

Fair Market Rent Survey Design: Results of Methodological Experiment

Leslyn Hall

Redstone Research, LLC

Randal ZuWallack

ICF International, Inc.

Fred Eggers, PhD

Econometrica, Inc.

March 19, 2012 !

TABLE OF CONTENTS

Executive Summary.....	4
1. Introduction	6
1.1. Background	6
1.2. The FMR Area Survey Experiment Study Design.....	7
2. The Questionnaire	12
2.1. Introduction	12
2.2. Comparison of FMR Area Survey and FMR Experimental Survey Questionnaires	12
2.3. Performance of the Revised FMR Area Survey Questionnaire	14
2.3.1. Respondent Fatigue	20
2.3.2. Respondents' Inability to Understand and/or Recall.....	22
2.4. Data Quality	22
2.5. Housing Assistance Questions	24
2.6. Unique Feature of the Web and CATI Modes	26
2.6.1. Refusal Conversion Statements	27
2.6.2. Bracketing	28
2.7. Qualitative Evaluation of the Revised FMR Survey Questionnaire.....	30
2.7.1. Telephone Survey Introduction	30
2.7.2. Eligibility Questions.....	31
2.7.3. Rent	32
2.7.4. Utility Questions.....	33
2.8. General Recommendations	33
3. Estimating Fair Market Rents.....	35
3.1. Introduction	35
3.2. Sample Counts and Imputation	36
3.3. Conformity of the Samples	44
3.4. Survey Estimates of 2012 FMRs	49
3.5. Lessons Learned	61
4. Evaluation of the Different Approaches	63
4.1. Introduction	63
4.2. Response and Cooperation Rates	64
4.2.1. Area Response Rates.....	68
4.2.2. Dual-Frame RDD Landline/Cell Phone Design Features.....	69

4.2.3.	ABS Mail Survey Design Features.....	72
5.	Cost Effectiveness of the Experimental Conditions	77
5.1.	Cost Models	87
5.1.1.	RDD Landline/Cell Phone Survey Cost Model.....	87
5.1.2.	ABS Mail Survey	88
5.1.3.	Cost Benefit.....	90
5.2.	The Cost of a Web Survey	92
5.3.	Cost Benefit Recommendation	93
6.	Conclusions and Recommendations	94
7.	Works Cited.....	97
	Appendices.....	99

EXECUTIVE SUMMARY

Background: In March 2011, the United States Department of Housing and Urban Development's (HUD's) Office of Policy Development and Research (PD&R) awarded a contract to a research team led by ICF International to identify a new data collection methodology for obtaining the necessary information to calculate Fair Market Rent (FMR) estimates. Historically, HUD had collected current rental information using random digit dialing (RDD) telephone surveys for specifically defined geographic areas. However, the costs for these surveys had been substantially increasing while the response rates and reliability of the results had been declining.

The Experimental Design: ICF's FMR Survey Team devised an experiment to measure the marginal benefit (defined as the relative cost for each survey response rate percentage point obtained) for two different sampling and data collection strategies designed address the same problem: (1) determining the distribution of gross and contract rents of one- and two-bedroom rental units (serving as permanent residences) for buildings built over two years ago where respondents' landlords were neither a public housing authority (PHA) or a relative, and (2) situations in which respondents did not perform work for their landlord in exchange for reduced rent. Specifically, these strategies were:

- *A dual-frame random digit dial (RDD) landline/cell phone survey* (conducted in Columbia, SC and Peoria, IL): Sampled numbers were randomly assigned to one of nine experimental conditions to test the use of pre-notification letters, a Web survey option, and letters to non-responders in terms of their efficacy and potential impact on response rates. This survey took place over four weeks during July and August of 2011.
- *An address-based sample (ABS) mail survey* (conducted in Charleston, SC and Fort Wayne, IN): Sampled addresses were randomly assigned to one of 18 experimental conditions to measure the use of pre-notification letters, a Web survey option, a second survey packet mailing, reminder postcards, and follow-up telephone calls to non-responders in terms of their potential impact on response rates. This survey was administered over eight and a half weeks from the end of July to mid-September 2011.

Response Rate Results: Generally, the various combinations did not produce response rates over 40%; response rates ranged from 15% for cell phone interviews to 52.4% for mail surveys where the full protocol was implemented and telephone follow-ups were made. While the RDD landline portion of the telephone experiment and the ABS mail survey produced comparable response rates overall, when the different experimental conditions are evaluated we found that the ABS mail survey methodology yielded the highest response rates (52.4%) when two survey packets were mailed, a postcard reminder was sent, and telephone follow-up calls were made to non-responders (no pre-notification letter was mailed). Offering an invitation to complete the survey on the Web within the pre-survey notification letter and the reminder postcard also increased response rates, but it is unclear as to why since the additional responses were not received through the Web survey itself.

