ENERGY STAR® Awareness as a Function of Survey Method

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ABSTRACT

This paper compares three survey methods (telephone, mail and WebTV) used in Wisconsin to measure ENERGY STAR® awareness among residential consumers. The authors discuss response bias, method effects and definitional issues in regards to measuring ENERGY STAR awareness. They conclude that the best survey method is, in part, dependent on what the researcher is trying to measure. But, program theory must drive what is measured.

Introduction

In the summer of 2000 the Energy Center of Wisconsin (ECW) and the Focus on Energy (FOE) program evaluators[1] jointly funded three studies to measure consumer awareness of the ENERGY STAR® logo in Wisconsin and its influence on purchases. These studies were conducted in June 2000, each with a random sample of Wisconsin households.

ENERGY STAR is a national program from the Environmental Protection Agency (EPA) and the Department of Energy (DOE) that identifies energy efficient products and homes with an ENERGY STAR logo. EPA, DOE and local programs work to make the public aware of ENERGY STAR and motivate consumers to use the logo when making purchase decisions. ENERGY STAR program implementers and evaluators are attempting to measure the impacts of the logo and program promotional efforts on consumer awareness and decision making.

The Wisconsin studies provide an opportunity to compare three survey methods—mail, telephone and WebTV—with respect to their effects on measurements of awareness and comprehension of the ENERGY STAR logo.

In this paper we discuss three main issues that arise when assessing the results of these studies.:

- ✓ *Non-response bias*—we compare the survey respondents to the population with respect to those demographic characteristics for which we have data.
- ✓ *Method effect*—When and if respondents see the logo during the survey itself affects their reported recall and demonstrated comprehension of the ENERGY STAR logo. The different survey methods provide different levels and timing of exposure to the ENERGY STAR logo during the survey process.
- ✓ *Definitional issues*—determining whether or not a respondent is "aware" of ENERGY STAR, and whether they "really know" what it means proved to be a knotty issue.

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[1] ECW and SFMC have collaborated on several evaluations of appliance efficiency programs in Wisconsin, to minimize the costs of related research and to ensure the comparability of data collection activities. ECW is an independent organization that provides research and demonstrations to further energy efficiency in the state. One of its ongoing activities has been assessment of appliance efficiency programs sponsored by Wisconsin investor-owned utilities and, more recently, promotion of ENERGY STAR qualified products. The Wisconsin Focus on Energy has been a pilot effort in the Northeastern portion of the state, in preparation for statewide programs using public benefits charges. It has been sponsored by the Wisconsin Department of Administration, which contracted PA Consulting to conduct independent evaluations of its components. SFMC is a subcontractor charged with evaluation of the ENERGY STAR products component.

Background

Three ENERGY STAR awareness studies were conducted concurrently in Wisconsin in June 2000, using the same core questions, as adapted to the research method involved. The first was a telephone survey, designed to replicate a 1999 Wisconsin study. The second was an adjunct to a national mail survey sponsored by the Consortium for Energy Efficiency (CEE) The final study used a pre-recruited panel of households who responded via WebTV.

Telephone survey. In 1999, the Energy Center of Wisconsin, with supplemental funding from Wisconsin Focus on Energy, included ENERGY STAR awareness questions in its biennial appliance sales tracking study. This study, conducted by telephone with random digit dialing (RDD), served as a baseline of ENERGY STAR awareness in Wisconsin. Given the baseline data, we wanted to continue the telephone approach in 2000 to collect longitudinal data and measure changes in awareness.

Mail survey. This study, sponsored by CEE and some of its members, used a mail survey developed by the EPA and its contractors to measure awareness of the ENERGY STAR logo. As our contribution to the national efforts of CEE, we agreed to conduct an (over)sample of the mail survey in Wisconsin to permit the assessment of methods effects reported in this paper.

