilling to accept more than a minor amount of pest damage. Even if apples were certified and tested to have no pesticide residues and were no higher in price, the amount of pest damage that would be accepted would be very small.

People's perceptions of the likelihood of someone in their household becoming ill from pesticide residues vary tremendously. About half of consumers view the chance of illness as fairly low, but a quarter see very high risks. Moreover, many types of illnesses are associated with pesticide residues in food--not just cancer. This finding has important policy implications because federal policy and risk communication has tended to focus exclusively on cancer. The public has other concerns that need to be addressed as well.

Despite the variation across people, perceptions of the likelihood of illness from pesticide residues explain little of the estimated willingness to pay for the different residue levels presented in this study. It is possible that it is people's uncertainty about what the risks could be that may better explain why people were willing to pay significant premia for guarantees that residues meet federal standards. If so, risk communication aimed at reducing people's perception of the average risks from pesticides may have little impact on consumer concerns. What may be needed instead is information about the safeguards in place that reduce the chance of mistakes--mistakes which could result in contamination problems or mistakes which could result in the need to revise tolerances for pesticide residues in food. This type of information would increase trust and reduce uncertainty about risks.

The methods used in this study provide a new approach for understanding consumer concerns about food safety. However, the results are contingent upon the specific market conditions presented to consumers. Different types of market conditions and products need to be examined to determine their impact upon willingness to pay for food safety improvements.

TABLE 1 HOUSEHOLD SIZE AND COMPOSITION

	CENSUS* HOUSEHOLDS	SAMPLE HOUSEHOLDS	SUB-SAMPLE HOUSEHOLDS
Average household size	2.6 persons	2.7 persons	2.8 persons
Percent of households with children under 18	35.1%	34.9%	38.4%
Percent of single-person households	28.5%	16.7%	15.0%

TABLE 2 HOUSEHOLD INCOME

INCOME	CENSUS* HOUSEHOLDS	SAMPLE HOUSEHOLDS	SUBSAMPLE HOUSEHOLDS
Less than $10,000	18.4%	8.4%	7.8%
$10,000- $49,999	63.1%	54.3%	60.6%
$50,000 or more	18.5%	26.4%	31.5%
No Answer		11.0%	
Mean before-tax household income	$32,144	$44,225	$46,463

TABLE 3 EDUCATIONAL ATTAINMENT OF RESPONDENTS

	CENSUS* RESPONDENTS	SAMPLE RESPONDENTS	SUB-SAMPLE RESPONDENTS
Percent of adults with no education or some elementary school education	6.8%	2.7%	1.9%
Percent of adults with only some high school education	16.9%	6.4%	5.9%
Percent of adults with high school diploma	38.9%	27.0%	26.8%
Percent of adults with some college education	17.0%	28.6%	29.9%
Percent of adults with college or graduate education	20.3%	31.9%	35.6%
No Answer		3.3%	

*SOURCE: U.S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States 1990. Washington, D.C.: U.S. Government Printing Office. 1990. Pages 45, 133, 445, 446, and 449.

TABLE 4 AGE OF HOUSEHOLDER**

Age of householder	CENSUS* HOUSEHOLDS	SAMPLE HOUSEHOLDS	SUBSAMPLE HOUSEHOLDS	Age of respondent
15-24	5.7%	4.2%	4.4%	25 or less
25-34	22.6%	16.2%	17.8%	26-35
35-44	21.2%	20.0%	23.2%	36-45
45-54	15.0%	17.0%	18.7%	46-55
55-64	14.1%	14.7%	14.4%	56-65
65-74	12.5%	18.3%	17.4%	66-75
75+	8.8%	6.3%	4.1%	76+
		3.2%		No answer

**The age categories on the left are used by the U.S. Census. The age categories on the right were used in this survey

*SOURCE: U.S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States 1990. Washington, D.C.: U.S. Government Printing Office. 1990. Pages 46.

TABLE 5 GENDER OF RESPONDENTS

	Full Sample	SubSample
FEMALE	52.2%	53.5%
MALE	43.9%	46.5%
NO ANSWER	4.0%	

TABLE 6 Q. How confident are you that the food your household eats is safe?

N = 906 U.S. Households

COMPLETELY CONFIDENT	9.5%
MOSTLY CONFIDENT	57.8
SOMEWHAT DOUBTFUL	23.4
VERY DOUBTFUL	3.8
NO ANSWER	5.5

TABLE 7 Q. The following is a list of potential food safety problems. In terms of the health of your household, which problem do YOU think is the most serious? Second most serious? Least serious?

N = 906 U.S. Households

	Most Serious	Second Most Serious	Least Serious
Residues of pesticides	28.4%	29.0%	7.3%
Additives and preservatives	20.1	21.7	17.9
Germs or bacteria	19.5	15.0	20.9
Fat and cholesterol	21.6	13.2	30.9
Residues of antibiotics and hormones	5.4	15.8	17.1
No answer	5.0	5.2	6.0

TABLE 8 Q. What do YOU think the chances are that there are any pesticide residues in each of the following types of food that you might buy when you do the grocery shopping?