Table 1. Overall Survey Design Response Rates

		N	Response Rate 3	Cooperation Rate 1	Refusal Rate 3
Overall RDD		41,289	26.6%	95.8%	3.4%
	Landline	29,040	37.7%	98.5%	1.1%
	Cell	12,249	15.0%	89.5%	8.8%
Overall ABS		20,000	37.3%	Not computed	Not computed

Costs: Conducting the FMR Area Survey is costly, and it is generally more expensive to complete telephone interviews than to collect mail surveys. The cost per completed telephone interview for the different experimental conditions ranged from \$77.18 per complete at the lowest cost (e.g. RDD landline telephone interview, pre-notification letter without a Web invitation, and no non-response letter) to the most expensive at \$277.19 (e.g. RDD cell phone interview with a pre-notification letter without a Web option and no non-response follow-up letter). The cost per completed ABS mail survey ranged from \$67.45 (e.g. no pre-notification, two survey packets, a postcard without a Web invitation, and telephone follow-up) to \$123.16 (e.g. no pre-notification letter, one survey packet, a postcard reminder without a Web invitation, and telephone follow-up).

Optimal Design Combination: From a cost-benefit perspective, the ABS mail survey strategy that involves mailing two survey packets, sending a reminder postcard, and following-up on the telephone with non-respondents (and does not include mailing a pre-notification letter) produced the highest response rate for the cost of the survey. The estimated cost-per-completed-interview (CPCI) for this design is \$84.69, approximately two-thirds of the \$127.26 CPCI for the optimal RDD landline/cell phone survey design.

Survey Estimates: Both experimental approaches successfully obtained the information necessary to calculate the distribution of eligible rental units within the targeted geographies. The FMR Area Survey experimental survey data yielded distributions of rental housing units, housing units by bedroom size, and public housing status that were comparable to the American Community Survey (ACS) for the same areas. However, estimation of the FMR distribution was somewhat hampered by the survey response rate and item non-response within the questionnaire for critical questions. Both unit non-response and item non-response made it necessary to consider alternative means for calculating gross and contract rents. In addition, in order to have enough cases to calculate gross and contract rents, it was necessary to consider more than one- and two-bedroom rental units as well as to develop “hot-decking” imputation¹ methods to handle missing utility information for the cases where respondents had not indicated the type of fuel powering those utilities that they paid for.

Questionnaire: FMR Area Survey questionnaire was revised for the experiment. Language was simplified and terminology was standardized. Comparable questions from the ACS were adopted for the revised instrument. The final RDD landline/cell phone survey took seven minutes and seven seconds, on average, to complete. Overall, the revised questionnaire performed well with few mode differences; item response rates tend to be high, and respondents answered the majority of questions posed to them. While item non-response was higher on average for the ABS mail survey (5.11%), it was not significantly higher than the RDD landline/cell phone survey (2.72%); these results are in-line with other survey research findings. While the ABS mail survey had higher item non-response on average, it actually had higher item response for the questions eliciting rent values, and performed as well as the RDD landline/cell phone survey for the eligibility questions. The ABS mail survey had the greatest item non-response for questions concerning the type of fuels used to power specific utilities. The survey data and interviewing experience also indicate that respondents do not comprehend the questions designed to determine the type and amount of possible housing subsidies. Therefore, there are still areas of the questionnaire, depending on the selected methodology, that the FMR Survey Team would recommend revising in order to further diminish survey error.

Overall Recommendation: If it were necessary to choose between an ABS-only or a RDD landline/cell phone-only survey approach, we would recommend that HUD adopt the ABS sampling approach for both quality and cost considerations. This sampling strategy will not only address current coverage issues with

¹ “Hot decking” is a common statistical imputation method for missing data where the missing value for a particular unit is imputed from another unit.

the FMR Area Survey, but it is also easily scalable to large or small geographies. We recommend sending an initial survey packet, followed by a reminder postcard, a replacement survey packet, and finally calling any non-responders for which a telephone number can be identified. Depending on the circumstances and the number of surveys to be collected, we would encourage HUD to consider retaining the Web option, as it can be cost effective in some cases and industry trends indicate that this mode is growing in popularity among respondents. When working with mail survey data, we recommend an approach that will maximize the number of cases that can be retained for analysis. We also recommend a “hot-decking” approach to imputing the utility information needed to calculate FMRs when respondents fail to indicate the type of fuel powering specific utilities that they pay for.² Lastly, we urge HUD to consider revisions to the questionnaire, particularly with respect to how utility information is collected and housing assistance status determined.

1. INTRODUCTION

1.1. BACKGROUND

In September of 2010, the United States Department of Housing and Urban Development’s (HUD’s) Office of Policy Development and Research (PD&R) issued a competitive Request for Quotation for Survey Research and Overview of Area Rent Surveys. Specifically, PD&R sought to identify a new data collection methodology that would provide more up-to-date rent data for calculating Fair Market Rent (FMR) estimates. HUD had been collecting this rental information using random digit dialing (RDD) telephone surveys for specifically defined geographic areas.³ However, over the last several years, the costs for these surveys had increased substantially while the response rates and reliability of the results had declined.

In March of 2011, HUD selected a research team led by ICF International that included individuals from Econometrica and Redstone Research (hereafter, this team is referred to collectively as “the FMR Survey Team”) to help them identify a new methodology. The FMR Survey Team was tasked with drafting a survey methodology that would provide more current rent data than is available from the American Community Survey (ACS) and that would be based on the entire rental housing market for a HUD-defined geographic area. The new methodology could not use newspaper advertisements to gather rent data, as a previous audit of the FMR process specifically prohibited this method.