Participating in the mail survey offered several benefits. First, we could compare Wisconsin mail survey results to national mail survey results as a gauge of local program impacts. Second, we would have both telephone and mail survey results for the same year. If future years included only mail surveys, we would have a 'bridge' from the telephone baseline to mail surveys. Finally, we could explore the effect of the data collection method on measurement of ENERGY STAR awareness.

WebTV panel. The final study used the population of Wisconsin households recruited for a panel who responded via WebTV. These households were recruited from an RDD list and provided WebTV at no charge while they serve on the panel. The panel was designed to be representative of the population, so some households were recruited to fill specific quotas. (This recruitment approach represents an attempt to overcome the potential bias of including only households with computer literacy and access to the internet.)

The WebTV survey was included for two purposes. First, we wanted to test this promising new approach to collecting survey data. Moreover, we believed that given its low costs it might be a better alternative than mail surveys for national data collection.

Overall Findings

The three studies yielded a wide range of estimates of both ENERGY STAR logo recognition and comprehension. Table 1 below shows these estimates by survey type.

Table 1. ENERGY STAR Recognition and Comprehension by Survey Method

	Survey Method (number of respondents)		
	Telephone (n = 1022)	**Mail** (n = 282)	**WebTV** (n = 201)
Recognition	17 %	36 %	32 %
Comprehension	11 %	45 %	57 %

The variation in these estimates is a function of three interrelated factors—non-response bias, method effects, and definitional issues.

Non-response bias

The response rate varied considerably across the three survey methods, as shown in Figure 1. These low response rates raise concerns regarding the representativeness of the respondents to the underlying population: If they differ in a way that is related to the research topic, the study estimates will be biased. These response biases may explain some of the observed variance in recognition and comprehension of the ENERGY STAR logo.

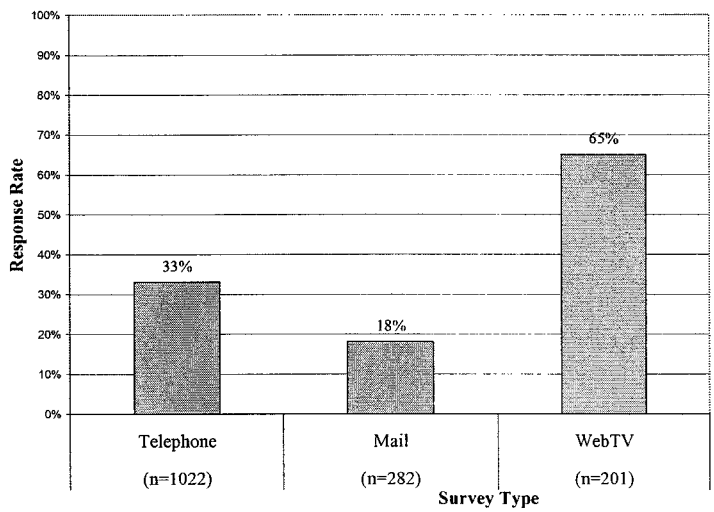

Figure 1. Response Rates to Wisconsin ENERGY STAR Surveys

Indeed, those who are the target audience for ENERGY STAR purchasing are more likely to respond to the mail and WebTV surveys. Generalizing these results to the Wisconsin population may overstate recognition and awareness of the ENERGY STAR logo in the general population.

Method effects

The three survey methods, by necessity, are administered with different levels and timing of exposure to the ENERGY STAR logo. Level of exposure is simply whether the respondent sees the ENERGY STAR logo as part of the survey research. Timing of exposure is whether the respondent is asked about the logo prior to seeing it. Telephone surveys do not allow for exposure to the logo as part of the survey process. Mail survey designers can chose whether or not to show the logo, but cannot control at which point the respondent does see it. WebTV surveys allow for control of both exposure to the logo and the timing of that exposure.

