

CUSTOMER SATISFACTION WITH INTERNET AND IVR AS CENSUS DATA COLLECTION TOOLS

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This paper reports the results of research and analysis undertaken by Census Bureau staff. It has undergone a Census Bureau review more limited in scope than that given to official Census Bureau publications. This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress.

1. Background

In early 2003, the Census Bureau implemented the 2003 National Census Test (NCT). The objective of the test was tri-fold: to study the impact of offering various self-response options, new or additional contact strategies, and alternative race and Hispanic origin questions on cooperation rates and data quality. The overall goal of the 2003 NCT was to identify the best strategy for increasing self response to the census, thus reducing the Nonresponse Followup (NRFU) workload. Successful accomplishment of this goal would improve the data quality of the 2010 Census while reducing the cost of data collection.

The NCT tested Internet, Interactive Voice Response (IVR), and paper response options. As part of an assessment of the success of the IVR and Internet applications, the Census Bureau issued customer satisfaction surveys to those who responded via those modes. This paper presents the methodology and results of the customer satisfaction surveys.

1.1 Previous Research

Internet

Census 2000 marked the first time in the history of the decennial census that the Census Bureau provided respondents with the option to submit their census form via the Internet. As part of a comprehensive plan to simplify public participation and to increase response rates to Census 2000, Census Bureau staff designed a web site to allow Internet users the option of reporting their census information via the web. Due to lingering security concerns, the site was not widely advertised, which resulted in a low level of Internet responses.

Regardless, the program was deemed operationally successful and recommendations for future work were to continue research on the Internet as a self-response option.

The Census Bureau implemented a customer satisfaction survey to evaluate the Census 2000 Internet Form. The survey was offered to respondents after successful completion of their Census 2000 Internet Form. Overall, 91 percent of respondents were satisfied with the Census 2000 Internet Form (U.S. Bureau of the Census, 2002b).

Also during Census 2000, the Census Bureau launched the Response Mode and Incentive Experiment (RMIE). One goal of this experiment was to investigate the effects of response mode [Computer Assisted Telephone Interviewing (CATI), IVR, Internet] on response rates and data quality. In this study, the Internet mode yielded relatively high data quality and it was believed that the benefits outweighed the additional cost associated with the mode (Caspar, 2002).

IVR

The Census Bureau tested an IVR system for census short form data collection in the 1995 Census Test. Very few respondents used the IVR system during this test, but usability testing showed that users responded favorably to the system.

In the RMIE, data quality was lowest for the IVR mode. This was primarily due to respondent confusion and the length of the survey. Although data quality was low and costs were high, recommendations were to research advances in speech recognition software to attempt improvements in the design of future IVR-based surveys (Caspar, 2002).

As part of the RMIE, a customer satisfaction survey was conducted with users of the IVR system. The survey was implemented immediately after respondents completed their census questions in the IVR system. The survey indicated that 72 percent of IVR respondents were satisfied or very satisfied with the instrument. However, respondents who came from large households tended to give lower overall satisfaction ratings. Related to this, respondents' level of satisfaction was influenced by the length of their calls. (Cantor et al., 2002).

2. Methodology

2.1 Panel Design

The methodology for the 2003 NCT consisted of a data collection strategy involving sixteen different experimental panels. One panel represented a control group that received a four-component mailing strategy including an advance letter, initial questionnaire package, reminder postcard and replacement questionnaire (sent to nonresponding households only).

Five of these panels comprised the self-response option portion of the test. These five panels examined strategies for increasing self-response to the census using alternative modes. Specifically, the panels tested the impact of offering different combinations of paper, Internet, and IVR reporting options.