After reviewing the relevant survey research literature⁴ and meeting with PD&R to discuss HUD’s goals and objectives for a new survey methodology, the FMR Survey Team proposed an experiment to determine the optimal FMR survey design. The FMR Survey Team detailed the proposed experiment, along with their rationale based on the relevant research literature, in a document submitted to HUD in June of 2011 titled “Fair Market Rent Survey Design A Literature Review and Study Design Plan”. The overarching goal for the research endeavor was to create a design utilizing a survey sample and contact protocol that would produce the best data quickly and for as little cost as possible. The research was

² The current HUD FMR estimation methodology has imputation methods for determining utility rates that are not provided by HUD for unexpected fuel types for different utilities that respondents indicate they have responsibility to pay. However, HUD does not have procedures for imputing fuel types when respondents indicate paying for a utility but not what fuel powers it. “Hot decking” is a commonly accepted statistical method of imputation for this particular scenario.

³ See *Random Digit Dialing Surveys: A Guide to Assist Larger PHAs* (U.S. Department of Housing and Urban Development: Washington, DC. 2000) found at <http://www.huduser.org/portal/publications/pubasst/rdd.html> for a description of HUD’s RDD survey methodology.

⁴ ICF International, Econometrica, and Redstone Research wrote and submitted a literature review to HUD titled “Fair Market Rent Survey Design A Literature Review and Study Design Plan” (June 2011).

conceived as a pilot experiment designed to understand the costs and benefits of specific design choices, and the impacts on data quality. The research objective was to better understand the survey process; the objective was not to calculate FMR estimates or produce datasets for the experimental geographies.

This report details the findings from this experiment. The remainder of this section summarizes the experimental study design. The report is then divided into sections that examine the results:

- **Section 2: Questionnaire** – describes how the FMR Area Survey questionnaire was adapted for the experiment, and how well it collected the necessary information for calculating an area’s gross rent distribution.
- **Section 3: Estimating Fair Market Rents** – uses the data collected to calculate contract and gross rents for the areas surveyed and examines the differences observed between experimental methodologies. It also compares the estimated FMRs to the current FMRs (for the four geographic areas).
- **Section 4: Evaluation of the Different Experimental Conditions** – examines (in terms of response and cooperation rates) how the different experimental conditions performed in terms of eliciting responses from eligible respondents.
- **Section 5: Cost-Effectiveness of the Experimental Conditions** – analyzes the incremental benefits and costs associated with each of the different experimental conditions.
- **Section 6: Conclusions and Recommendations** – reflects on the survey experiment’s outcomes and offers conclusions and recommendations for a future FMR Area Survey data collection methodology.

1.2. THE FMR AREA SURVEY EXPERIMENT STUDY DESIGN

The core of the FMR Area Survey 2011 study design was an experiment to test the marginal utility⁵ of various protocol elements (*Figure 1-1*) selected to reduce different aspects of potential error within the FMR Area Survey. The experimental approach can be summarized as follows:

- **The methodologies:** We conducted two parallel FMR Area Surveys utilizing two different methodologies: (1) an address-based sample (ABS) using a modified version of Don Dillman’s Tailored Design Approach (Dillman, Smyth, & Christian, 2009) with a self-administered mail questionnaire (referred to as the “ABS mail survey”); and (2) a dual-frame RDD landline/cell phone sample administered by trained telephone interviewers (referred to as the “RDD landline/cell phone survey”).
- **Location:** The two different methodologies were conducted in separate geographic areas to avoid overburdening residents with requests for survey participation, having the samples overlap, or contaminating the results from two different methods. However, this choice meant relinquishing control over external factors that could influence outcomes, such as local economic conditions, natural disasters, and so forth. To ensure that our results were not unique to the particular areas we surveyed, we selected two similarly matched pairs of areas – conducting the RDD landline/cell phone methodology in one and the ABS mail in the other (for specifics on how these particular geographic areas were selected, please see *Appendix A: Area Selection*).

⁵ For our purposes, marginal utility refers to the increase in response rates (and therefore data quality) that HUD receives in return for the additional cost and time invested in each element of the data collection protocols.