Since both the WebTV and mail survey respondents could see the logo as part of the survey, many discerned its meaning. Hence, the most generous estimate of comprehension (as shown in Table 1) includes those with no prior exposure to the logo. The ability to control timing and exposure to the logo in the WebTV allows researchers to answer more questions about the type and level of understanding of ENERGY STAR. It also gave the authors the opportunity to explore the effects of timing and exposure to survey responses.

Definitional Issues

In developing and analyzing these surveys we struggled with two definitional issues. First, what is meant by "awareness" of the ENERGY STAR logo? It can be aided recognition, unaided recognition or an understanding of the message the logo attempts to convey. The definition of 'awareness' is dependent upon what the researchers determine the goal of the ENERGY STAR program or activity to be. Second, open-ended questions regarding the meaning of the logo require survey coders to categorize responses and analysts to make a determination about comprehension. We found inconsistencies in the coding for the telephone and mail surveys.

Clarifying these definitional issues is important for determining which survey method to use. It is also important for making comparisons across surveys conducted at different times or in different regions. A comparison of survey results of awareness based on unaided recognition to a survey that used aided recognition, for example, would indicate differences that are a definitional artifact.

Detailed Findings

A more detailed look at our analysis and findings across the three survey methodologies supports our conclusion that the survey method should be determined in part by what the researcher is trying to measure. The selected measurement, in turn, should be supported by the program theory.

Non-response bias

Response rates. The national ENERGY STAR Awareness Mail survey had a response rate of 6%. In Wisconsin the response rate was higher (18 percent), in part because the mailing included a cover letter on the letterhead of the Energy Center of Wisconsin that gave the survey a more local focus and provided a contact name and number.

Nonetheless, the mail survey had the lowest response rate of the three Wisconsin surveys, followed by the telephone survey and then the WebTV. The response rates are not directly comparable,. The mail survey response rate is the simplest to calculate; it is the number of respondents divided by the total number of households sent the survey. This does not remove surveys returned because of bad addresses nor does it eliminate businesses.

The RDD telephone response rate (33 percent) is based on the number of households called, as best could be determined. Numbers that were businesses, disconnected, or dedicated computer or fax lines were eliminated. For many numbers, however, this determination was not possible because the telephone was never answered. These cases were counted as valid residential phone numbers and thus entered the denominator, lowering the response rate.

The low telephone response rate also reflects the time provided for the study effort. The telephone survey was limited to a two week time period with a target of obtaining a certain number of surveys within the sampling cells (based upon geography). Therefore, new numbers were entered into the sampling frame before existing numbers were exhausted. As a result, non-response was biased toward people who were not home when we were calling. We also note that higher response rates are achievable using the telephone approach if procedures emphasizing response rates are used (we had greater than 60 percent response rate to the Appliance Saturation Survey).

The WebTV response rate (65 percent) is based on the number of households participating in an established panel who did respond, compared to the number of those who did not. It does not factor in households that initially refused to be part of the panel.

The company maintaining the panel strives to have a panel comprising households representative of national characteristics. Therefore, when a household refuses to be a member of the panel a household with similar characteristics is recruited. Participating households are provided with WebTV access and user training, so the panel is not limited to those who are computer literate and equipped. It does not include, however, those who are techno-phobic. It should also be noted that the WebTV survey contractor recruited new households for this study because the previously existing number of panel households in Wisconsin was too low to achieve the goal of 200 completions.

Response bias. We compared the Wisconsin survey respondents to the Current Population Survey (CPS) results for May 2000 on demographic characteristics that were included in the surveys and the CPS. This analysis, Table 2 below, shows that the demographic composition of each survey differs significantly from the CPS. We outline these differences below.

- *Home Ownership*. Respondents to the mail survey are much more likely to be homeowners than the Wisconsin population.
- *Education.* Households with the lowest educational levels are less likely to respond to each of the surveys.
- *Income.* Households with the lowest incomes are less likely to respond to each of the surveys.
- *Number of persons in the household.* Single person households are less likely to respond to each of the surveys.
- *Housing type.* People in single-family dwellings are much more likely to respond to the mail survey and those living in manufactured homes are less likely to respond to any of the survey types.