The self-response option (i.e. Internet, IVR, and paper) panels reflect two strategies referred to as “push” and “choice”. Households in the push panels did not initially receive a paper questionnaire. In place of a questionnaire, those households initially received a guide for using one or both electronic response modes. The letter sent with the guide requested households to use one of the electronic response modes. The letter also used motivational language about the IVR and/or Internet systems. Households in the choice panels were offered the electronic response modes in addition to the option of mailing back a paper questionnaire, with no language pushing the respondent to use an electronic mode. Households assigned to any of the panels that included the IVR option were not told that it was an automated system. Specifically, the 2003 NCT self-response option panels were:

Control: Households received an advance letter, initial questionnaire, and reminder postcard. Nonrespondents received a replacement questionnaire.

Push IVR (M1): Tested a push strategy for the IVR system. Households initially received a guide to the IVR system in place of a paper questionnaire. Nonrespondents received a paper replacement questionnaire.

IVR Choice (M2): Tested a choice strategy for the IVR system. Households could choose to respond via paper or the IVR system. Nonrespondents received a replacement questionnaire.

Internet Choice (M3): Tested a choice strategy for the Internet. Households could choose to respond via paper or

the Internet. Nonrespondents received a replacement questionnaire.

Push IVR and Internet (M4): Tested a push strategy for the IVR and Internet. Households initially received a guide to both electronic response options in place of a questionnaire. Nonrespondents received a paper replacement questionnaire.

IVR and Internet Choice (M5): Tested a choice strategy for the IVR and Internet. Households in this panel could choose to respond via paper, IVR or Internet. Nonrespondents received a replacement questionnaire.

2.2 Modes

Housing units selected for the 2003 NCT were eligible to respond by up to three modes, depending on their panel assignment. The three modes included paper, Internet, and IVR. Each data collection mode collected the census short form data items.

Paper

The 2003 NCT short form was modeled after the Census 2000 short form, with only minor changes in the introductory language (to reflect the “test” nature of the form). The form allowed the respondent to list names for up to 12 household members. For up to six household members, the form provided space for reporting the 100 percent census data items (i.e. relationship, age/date of birth, sex, Hispanic origin, and race). The form also collected traditional short form housing unit level data (household count, home ownership, and telephone number).

Internet

The 2003 NCT Internet application required respondents to enter their 14-digit housing unit identification number, which was printed on the materials they received in the mail. The application collected short form housing unit level and person level data for up to 30 household members. The interactive application included a progress indicator on the left side of the screen and allowed respondents to back up and correct previously entered information. The system incorporated soft edits, which alerted respondents to incomplete or inaccurate responses but did not require corrections to these items. Once respondents went through each question for all household members, they could view a summary of their answers prior to making a final submission.

IVR

The 2003 NCT IVR application used speech recognition technology. That is, respondents were asked to speak their answers, and the system detected their response by comparing it to a set of “in vocabulary” responses for the question. The IVR system then repeated back to the respondent what it “understood” for verification. However, in some cases the respondent may not have answered the question. In addition, during verification, the respondent may have indicated that the IVR system heard the response incorrectly. In these two instances, the IVR system re-prompted the respondent with a slightly altered wording of the question. The altered wording either provided more information or let the respondent know that they could use touchtone entry to key in their response. However, if the system was still unable to understand the respondent after the maximum number of re-prompts (in general, two) then that question was considered a failure. If the question was one that the Census Bureau had determined as critical for further census processing, such as the unique housing unit identification number, then the respondent failed out of the IVR system and the call transferred to a telephone agent. Similarly, if there were two consecutive question failures, the call transferred to a telephone agent. Otherwise, the system moved on to the next question.

Transferred calls were handled in two different ways depending on when the transfer occurred. If the transfer occurred during business hours, the IVR system transferred the respondent to a telephone agent. The agent obtained the respondent’s census information by conducting an interview from the beginning (any data collected by the IVR did not carry over into the agent interview) and submitted the data via a modified version of the Internet application.

If the call was marked as a transfer during non-business hours then the IVR system gave respondents a new telephone number that would connect them directly to agents during business hours, thereby allowing respondents to bypass the IVR system.