- Columbia, SC (RDD landline/cell phone survey) and Charleston, SC (ABS mail survey).
- Peoria, IL (RDD landline/cell phone survey) and Fort Wayne, IN (ABS mail survey).
- **Definition of the population:** The FMR Experimental Survey defined the survey population as sampled adult residents of Columbia, SC, Charleston, SC, Peoria, IL or Fort Wayne, IN who rent a one- or two-bedroom housing unit, had recently moved, and had knowledge of their housing and utility costs. The data includes interviews with many more respondents who do not meet all of these criteria, making a more nuanced and complete analysis of the experimental results possible.
- **Sampling frames:** We created ABS and dual-frame RDD landline and cell phone sample frames to provide near-100% coverage of the residential household populations in the four designated geographic areas according to HUD's definitions. The dual-frame RDD landline/cell phone survey sample design compensates for the current coverage issues with the FMR Area Telephone Survey in that it includes cell phone-only households. The ABS mail survey design provided an alternative means for reaching eligible respondents without the telephony challenges of call blocking and caller ID⁶ (for a more specific explanation of how these frames were constructed, see *Appendix B: Sampling Frames*).
- **The questionnaire:** The FMR Experimental Survey relied on three distinct questionnaires appropriate for the mode of response but similar in content to the previous FMR questionnaire: a mail survey questionnaire, a CATI (Computer-Assisted Telephone Interviewing) survey questionnaire, and a Web survey questionnaire. These questionnaires differed from the original FMR questionnaire in that they: were written for an 8th to 9th grade reading level, standardized terminology for key concepts, incorporated validated questions from other Federal data collection efforts, and removed all of the previous termination points that HUD had used to screen for eligibility. Copies of these questionnaires, and the letters sent to respondents, can be found in *Appendix C: Survey Materials*.
- **Mixed-mode data collection:** The ABS mail survey and the RDD landline/cell phone survey ran in parallel from July 22, 2011 until August 18, 2011 (when the telephone experiment concluded and September 19, 2011 when the ABS experiment ended). *Appendix D: Timeline* contains a timeline for data collection activities. Both the ABS mail survey and the RDD landline/cell phone survey offered some randomly selected respondents the opportunity to complete the survey via the Web.
- **ABS and mail questionnaire:** We mailed a pre-notification letter to residents selected for this condition seven days before they could expect to receive a survey packet. There were two versions of this letter: (1) one for residents in the mail treatment group offering a Web option, and (2) one for residents in the mail treatment group that did not offer a Web option. One week later, we mailed survey packets (including cover letter, survey questionnaire, and a postage-paid return envelope) to all sampled residents in the mail treatment group. Two weeks after the pre-notification letter, we mailed reminder postcards to respondents designated for the postcard condition in the mail treatment. There were two versions of this postcard: (1) one for residents in the mail treatment group offering a Web option, and (2) one for residents in the mail treatment group without such an option. Two weeks later, records in the mail treatment designated for the second survey packet condition received a second survey packet replicating the first packet. Finally, approximately two weeks after the second survey packet

⁶ For a more nuanced, thorough discussion of the advantages and disadvantages of each of these sample approaches, see ICF International's *Literature Review and Study Design*.

was mailed, we made telephone calls to all mail treatment group non-responders for which a telephone number could be identified through the reverse-matching of addresses to telephone numbers. Copies of these materials can be found in *Appendix C*.

- ***The dual-frame RDD landline/cell phone sample telephone questionnaire:*** After selecting the RDD landline telephone sample, the sample was reversed-matched to obtain addresses to which a pre-notification letter could be mailed. The entire RDD landline sample was randomly assigned to either receive a pre-notification letter or not. Those selected to receive a pre-notification letter randomly received one of two possible versions: (1) one for residents in the phone treatment group offering a Web option, or (2) one for residents in the phone treatment group without the Web survey option. Sampled records with numbers known to reach cell phones, records in the phone treatment that were not selected for the pre-notification condition, and those records for which we did not have an address did not receive a pre-notification letter and were immediately sent to the phone treatment for dialing. Records in the phone treatment were attempted a maximum of seven times. One week after the pre-notification letters were mailed to selected respondents, we began calling all other respondents. Prior to dialing, we randomly assigned records to the possible treatment of either receiving or not receiving a non-response letter halfway through the dialing protocol. After three unsuccessful attempts, those records that we had designated to receive the non-response letter treatment where the telephone was believed to be a residential working telephone number were mailed a letter, and dialing ceased for one week (to allow time for the letter to be received). After this one-week hiatus, we returned these records to the larger sample and resumed calling. Throughout this time period, we continued to call those records not designated to receive non-response letters.¹

The survey protocols selected for both the ABS sample and the RDD sample were chosen because research has already established their efficacy for increasing response rates.⁷ However, it was not known how well these protocols would work for a data collection effort seeking to identify a low incidence population in which large numbers of housing units would need to be screened, as is the case with the FMR Area Survey. Furthermore, we were specifically seeking to test the following with respect to the FMR Area Survey methodology:

- ***Pre-notification letters:*** Although, these are known to increase response rates, they add a week to the data collection schedule and increase the project's budget (Edwards, et al., 2009). We were interested in better understanding not only how cost-effective they might be for a telephone survey, but also their utility with an ABS mail survey approach.
- ***Web response options:*** Some studies have indicated that response rates from mixed-mode studies are lower when mail and Internet options are offered at the same time (Griffin, Fischer, & Morgan, 2001); (Israel, 2009); (Messer & Dillman, 2010). However, there is also some evidence that the final samples in mixed-mode studies are more representative than the final sample in mail-only studies (Messer & Dillman, 2010). Furthermore, the public's willingness to complete Web surveys, the Internet's increasing penetration of American society (Pew Research Center, 2010), and the growing use of smart phones by young people (Smith A. , 2011) prompted our desire to investigate this approach.
- ***Second survey mailings:*** These are known to increase response rates, but they have a significant impact on the data collection schedule and costs (Dillman, Smyth, & Christian,