Many ENERGY STAR products are for home improvement (windows, doors) or more likely to be purchased by homeowners than renters (e.g., major appliances, heating and cooling systems). Furthermore, ENERGY STAR products tend to be more expensive than other products of the same type. Therefore, the target market for many ENERGY STAR products is homeowners with higher incomes. Since income and education are correlated, one explanation for these findings is that the respondents to the surveys are more likely to be those who have been exposed to ENERGY STAR logo when shopping or through targeted advertising.

Table 2: Comparison of Survey Respondents to the Current Population Survey

	Survey Type			
Demographic Variables	**Phone**	**Mail**	**WebTV**	**CPS**
Home Ownership		***		
Own	71 %	90 %	75 %	69 %
rent and other	29	11	25	30
	(1011)	(275)	(175)	(683)
Education	***		***	
high school or less	41 %	Na	31 %	48
some college/tech grad	28	Na	39	27
college grad	20	Na	22	15
graduate school	10	Na	8	10
	(989)		(202)	(683)

Table 2: Comparison of Survey Respondents to the Current Population Survey (continued)

Demographic Variables	Phone	Mail	WebTV	Current Population Survey
1999 Household Income	***	***	***	
less than $25,000	26 %	21 %	13 %	34%
$25,000 - $49,999	35	30	39	29
$50,000 - $75,000	21	29	29	22
greater than $75,000	18	20	19	15
	(597)	(240)	(184)	(580)
Number of people in household	***	***	***	
1	18 %	21%	17 %	26%
2	37	39	38	34
3	15	14	15	17
4	18	18	15	13
5+	11	8	14	10
	(998)	(267)	(175)	(663)
Type of housing[1]	***	***	***	
Single family home	72%	85%	73%	72 %
multi-family	25	11	22	22
manufactured home	3	3	2	5
Other	0	1	3	1
	(1015)	(277)	(175)	(720)

na Not available

*** Difference from Current Population Survey is statistically significant at the 95% confidence level using a Chi-squared test.

Method effects

Visually aided and unaided recognition. The next analysis addresses the different levels of 'awareness' of ENERGY STAR across the three survey populations. Respondents in each of the surveys were asked if they had seen or heard of the ENERGY STAR logo prior to the survey. Respondents in the telephone survey never saw the ENERGY STAR logo as part of the survey. Their responses are based on unaided recognition of the term ENERGY STAR logo.

In contrast, mail survey respondents saw the logo at the outset of the survey instrument, and so were visually aided in their recall. The WebTV provided control of exposure to the logo, and allowed us to determine the impact of visually aiding respondents in their recognition. Figure 2 shows the flow of questions for the three survey instruments. WebTV respondents were asked the questions similar to the telephone survey, then shown the logo (like the mail survey) and asked to either confirm that this is what they recalled, or indicate whether they now recognized it.