2.3 Customer Satisfaction Surveys

Customer satisfaction surveys measured respondent reactions to the Internet and IVR response modes. The customer satisfaction surveys were offered to all respondents who completed the 2003 National Census Test by way of one of the electronic response modes. In general, each respondent completed their customer satisfaction survey in the same mode as their census form, and respondents to the customer satisfaction surveys were self-selected.

IVR respondents who transferred to a telephone agent (IVR Transfers) were also asked to provide customer satisfaction information for the IVR system. Agents implemented the short customer satisfaction survey prior to collecting the caller’s census information. The customer satisfaction survey questions were administered before the census questions, in order to obtain more accurate responses regarding the respondent’s experience in the IVR system. However, we did not want to deter respondents from subsequently giving their census information. Therefore, the survey was limited to three questions, and respondents were allowed to explicitly refuse to answer customer satisfaction survey questions.

The customer satisfaction surveys evaluated various aspects of the electronic response modes, including overall satisfaction. The satisfaction measures serve as indicators of the success of these response modes (in terms of customer satisfaction), and provide feedback for future census products using electronic response modes.

2.4 Distribution of Overall NCT Response

We looked at the amount of overall response to the 2003 NCT for a given panel that was due to each mode. The push strategy (panels M1 and M4) succeeded in pushing respondents to an electronic mode (however, the push panels had significantly lower overall national cooperation rates when compared to the control panel). In the Push IVR panel (M1), over 67 percent of respondents used the IVR system. In the Push IVR & Internet panel (M4), over 38 percent used the IVR system and over 30 percent responded by Internet. However, when given a choice between using an electronic response mode and paper (panels M2, M3, and M5), respondents largely chose to respond by paper (88.4 percent to 93.2 percent).

Across all panels that included the IVR option, 17 to 22 percent of IVR primary returns were ultimately completed by telephone agents. Considering the size and scope of a decennial census, the infrastructure required to accommodate this number of calls could be very extensive. Thus, a reduction in the proportion of calls transferred to agents would certainly be required.

2.5 Data Analysis

To analyze the customer satisfaction survey data, this paper presents descriptive statistics. Weighted means and variances are presented in tables to summarize, describe, and organize the data. For most items, data are presented overall and by push and choice panels because we anticipated differences by panel type for some items. That is, we expected that pushing respondents to use electronic modes may reflect negatively on their reported satisfaction.

2.6 Variance Estimation

To account for the stratified clustered sample design, WesVarPC version 4.1 was used to compute standard errors for all estimates. A jackknife replication methodology using random groups was used to estimate standard errors. The housing units were sorted in the same order that they were selected and the clusters of housing units (or housing units selected at each hit) were assigned sequentially to one of the 250 random groups.

3. Limitations

3.1 Short Term IVR System Failure

As part of the security plan for the IVR application, log files were to be deleted after a period of seven days. The first time the deletion was performed, a ‘bug’ was discovered in the software used to delete the log files. This bug caused some necessary links in the application to be deleted, which resulted in respondents receiving an error message at a point near the beginning of the IVR instrument. The links were restored approximately 38 hours later.

The exact behavior of the IVR system during the down period is unclear. Test calls to the IVR system illustrated that the behavior of the IVR instrument was inconsistent during this time. It was determined that some calls with households of size one were able to complete the interview without getting the error message. However, households of size two or more always got an error during this down time.

This problem may have customer satisfaction implications if respondents were transferred to an agent or if they tried the system a second time and successfully completed their census form via the IVR system.

3.2 Potential for Nonresponse and Selection Biases

The Internet satisfaction measures come from successful respondents only. That is, we were unable to obtain measures of satisfaction from those who tried to respond via the Internet, but did not complete the response process for any reason. Therefore, Internet satisfaction estimates may contain some bias due to the design and implementation of the customer satisfaction survey. However, satisfaction measures were taken from IVR respondents who completed the IVR process as well as those who failed out of the IVR system.