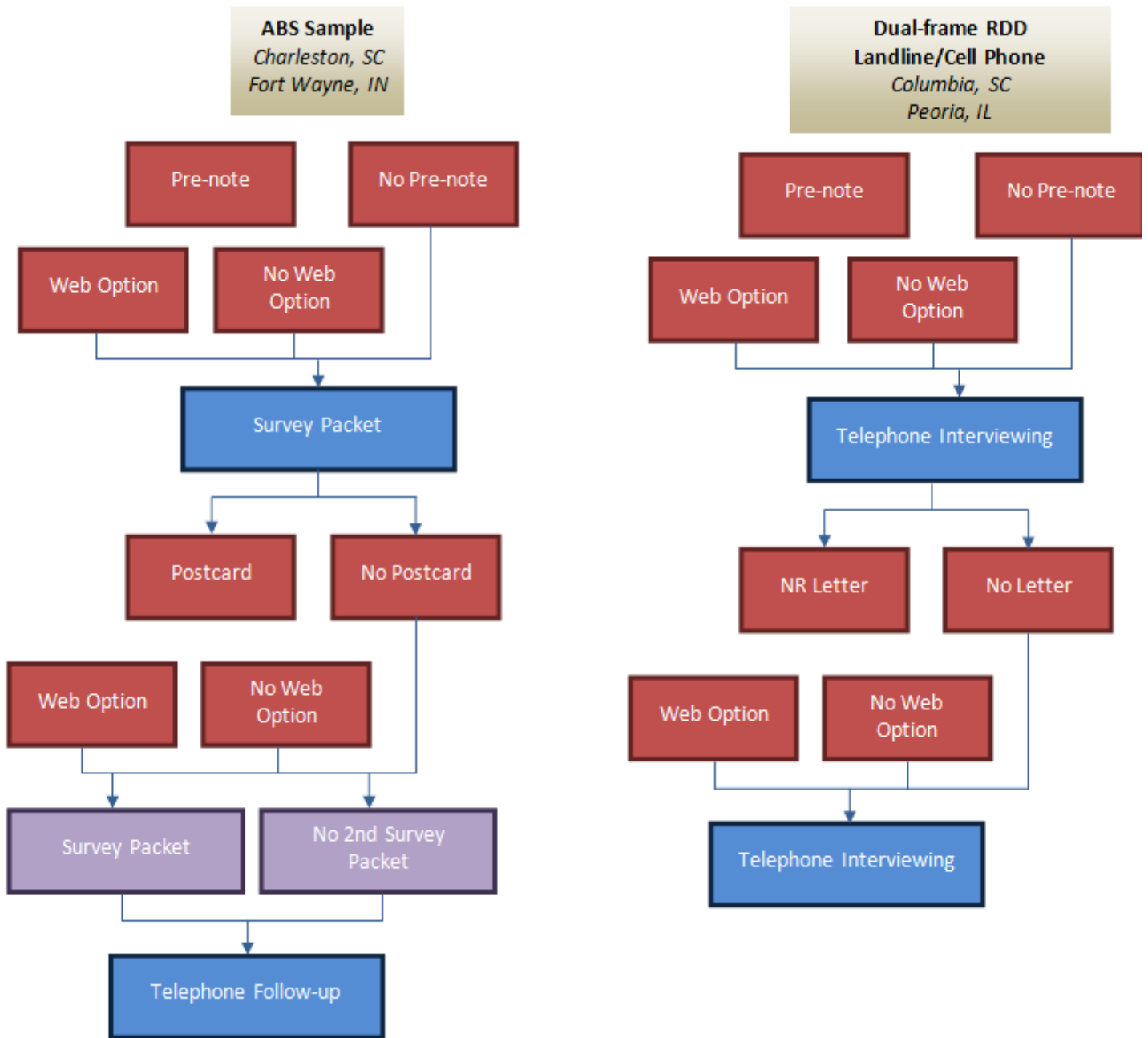
⁷ See ICF International's *Literature Review and Study Design* for a discussion of the advantages and disadvantages for different survey protocols for increasing response rates and how they relate to the FMR Area Survey.

2009); we wanted to investigate if a second survey mailing might be more cost effective than early telephone follow-up.

- ***Non-response letters to RDD respondents:*** In the era of caller-id and call screening technologies, a respondent choosing not to pick up the phone can be interpreted as a “soft refusal”. Previous ICF experience had indicated that refusal conversion and non-response letters were effective for increasing response rates. Refusal conversion letters and/or non-response letters had never been tested within the FMR Area Survey context. Even though these letters can add cost and time to the survey, they could encourage respondents to participate via the telephone or the Web and potentially be a more cost-effective method to increase response than screening additional telephone numbers.

The remainder of this report describes the results of the FMR Area Survey experiments in general, and the above in particular. We conclude with recommendations for modifying the methodology used to collect current rent data in order to estimate FMRs.

Figure 1-1. FMR Area Survey Experiment Structure



2. THE QUESTIONNAIRE

2.1. INTRODUCTION

Survey data quality is a complex concept with many interrelated factors: the sample, the data collection protocol, the cognitive tasks required of respondents, and respondents' reactions to the survey itself. The FMR questionnaire supports data quality because it minimizes potential sources of error. HUD's decision to explore alternative methodologies for the FMR Area Survey created an opportunity to revise the questionnaire used to identify eligible rental units and collect rent and utility data. Experimenting with different modes of data collection required questionnaires appropriate for each mode, yet also comparable in content and respondent burden. For the telephone experiment, it was necessary to add questions to take into account respondents who answered on their cell phones (*Appendix C*). For the ABS mail survey experiment and the Web option, the telephone survey would need to be crafted into a self-administered form. In addition, for the mail survey, instructions would need to be added to guide people to the appropriate follow-up questions in the instrument. Careful thought needed to be put into how we could minimize the mode effects that might arise from the different forms of administration. Any changes made to the questionnaire needed to maximize quality of the survey data by minimizing overall survey error.