0.	No (0%) chance	6.	51-60% chance
1.	1-10% chance	7.	61-70% chance
2.	11-20% chance	8.	71-80% chance
3.	21-30% chance	9.	81-90% chance
4.	31-40% chance	10.	91-100% chance
5.	41-50% chance		

N = 906 U.S. Households

ITEM	AVERAGE SCORE
Fresh fruits and vegetables	5.8
Apples	5.5
Lettuce	5.4
Tomatoes	5.2
Oranges	4.8
Fresh fish (fresh or salt water)	4.3
Fresh Meats (beef, chicken, pork)	4.2
Frozen or canned fruits and vegetables	4.1
Fruit juices or vegetable juices	4.1
Cereals, flour, or uncooked grains	3.8
Dairy Products	3.1
Bread and baked goods	2.9

TABLE 9 Q. What do YOU think the chances are that someone in your household will have health problems someday because of the current level of pesticide residues in their food?

N = 906 U.S. Households

0.	No chance	4.1 %	
1.	1 in a Million	19.5 %	
2.	1 in 100,000	16.4 %	
3.	1 in 10,000	13.4 %	AVERAGE = 3.3
4.	1 in 1,000	15.6 %	
5.	1 in 100	12.1 %	
6.	1 in 10	5.1 %	
7.	1 in 5	3.2 %	
8.	1 in 2	1.0 %	
9.	Certain to happen	4.4 %	
	NO ANSWER	5.2 %	

TABLE 10 Q. What do YOU think the chances are that someone in your household will have one of the following health problems someday because of the current level of pesticide residues in their food?

0.	No chance
1.	1 in a Million
2.	1 in 100,000
3.	1 in 10,000
4.	1 in 1,000
5.	1 in 100
6.	1 in 10
7.	1 in 5
8.	1 in 2
9.	Certain to happen

N = 906 U.S. Households

SCORE:	0	1	2	3	4	5	6	7	8	9
Cancer					3.8					
Allergies					3.6					
ALL HEALTH PROBLEMS					3.3					
Heart disease				2.8						
Nervous system disorders				2.7						
Impaired immune system				2.5						
Impaired child development			2.1							
Birth defects			2.0							
Mental Illness			1.8							

TABLE 11 Q. Which, if any, of the following things do you do regularly to avoid pesticide residues in the fresh produce you buy?

N = 906 U.S Households

ITEM	PERCENT
Do Nothing	5.1 %
Rinse fresh produce with water	90.8
Grow my own fresh produce	29.8
Avoid imported produce	23.0
Wash produce with soap and water	11.0
Buy foods tested for pesticide residues	11.1
Buy organic food	10.7
Other	5.0
No answer	1.2

TABLE 12 Suppose all foods you bought were tested and certified to have (SEE LABELS BELOW). How much do you think that would REDUCE the chances your household will have health problems someday because of pesticide residues?

0. Not at all (0%)
1. A little (10-20%)
2. About a third (30-40%)
3. About half (50%)
4. About two-thirds (60-70%)
5. A lot (80-90%)
6. Totally (100%)

N = 906 U.S. Households

LABELS:	0	1	2	3	4	5	6	N/A	AVG SCORE
	%	%	%	%	%	%	%	%	
No Pesticide Residues	7.7	16.1	8.1	9.9	8.6	28.8	18.4	2.3	3.6
No Detectable Pesticide Residues	7.7	17.2	10.2	15.6	13.1	28.8	5.3	2.1	3.2
No Residues Above Federal Limits	8.7	23.8	18.0	19.5	11.8	13.1	3.1	1.9	2.6
OWN ACTIONS*	4.5	31.3	17.1	17.7	8.1	15.8	0.8	4.7	2.5

*The question here was: How much do you think the actions you take reduce the pesticide residues in the fresh produce you buy?

TABLE 13 ADDED WILLINGNESS TO PAY FOR CERTIFIED AND TESTED APPLES

N = 681 Households

Apples Certified and Tested to Have:	Added Price per Pound in Cents
No Pesticide Residues	37.5
No Detectable Pesticide Residues	23.6
No Residues Above Federal Limits	23.6

TABLE 14 PROBABILITY OF APPLE PURCHASE

PRICE	NO LABEL	FEDERAL LIMIT LABEL	NO RESIDUE LABEL
.39	.7439	.8222	.8580
.49	.7079	.7926	.8323
.59	.6698	.7604	.8038
.69	.6297	.7256	.7725
.79	.5883	.6884	.7386
.89	.5458	.6493	.7023
.99	.5028	.6085	.6638
1.09	.4597	.5664	.6236
1.19	.4171	.5236	.5819
1.29	.3755	.4805	.5393
1.39	.3352	.4376	.4962
1.49	.2968	.3954	.4532

TABLE 15 WILLINGNESS TO ACCEPT PEST DAMAGE ON CERTIFIED AND TESTED APPLES

N = 681 Households

Apples Certified and Tested to Have:	% of Apple in Photo With Pest Damage
No Pesticide Residues	11.9%
No Detectable Pesticide Residues	7.5
No Residues Above Federal Limits	7.5

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