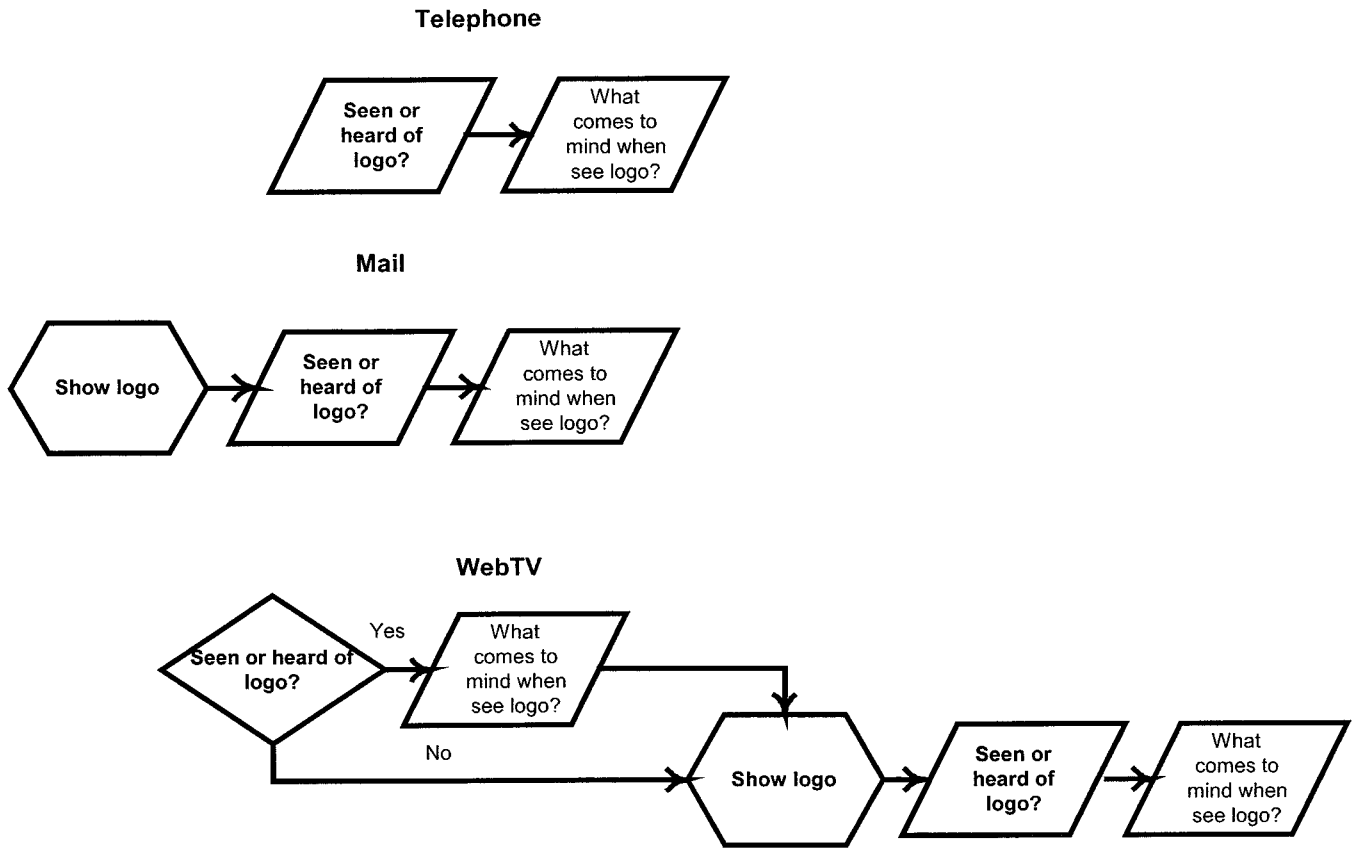

Figure 2. Level and Timing of Exposure to the ENERGY STAR Logo

Table 3 shows the percentage of respondents from each survey who claim to recognize the ENERGY STAR logo, either visually aided or not. Without a visual aid, 28 percent of the WebTV respondents and 17 percent of the mail respondents report having seen or heard of the ENERGY STAR logo prior to the survey. One explanation for the lower percentage (compared to WebTV) of those recognizing the logo in the telephone survey is related to the fact that telephone respondents have the lowest education and income characteristics of the three sets of survey respondents. Aided recognition is consistent between the WebTV and mail survey respondents.