This section of the report addresses the following topics as they relate to the FMR Area Survey questionnaire:

- The changes made to the FMR questionnaire for the experiment.
- How the revised questionnaire performed overall in capturing the necessary data for calculating the FMRs, and any observable differences by mode.
- The questionnaire's ability to accurately ascertain housing assistance status and the market rent for individuals receiving subsidies or living in public housing.
- General observations and recommendations for the future.

2.2. COMPARISON OF FMR AREA SURVEY AND FMR EXPERIMENTAL SURVEY QUESTIONNAIRES

The original FMR Area Survey questionnaire evolved organically over time to address HUD's needs. Yet in practice, the questionnaire has become somewhat problematic to implement for the following reasons:

- ***The structure of the questions in the FMR Area Survey questionnaire did not promote cognitive fluency.***⁸ Key concepts, such as the housing unit and utilities, were not referred to with consistent terminology.⁹ The questionnaire contained a number of items that actually represented more than one question within a question.¹⁰ Questions eliciting rent values were long and complex, asking people to both include and exclude certain amounts when responding. And, questions concerning housing assistance status and levels were not clearly understood. Overcoming this disfluency – difficulty with question comprehension – required

⁸ Researchers use the term 'fluency' to reflect the ease with which question content can be processed.

⁹ Multiple terms were used to refer to where the respondent lived: residential household, property, residence, household, building, unit, structure, and housing unit. "Utility" and "primary fuel type" were used inter-changeably.

¹⁰ For example, FMR_Q17a "Is part of your rent, or anyone who lives with you, paid for by a Federal, State, or local program?" This is actually two questions: one question about the respondent's receipt of a subsidy and another question about anyone else who lived with them, whether or not they also received a housing subsidy. It is possible to know the answer to the first part of the question, but maybe not the second.

respondents to exert special cognitive effort that relied on both motivation and ability (Smith & DeCoster, 2000). Research has indicated that not all survey respondents are motivated to exert this kind of effort (Krosnick, 1991). This disfluency threatened the survey data's validity.

- ***The reading level of the questionnaire was higher than the average U.S. adult's reading level.*** The questionnaire's language was at a 12th grade reading level,¹¹ and yet the average adult in the U.S. reads between an 8th to 9th grade level (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993).¹² Even if respondents were motivated to answer the survey questions, their ability to do so may be constrained by the time available to complete the survey or a limited reading proficiency and/or English fluency. The more complex the question, the less likely all respondents will be able to respond accurately. Further, limitations on ability disproportionately affect respondents with less education or whose first language is not English.¹³
- ***The questionnaire was inefficient.*** If the housing unit was comprised of independent adults living as roommates, it was necessary to transfer from the original respondent to the roommate, risking break-offs and non-compliance. In addition, the geographic eligibility questions occurred at the end of the survey, resulting in the collection of ineligible data.

In general, revisions to the FMR Area Survey questionnaire addressed each of these challenges and potential sources of error. Yet, some revisions were specific to a particular mode of administration (and therefore, had the potential to add a new source of error¹⁴). For example, the CATI and the Web surveys were able to offer bracketing responses as a means to “save” cases from being ineligible if a respondent did not provide a contract rent amount, either because he or she did not know or refused to answer. Respondents who initially refused or indicated not knowing their rent were asked if the amount paid was higher or lower than a particular value over a series of questions until an approximate gross rent value could be determined. Bracketing was programmed into the automated CATI and Web systems and displayed if needed; this was not possible with a paper mail questionnaire. For the experiment, the bracketing questions were limited and did not establish respondents' rents to a useful value for calculating FMRs; however, the experiment did demonstrate that this method could “save” cases for use and would be useful if the bracketing was further developed to obtain rents within ranges of \$25 or less. (Please see *Appendix E* for a copy of HUD's FMR Area Telephone Survey questionnaire and *Appendix C* for the materials developed for this experiment).

The following principles were used to guide choices when revising the questionnaire:

- Limit the reading level of the questionnaire to no higher than an 8th or 9th grade level.
- Standardize terminology for key concepts to facilitate comprehension and make the cognitive tasks of understanding the question and retrieving information easier.

¹¹ The reading level of the questionnaire was assessed using the Flesch-Kincaid tool included with Microsoft Word.

¹² The 1992 National Assessment of Adult Literacy, on which this report was based, found that the average adult's reading level was between an 8th and a 9th school grade level. The 2003 assessment found that there had been no significant change in adult reading levels since 1992 (http://nces.ed.gov/naal/kf_demographics.asp last accessed on 11/30/2011).

¹³ The 2003 National Assessment of Adult Literacy found that individuals who did not speak English prior to going to school, African Americans, Hispanics, and those who did not graduate from high school were more likely to read at below a “basic” level (http://nces.ed.gov/naal/kf_demographics.asp last accessed on 11/30/2011).

¹⁴ Another example, for safety and ethical reasons, the telephone questionnaire included questions to determine if someone was on a cell phone, if it was safe to participate, and if the respondent was over 18 years of age.