Due to the self-selected response nature of the surveys, the results may suffer from response bias. Respondents are

likely to represent customers with stronger feelings (very satisfied or very dissatisfied) compared to those who don’t take the time to respond (Wellens and Martin). Typically, customer satisfaction surveys experience low response rates, obtaining responses primarily from very satisfied or very dissatisfied participants. Therefore, nonresponse bias may limit the generalization of the survey data. However, the high response rates observed for these surveys (see Table 1) is likely to offset much of that bias.

3.3 IVR Dialogue

When we developed the dialogue for the IVR application, we had the constraint that the wording and flow of the census questions in the IVR system had to mirror the format of the paper questionnaire. This decision was made to minimize the possibility that the cooperation rates were due to questionnaire changes, rather than the offering of the specific mode. As a result, the dialogue was not optimal for an IVR application, and we believe some respondents had difficulty working through the application for this reason.

4. Results

This section discusses results from the three customer satisfaction surveys implemented in the 2003 NCT. Satisfaction rates are presented overall and broken out by push and choice panels. As mentioned previously, we suspect that, for particular satisfaction measures, respondents in the push panels might be less satisfied than those in the choice panels. T-tests were conducted to test for significant differences across type of panel at a significance level of $\alpha = 0.10$.

4.1 Customer Satisfaction Survey Response Rates

Table 1. Customer Satisfaction Survey Response Rates*

Mode	Overall	Push	Choice
Internet	97.1% n=2378	96.3% n=1470	98.5% n=908
IVR	92.5% n=4176	92.3% n=3723	94.0% n=453
IVR Transfers	95.8% n=1255	95.8% n=1100	95.5% n=155

[†]n’s represent number of eligible respondents

*Unweighted estimates

Table 1 shows response rates for each of the three customer satisfaction surveys. For IVR and Internet, customer satisfaction surveys were implemented immediately following the successful submission of an electronic census form. Response rates for the Internet and

IVR surveys are based on the number of users who successfully completed their census form via each mode and therefore, had the opportunity to respond to the customer satisfaction survey. The response rate for the IVR Transfer survey is based on the number of IVR users who transferred to an agent and provided their housing unit identification number. It was at this point that respondents had the opportunity to complete the IVR Transfer customer satisfaction survey.

We experienced very high response rates across all modes and across panel type. While response to customer satisfaction surveys is generally low, there are a few reasons why we may have experienced unusually high response rates. Those reasons include: a nearly seamless transition from census questions to customer satisfaction questions; low burden -- that is, we asked a small number of questions, and it required no extra work on the part of the respondent to get to the questions; and lastly, perceived legitimacy of government. Respondents to the customer satisfaction surveys came largely from the push panels. This was a reflection of the relatively small number of choice panel respondents who chose an electronic response mode. In addition, IVR respondents came from push panels at a higher rate than Internet respondents. This was likely the case because the IVR mode was offered in more panels (specifically, push panels) than the Internet mode.

4.2 Were respondents satisfied with the IVR system?

Satisfaction with the IVR system was measured via both the IVR and IVR Transfer surveys. The IVR satisfaction survey was voluntary and contained six questions. The IVR Transfer survey was voluntary and contained three questions. The questions on both satisfaction surveys dealt with respondents' experience in the IVR system.

Table 2. Satisfaction Ratings for the IVR System

	Overall	Push	Choice
Overall Satisfaction	67.0% (0.84%)	65.9% (0.91%)	76.4%* (2.24%)
Understood System's Voice	93.1% (0.42%)	93.0% (0.44%)	94.5% (1.26%)
System Understood Respondent	70.3% (0.80%)	69.7% (0.84%)	75.0%* (2.35%)

†Standard errors appear in parentheses
*Significantly different than push panel

Table 2 shows satisfaction ratings on three basic measures from the IVR customer satisfaction survey: overall satisfaction, ability to understand the system's voice, and system's ability to understand respondent's voice. Satisfaction was based on respondents reporting a four or

five on a five-point satisfaction scale, where five means "very satisfied" and one means "very dissatisfied".