Table 3. Recognition of ENERGY STAR Logo by Survey Type

	Unaided Recognition	**Aided Recognition**
Survey Type		
Mail (n = 282)	na	36 %
Telephone (n = 1022)	17 %	na
WebTV (n = 201)	28 %	32 %

A more detailed examination of the WebTV respondents shows that some respondents incorrectly report that they have or have not heard of or seen the ENERGY STAR logo. Table 4 below shows that although 28 percent of respondents report prior knowledge of the logo, only 19 percent of

them confirm that this is what they were thinking of when they responded. In other words, nearly 1/3 (9/28) of those claiming unaided recognition were wrong (false positives). However, an additional 13 percent recognize the logo after being shown the picture (false negatives). Overall, in the WebTV survey a total of 32 percent of respondents recognize the ENERGY STAR logo with a visual aid, comparable to the 36 percent who recognize it in the mail survey.

Table 4. Aided and Unaided Recognition of ENERGY STAR Logo by WebTV Respondents

		Unaided Recognition	
		Yes	**No**
Aided Recognition	**Yes**	19 %	13 %
	No	9 %	59 %
	Total	28 %	72 %

Comprehension. For the analysis of comprehension for telephone and WebTV with unaided recognition we coded responses to the question "What does the ENERGY STAR label mean to you?" For the analysis of comprehension for mail and WebTV respondents with aided recognition we coded responses to questions that asked about ". . . the first message that comes to mind when you see the ENERGY STAR label?" Respondents were also asked to "describe any other messages that come to mind..." but those responses were not included in this analysis.

Respondents who gave an answer indicating they had an adequate understanding of the message that the ENERGY STAR logo attempts to convey were categorized as 'comprehending.' Their comments included references to energy efficiency, saving on costs, or linking the product to some environmental good or complying with some standards.

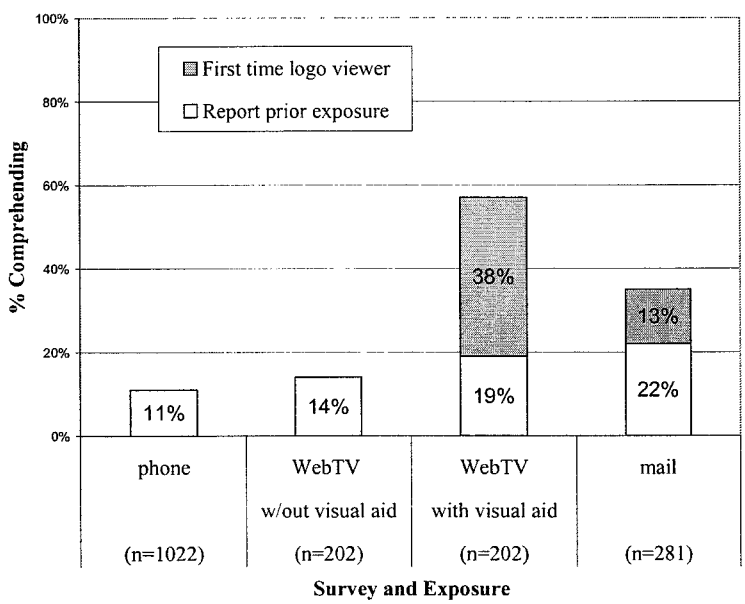

Figure 3. Comprehension of ENERGY STAR Logo by Timing in Survey and Prior Awareness of Logo

Figure 3 shows the percentage of respondents to each survey variation who were categorized as comprehending the ENERGY STAR logo by survey type and visual aid. The leftmost bars show the percentages of phone and WebTV respondents who could adequately describe the meaning of the ENERGY STAR logo without seeing it. (These WebTV respondents are only those who verified awareness after being shown the logo and were deemed "comprehending" based on answers provided before they saw it.)

The rightmost bars in the figure indicate the percentage of respondents who showed comprehension of the logo with a visual aid. The bottom part of the bar 'WebTV with visual aid'—19 percent of respondents—includes the 14 percent who confirmed having seen it before, plus an additional 5 percent who recognized the logo when it was shown to them. These respondents can be compared to the 22 percent of mail respondents who reported seeing the logo prior to the survey and showed comprehension by their description of its meaning.