- Craft questions to determine eligibility, elicit rent values, and collect utility information to gather the best possible data for the particular mode of response so that the information provided would be the same for any mode.¹⁵
- Use validated items from other Federal data collection projects wherever appropriate and possible.
- Preserve items from the original FMR Area Survey questionnaire, if improved alternatives were not available (as there is a wealth of historical data that can be used for evaluating potential mode effects).

The revised FMR Area Survey questionnaires underwent a limited testing process prior to their implementation. A full-scale pilot was deemed unnecessary, as the new items to the questionnaire were borrowed from the ACS or the American Housing Survey (AHS). HUD uses the ACS as a data source for benchmarking its own estimates. Using the same questions, wording, and terminology for the FMR Area Survey would facilitate comparisons to ACS-derived estimates in the future. Likewise, the AHS questions we used had also undergone extensive cognitive testing and subsequent piloting; therefore, it was decided that additional testing would not be needed. The questionnaires were evaluated for usability by asking individuals unfamiliar with the project to complete a mail survey form while we observed them filling it out, and then discussed features of the instrument with each respondent. The mail survey instruments were then subjected to several rounds of review by senior researchers on the FMR Survey Team. CATI and Web questionnaires underwent rigorous testing procedures (i.e. hard-key tests, scenario tests, usability testing, and random-digit generation testing) to ensure the appropriate and accurate functioning of the computer programs controlling their administration. A final test for all modes involved a close comparison of questions to ensure consistency across the different modes.

2.3. PERFORMANCE OF THE REVISED FMR AREA SURVEY QUESTIONNAIRE

In evaluating the performance of the revised FMR Area Survey questionnaire, we considered the following factors:

- Item non-response¹⁶ for each question across modes (i.e. don't know, refused, blank, multiple marks, non-responsive answers);
- Item non-response for each question by mode;
- Data quality in terms of the number of questions individual respondents answered; and
- The ability to identify the eligible population.

Item non-response is low for the revised FMR questionnaire; the average item non-response rate was 5% or less across all modes for all questions (see *Table 2-1*). When outliers are removed,¹⁷ the average item

¹⁵ In fact, under these conditions, mode differences were an important finding.

¹⁶ In general, for our analysis, non-response was defined to happen any time a respondent either left a question blank that should have been answered, indicated “don't know”, recorded “decline to answer”, or provided a non-responsive answer – that is, provided more than one answer, a response that was not appropriate to the questions, or gave an illegible response. We do not differentiate between “don't know” and “decline to answer” in our analysis; only the telephone mode made this distinction clearly. Therefore, analysis exploring differences due to lack of knowledge or unwillingness to cooperate would be beyond the scope of this report.

¹⁷ On the mail survey, the question for “Why does the rent change?” was skipped or not answered by many individuals (46.3% of the people who should have answered it did not), as was the “other-specify” item associated with it (38.7% did not respond who should have).

non-response rate is less than 3% for all modes. Meta-analysis of telephone interviews and mail surveys reveals that mail questionnaires tend to have higher item non-response rates compared to other modes of administration on all items, except when the topic is sensitive (de Leeuw, 1992). The ABS mail survey questionnaire's average item non-response rate was 5.1% (or 2.8% with outliers removed), and the RDD landline/cell phone rate was 2.7%. The relatively low mail survey item non-response rate is indicative of a high level of understanding for the survey items, as even without an interviewer to clarify questions, people were able to provide responses and follow instructions. The Web survey questionnaire had negligible item non-response (and as such, we exclude its discussion from the remainder of the analysis). Only 81 individuals across all modes sought to respond via the Web. Those who responded via the Web tended to have a better rate of completing the entire survey; only three questions demonstrate any item non-response, making generalizations about item non-response for the Web survey difficult.¹⁸

We do observe mode effects when comparing the patterns of item non-response. Consider the following:

For RDD landline/cell phone questionnaire:

- Compared to the other modes, there is higher item non-response on the telephone for questions about how much people pay for rent, or what their housing assistance status is. This might be an artifact of the interview process – respondents may be sensitive about how much they pay for rent, and/or their housing assistance status. Other research has consistently demonstrated that financial items and personal questions are sensitive ones for most respondents (de Leeuw, 1992).
- On the telephone, we see a very low item non-response rate for questions that had uncharacteristically high rates of non-response for the mail and the Web modes – namely, the question asking people why their rent changed during the year if it did not stay the same. There was only a 1.3% item non-response on the telephone, but non-response was 11.1% on the Web and 46.3% on the mail survey. This indicates that respondents using the self-administered forms might not have understood the question and that telephone interviewers provided important clarifications of the question and its intent, thus facilitating response to that particular question.

For the ABS mail questionnaire:

- Whenever mail respondents were asked to provide a response to an “other-specify” type question, we observe higher item non-response than for the telephone or Web – cases where either an interviewer or a prompt reminded people to provide an answer. This is a common finding on most surveys and is not unique to the revised questionnaire (Kwak & Radler, 2002).

¹⁸Note also that the Web survey questionnaire prompted respondents when an item was left blank, asking people if they intended to do so.