In terms of overall satisfaction, only 67 percent of successful IVR respondents reported being satisfied or very satisfied with the IVR system. As expected, respondents in the push panels were significantly less satisfied with the IVR system than respondents in the choice panels. That is, we anticipated that respondents who were pushed to use a certain mode might be less satisfied overall than those respondents who chose their mode of response. Overall, respondents were satisfied with understanding the IVR system's voice. However, respondents were less satisfied with how well the system understood their voice. In addition, respondents in the push panels were significantly less satisfied with how well the IVR system understood their voice, when compared to the choice panels.

Among IVR Transfer respondents, just 42.5 percent reported being satisfied or very satisfied with the IVR system, overall. In the IVR Transfer survey, respondents in the push panels were also significantly less satisfied than respondents in the choice panels.

Table 3. Would IVR respondents use a Census IVR System in the future?

	Overall	Push	Choice
Yes	64.3% (0.79%)	62.7% (0.86%)	77.7%* (1.97%)
No	15.0% (0.58%)	15.8% (0.64%)	8.2%* (1.34%)
Not Sure	20.7% (0.66%)	21.5% (0.69%)	14.1%* (1.74%)

†Standard errors appear in parentheses
*Significantly different than push panel

Table 4. Would IVR Transfer respondents use a Census IVR System in the future?

	Overall	Push	Choice
Yes	51.6% (1.60%)	51.7% (1.74%)	51.3% (4.56%)
No	25.2% (1.36%)	26.1% (1.44%)	18.7%* (3.81%)
Not Sure	22.2% (1.26%)	21.7% (1.43%)	26.2% (4.36%)

†Standard errors appear in parentheses
*Significantly different than push panel

Respondents to both the IVR and IVR Transfer customer satisfaction surveys were asked whether they would use the same reporting system in the future. Table 3 and Table 4 show that, overall, 64.3 percent of IVR respondents and 51.6 percent of IVR Transfer respondents said they would use the system in the future. As we would expect, IVR respondents in the choice panels were significantly more

likely to say they would use the system in the future. Again, we anticipated that forcing respondents to use a certain mode would reflect in less satisfaction, and therefore reduced willingness to use the mode in the future. However, IVR Transfer respondents in the choice panels were no more likely to say they would use the system again than those in the push panels. One percent of IVR Transfer respondents refused this question. (Note: IVR Transfer respondents could refuse to answer satisfaction survey questions, however there was no separate concept of a refusal in the IVR and Internet satisfaction surveys.)

Table 5. How would IVR respondents prefer to respond to census questions?

Preferred Mode	Overall	Push Panels	Choice Panels
Internet	24.0% (0.78)	23.2% (0.86%)	31.2%* (2.49%)
Telephone	42.4% (0.76%)	40.8% (0.80%)	56.2%* (2.66%)
Mail	33.5% (0.80%)	36.0% (0.84%)	12.7%* (1.66%)

[†]Standard errors appear in parentheses
^{*}Significantly different than push panel

IVR respondents were asked their preferred mode of response, given the choice. Table 5 shows that, overall, just over 42 percent of respondents indicated they preferred to respond via the telephone. Choice panel respondents selected telephone as their preferred mode at a significantly higher rate than push panel respondents. This is not surprising, considering those in the choice panel always had a paper form as a response option, but chose to respond via the IVR. Those in the push panels were not given a paper form unless they received the targeted replacement questionnaire. Also worth noting is that push panel respondents selected mail as their preferred mode at a significantly higher rate than choice panel respondents.

4.3 Were respondents satisfied with the Internet form?

Respondents who successfully submitted their NCT Internet form found a customer satisfaction survey at their confirmation screen. The survey was voluntary, contained six questions, and was in a scrollable format. Results are presented overall and by push and choice panels. However, note that the push panel that included the Internet response option, also included IVR as a response option. So, respondents technically still had a choice in response options. Satisfaction was determined by those who selected “satisfied” or “very satisfied” on a five-point scale.