The top part of the rightmost bars in the figure indicate the respondents who saw the ENERGY STAR logo for the first time as part of the survey, but were able to accurately discern its meaning. Almost one-half of the WebTV respondents (47 percent) and 17 percent of the mail survey respondents who had not previously seen the logo were able to discern its meaning This indicates that the ENERGY STAR logo in and of itself effectively communicates its message to many consumers.

A much lower percentage of mail respondents were able to discern the meaning of the ENERGY STAR logo when seeing it for the first time. This may be an artifact of the survey method. It is possible that mail survey respondents took less time and care completing the survey, as they had less of a commitment to the research. It is also possible that the coding was inconsistent across the two surveys or that demographic differences between the two sets of respondents affect their ability to discern the meaning .

Next we looked at ENERGY STAR comprehension by selected demographics. Table 5 shows the percentage of respondents within each group that showed comprehension of the ENERGY STAR logo. In this analysis, we only included those cases that reported prior awareness of the ENERGY STAR logo *and* adequately described what it means. The reported percentages are those in each group who comprehend the ENERGY STAR logo. For example, 37 percent of homeowners responding to the mail survey are aware of and comprehend the ENERGY STAR logo, compared to 24 percent of renters.

Table 5. Comprehension of the ENERGY STAR Logo by Selected Demographics

	Survey Type		
	telephone	**Mail**	**WebTV**
Home ownership			
Own	13[a] % (717)	37 % (246)	24[a] % (132)
Rent	7 % (289)	24 % (27)	5[a] % (43)
Education			
high school or less	9[ab] % (405)	Na	15 % (63)
tech. school/some college	14[a] % (277)	Na	22 % (78)
college grad	9[c] % (198)	Na	24 % (44)
graduate school	17[bc] % (99)	Na	13 % (16)

Table 5. Comprehension of the ENERGY STAR Logo by Selected Demographics (cont'd)

	Survey Type		
	telephone	**Mail**	**WebTV**
1999 Household Income			
less than $25,000	8^{ac} % (155)	16^{ac} % (50)	8% (12)
$25,000 - $50,000	10^{b} % (211)	22^{bd} % (72)	11^{a} % (47)
$50,000 - $75,000	19^{ab} % (124)	50^{ab} % (70)	19 % (91)
greater than $75,000	17^{c} % (106)	58^{cd} % (48)	29^{a} % (34)

na Not available

a,b,c,d Differences between groups (with the same letter) are significant at the 95 percent confidence level.

Comprehension of the ENERGY STAR logo is greater among those who own their home and have higher income (and education) levels. These households tend to be overrepresented in the respondent population (see Table 2). Therefore, the survey instruments, to varying degrees, may over-report the percentage of the total population that is knowledgeable about ENERGY STAR.

Conclusions

Non-Response Bias

Non-response bias is inherent in all survey research, where some portion of the sampled population will not respond to the questions. The greater the percentage of non-respondents, the greater the concern for bias. Low response rates and potential or real biases make it difficult to generalize study results to the population with any confidence.

All three survey methods had non-response bias, but the size of the bias, and to some extent, the nature of the bias varied by survey type. We know that people who are more interested in an issue are more likely to respond to a survey asking about that issue. Also, people who are aware of something are more likely to respond to a survey (this would have the biggest effect on the mail survey because respondents know what the survey is about as soon as they look at it), so a survey that tests awareness is likely to overstate that variable.

In the case of the ENERGY STAR surveys, we found that the targeted population (which is also those most likely to be aware) was overrepresented in the respondents. Therefore, all the survey methods, to varying degrees, are likely to over-report the percentage of households aware of ENERGY STAR. The respondents to the three survey methods differed somewhat from each other. Therefore, some of the observed differences in recognition and comprehension could be a result of differences in the survey population.