Table 6. Satisfaction Ratings for the Internet Form

	Overall	Push	Choice
Overall satisfaction	75.8% (1.04%)	74.3% (1.30%)	78.3%* (1.51%)
Time required to load the form	82.0% (0.82%)	80.7% (1.02%)	84.3%* (1.23%)
Moving through the form	82.4% (0.82%)	81.5% (1.09%)	83.8% (1.24%)
Ease of submitting the form	84.9% (0.82%)	83.9% (1.07%)	86.6%* (1.24%)
Privacy protection	64.0% (1.17%)	62.0% (1.45%)	67.3%* (1.74%)

[†]Standard errors appear in parentheses
^{*}Significantly different than push panel

In terms of overall satisfaction, Table 6 illustrates that respondents reported being satisfied or very satisfied nearly 76 percent of the time. Respondents in the choice panels were significantly more likely to report being satisfied or very satisfied overall than respondents in the push panel.

Satisfaction across the three middle measures is fairly consistent. That is, respondents are generally satisfied with the time required to load the form, moving through the form, and the ease of submitting the form. Choice panel respondents were significantly more satisfied with the time required to load the form and the ease of submitting the form than push panel respondents.

While satisfaction with the privacy protection seems low, it’s important to note that only about 10 percent of respondents reported being dissatisfied or very dissatisfied with privacy protection. About 25 percent reported neither satisfaction nor dissatisfaction. This was likely due to the lack of obvious information on privacy protection in the introductory pages of the Internet instrument. Choice panel respondents were significantly more likely to be satisfied with the privacy protection than push panel respondents.

Internet respondents were asked why they chose to respond to the 2003 NCT online, and respondents could choose multiple reasons. Overall, respondents felt that the Internet was the most convenient way to respond. Respondents also felt that responding via the Internet was easy, and for many respondents, the Internet was simply their preference. Respondents in the choice panels were significantly more likely to say they preferred to use the Internet, when compared to respondents in the push panel.

When respondents were asked whether they would use a Census Internet form in the future, 93 percent indicated that they would. It is also important to note that less than one percent of respondents said they would not use the

system again. There were no significant differences in response across the choice and push panels.

Table 7. How would Internet respondents prefer to respond to census questions?

	Overall	Push	Choice
Internet	93.9% (0.53)	92.4% (0.79%)	96.5%* (0.62%)
Telephone	0.7% (0.20)	0.7% (0.27%)	0.7% (0.30%)
Mail	5.3% (0.49%)	6.9% (0.73%)	2.8%* (0.58%)

†Standard errors appear in parentheses
*Significantly different than push panel

Internet respondents were asked their preferred mode of response, given the choice. Table 7 shows that respondents overwhelmingly indicated that Internet was their preferred mode of response. However, respondents in the choice panels were significantly more likely to choose Internet than those in the push panel. Push panel respondents were significantly more likely to choose mail as their preferred mode of response, when compared to choice panel respondents. In addition, it is interesting to note, that even when pushed to electronic response modes, 92.4% of respondents still prefer the Internet.

4.4 How do the IVR and Internet satisfaction data compare?

A few of the customer satisfaction measures taken were included on both IVR and Internet satisfaction surveys. Here, we present these data again to see comparisons of those measures across modes. This section focuses solely on choice panel rates, because the overall rates for IVR and IVR Transfers were driven by push panels at a significantly higher rate than the Internet overall rates. Additionally, we know there were significant differences across the push and choice panels on these measures. Therefore, we continue with only the choice panel rates, because this is the more conservative implementation strategy.