Method Effects

By method effects, we refer to possible differences in responses or results that are due to the nature of the survey instrument (separate from response rate effects). A significant difference across

these three survey types was the ability to show the ENERGY STAR logo, and with WebTV, to control the timing of respondent exposure to it. We expected surveys that show respondents the logo and ask if they have seen it before to result in a greater percentage of those that claim to recognize it. What we found in the WebTV experiment was that a sizeable proportion of respondents who reported knowing of the ENERGY STAR logo had been thinking of something else (false positives). When shown the logo they changed their answer, but were replaced by a slightly greater number of respondents who recognized it with the visual cue (false negatives).

Another potential method effect is the care with which respondents fill out the survey. WebTV panelists are getting something for their participation in the panel. They have made a prior commitment to complete surveys, and so may take the survey more seriously. Both mail and WebTV respondents can complete the survey at a time that is convenient for them to do so.

Table 6 summarizes issues related to each of the survey types.

Table 6. Summary of Method Issues for Three Survey Types

	Mail	**Telephone**	**WebTV**
response rate	very low	medium	high
time to complete	slow	controllable (but affects response rate)	fast
Costs	high	low	low
ability to control visual exposure	yes (either show or don't show)	no (can't show)	yes
ability to control timing of visual exposure	no	na	Yes
ability to provide graphics	high	none	high
size of sample population	high	high	low
repeatable with sample population	yes	Yes	no (until larger panel is established)
repeatable with different populations in geographic area	yes	Yes	no (until larger panel is established)
information on non-responders	limited	limited	relatively detailed
convenient (for respondent)	high	low	high

Definitional Issues

Defining terminology proved to be one of the more problematic aspects of the research. We found a lack of clarity on what the ENERGY STAR logo is attempting to convey, which led to problems defining "awareness." When we broke the awareness issue into recognition and comprehension, we still encountered issues. Recognition could be aided or unaided. Comprehension was both difficult to define, and difficult to determine by coding short answers to open-ended questions.

Besides the standard concerns regarding consistency across different coders, the coding categories for the telephone and mail surveys were substantially different. This clearly pointed to the need for ENERGY STAR researchers to agree to a specific coding scheme, with clear definitions of what falls under each category, to allow for comparisons across time, geography and method.

It isn't necessary to arrive at a single definition of awareness or comprehension. What is needed is to clearly identify differences in definitions, so that the coding of open-ended responses allows for differentiation among them. Then we must agree to a vocabulary that conveys the different meanings and agree to the codes that fall under that definition.

Overall

The research reported here shows once again that evaluators and market researchers must take care to identify the most appropriate method for measuring the effects that are at issue. Similarly, reviewers and regulators must be sure that they understand just what measurement methods lie behind a particular result. Different measurement procedures may produce quite different results for any of the several reasons discussed.

Furthermore, these findings indicate the importance of selecting measurement methods that are consistent with the theoretical expectations and needs of the program. With this information, the researcher can more readily select the appropriate study procedures. With respect to awareness of the ENERGY STAR logo, for example, it would be helpful to clarify the program theory before determining the survey method to be used to test that theory. Does the program theory require that customers be aware of the logo and its meaning before they begin shopping for appliances? Or does it only require that the logo engage the attention of the shopper and communicate its meaning to him or her during the shopping trip? In the first case, it would seem that the most important statistic for gauging the success of the promotion is unaided recognition, coupled with comprehension: The shopper should be *planning* to use the ENERGY STAR logo as a decision tool. In the second case, the most important measure would seem to be comprehension of the logo's connotation, whether or not the customer recognized it beforehand.[2]

We admit to being unclear, ourselves, as to the specifics of the program theory to be tested here. But that is one more value of methodological research—to spotlight issues that must be resolved by further theoretical development and analysis.

[2] We note that consistency of measurement technique is crucial to tracking changes in awareness or comprehension—even if a less-than-ideal measurement method has been selected.