Table 8. Comparison of Choice Panel Satisfaction Results by Mode

	Response Mode		
	Internet	IVR	IVR Transfer
Overall Satisfaction	78.3% (1.51%)	76.4% (2.24%)	53.1%** (4.20%)
Would use mode in future	93.3% (0.93%)	77.7%* (1.97%)	51.3%** (4.56%)

†Standard errors appear in parentheses
*Significantly different than Internet
**Significantly different than IVR

As shown in Table 8, cross mode comparisons showed significant differences in overall satisfaction. That is, Internet respondents were significantly more satisfied with their mode than IVR or IVR Transfer respondents. Similarly, those respondents who successfully completed their census form in the IVR system were significantly more satisfied with the IVR than IVR Transfer respondents. This is not surprising, considering those respondents who transferred to a telephone agent were likely to have experienced difficulties with the IVR system.

In addition, Internet respondents were significantly more likely to say they would use their mode in the future when compared to IVR and IVR Transfer respondents. Similarly, successful IVR respondents were significantly more likely to say they would use the IVR mode in the future when compared to those IVR users who ultimately completed their census form through a telephone agent.

Table 9. Which mode of response do respondents prefer?

Preferred Mode	Response Mode	
	Internet	IVR
Internet	96.5%* (0.62%)	31.2% (2.49%)
Telephone	0.7% (0.30%)	56.2%** (2.66%)
Mail	2.8% (0.58%)	12.7% (1.66%)

†Standard errors appear in parentheses
*Significantly different than Telephone and Mail
**Significantly different than Internet and Mail

As Table 9 shows, respondents tended to prefer the mode with which they responded. That is, IVR respondents preferred the IVR as a response mode over both Internet and mail. Internet respondents overwhelmingly preferred the Internet over both telephone and mail. However, IVR respondents seem relatively open to the Internet as a response option, while Internet respondents showed no interest in the telephone as a response option.

Note that respondents may have interpreted the telephone response option differently. IVR respondents are likely to have interpreted ‘telephone’ to mean an IVR system similar to the one they had just used. Internet respondents, however, may have interpreted ‘telephone’ as an IVR system or as speaking to a telephone agent.

5. Conclusions/Recommendations

The customer satisfaction surveys provided some very insightful information regarding respondent perception of the IVR and Internet instruments used in the 2003 National

Census Test. Internet respondents indicated relatively high satisfaction with their mode. That is, 76 percent of Internet customer satisfaction survey respondents said they were satisfied or very satisfied overall. In addition, 93 percent of the Internet respondents said they would use a Census Internet form in the future. Internet respondents felt it was the most convenient way to respond.

Overall satisfaction with the Interactive Voice Response system was relatively low. About 67 percent of respondents who made it through the system reported being satisfied overall, and 42.5 percent of IVR Transfer respondents reported being satisfied overall. Recall that we faced design constraints when designing the IVR system, in that it had to resemble the paper form as much as possible. Thus, we believe the low satisfaction is partly due to the specific design of the IVR system. Regardless, just over 64 percent of IVR respondents and 51.6 percent of IVR Transfer respondents said they would use a Census IVR system in the future and, when given a choice, respondents still prefer the telephone response mode.

Overall, the results indicate greater customer satisfaction with either electronic mode for those given a choice of response modes as compared to those 'pushed' to use a specific mode or modes. However, other research indicates some advantages with a push strategy in terms of speed of response (Brady, et al., 2003). Thus, more research is needed, including analysis of the cost implications to all census operations, before we can make decisions regarding how to proceed with the push versus choice strategies.

Recommendations for future research are as follows:

- Continue research on the Internet and IVR as census response modes. The relatively high satisfaction with the Internet, and respondents' willingness to use electronic systems suggest potential for using alternative modes in the next census. In addition, respondents are likely to become accustomed to these modes as we move into the future.
- Work towards improvements in the IVR system; that is, one that has better success in terms of hearing respondent answers. Respondents indicated that the system had trouble understanding their answers. An improved system and a reduction in the number of transfers to a telephone agent could increase respondent satisfaction with the IVR.

- To maximize customer satisfaction, investigate the use of help systems for electronic modes.

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