Table 2-1. Item Non-Response by Survey Mode

	Variable Name	Percent Not Responding		
		Mail (N)	Phone (N)	Web (N)
Total Number of Renting Respondents Answering by this Mode		1,140	528	81
Is this house, apartment, or mobile home	Eligibility RENT	0.00%	0%	0%
What county - AREA 1 Fort Wayne	Eligibility RCNTY1	NA	8.7% (103)	0.0% (27)
What county - AREA 2 Peoria	Eligibility RCNTY2	NA	6.8% (146)	0.0% (11)
What county - AREA 3 Columbia	Eligibility RCNTY3	NA	1.0% (199)	0.0% (13)
What county - AREA 4 Charleston	Eligibility RCNTY4	NA	1.3% (80)	0.0% (30)
What's your town or city's name	Eligibility RTOWN	0.0% (1,140)	0% (51)	0.0% (0)
What is your ZIP code	Eligibility RZIP	0.0% (1,140)	0.1% (51)	0.0% (0)
How long have you lived....	Eligibility LIVE2Y	0.5% (1,140)	0.2% (528)	0.0% (81)
How many bedrooms	Eligibility BEDRM	1.12% (1,140)	0.2% (528)	0.0% (81)
Best describes the building	Eligibility BLDG	5.5% (1,140)	0.9% (528)	0.0% (81)
Describes the building - OTHER	Eligibility BLDGO	2.63% (38)	0.00% (0)	0.0% (6)
Built in the last 2 years	Eligibility BLD2Y	0.8% (1,140)	4.5% (528)	1.2% (81)
Someone live there all year	Eligibility ALLYR	0.70% (1,140)	0.2% (528)	0.0% (81)
Owner a relative	Eligibility OWNREL	0.5% (1140)	0.4% (528)	0.0% (81)
Do you do any work for your landlord	Eligibility WRKLAND	0.6% (1,140)	0.0% (528)	0.0% (81)

Percent Not Responding					
Variable Name			Mail	Phone	Web
			(N)	(N)	(N)
Apart from utility costs, does this apartment rent for the same amount every month of the year	Eligibility	RNTSAM	2.7% (1,140)	0.4% (528)	0.0% (81)
Why does the rent change	Eligibility	WHYRNT	46.3% (106)	1.3% (26)	11.1% (9)
Why rent changes - OTHER	Eligibility	WHYRNT0	38.68% (106)	0.0% (16)	0.0% (7)
As part of your rental agreement do you have to recertify your income every year to determine how much rent you pay	Public Housing Status	RECERT	1.7% (1,140)	3.0% (528)	0.0% (81)
Is your rent amount lower because you are in a government housing program	Public Housing Status	GOVTHP	1.5% (1,140)	2.1% (528)	0.0% (81)
Is the housing authority your landlord	Public Housing Status	PHALLD	4.9% (1,140)	5.3% (528)	1.2% (81)
Does a local housing authority own this	Public Housing Status	PHAOWN	5.6% (1,140)	10.4% (528)	0.0% (81)
How much do you or does your family pay for rent each month	Rent	RRENT	3.8% (1,140)	5.4% (528)	2.5% (81)
Do you have any roommates		RRMATE	1.6% (1,140)	0.0% (528)	1.2% (81)
How much is the total rent	Rent	TOTALR	8.4% (1,140)	14.3% (17)	0.0% (43)
Does your household have a voucher	Public Housing Status	HCV	2.2% (1,140)	4.9% (528)	0.0% (81)
How much would your rent be if you had to pay it all yourself	Rent	RCHV	0% (70)	10.4% (228)	2.5% (81)
Are utilities included in your rent	Utilities	UTIL	3.2% (1,140)	0.2% (528)	0.0% (81)

Percent Not Responding					
Variable Name			Mail	Phone	Web
			(N)	(N)	(N)
Cost of heating	Utilities	HEAT	1.3% (972) ¹⁹	0.0% (460)	0.0% (65)
Heating fuel	Utilities	HEATF	4.2% (972)	4.4% (435)	0.0% (61)
Cost of air conditioning	Utilities	AIRCON	1.5% (972)	0.0% (460)	0.0% (85)
Air conditioning fuel	Utilities	AIRCONF	4.2% (972)	4.8% (398)	0.0% (55)
Cost of cooking	Utilities	COOK	3.3% (972)	0.4% (460)	0.0% (65)
Cooking fuel	Utilities	COOKF	3.2% (972)	2.4% (415)	0.0% (57)
Cost of hot water	Utilities	HOTW	1.9% (972)	0.4% (460)	0.0% (65)
Hot water fuel	Utilities	HOTWF	5.0% (972)	6.9% (332)	0.0% (51)
Water	Utilities	Water	1.3% (972)	1.30% (460)	0.0% (65)
Lights	Utilities	LITE	0.8% (972)	1.40% (460)	0.0% (65)
Refrigerator/Range	Utilities	APPL	0.7% (972)	0.9% (460)	0.0% (65)
Sewer	Utilities	SEWR	2.2% (972)	3.7% (460)	0.0% (65)
Trash	Utilities	TRASH	2.4% (972)	3.3% (460)	0.0% (65)
How many different residential telephone lines ²⁰		TEL	4.9% (1,140)	2.2% (528)	0% (81)

¹⁹ The mail survey questionnaire included an instruction for respondents whose utilities were included in their rent to skip to a question later in the questionnaire. Non-response was only calculated for those individuals who should have answered the question but did not.

²⁰ This question is used for respondents in the RDD landline sample in order to determine appropriate sample weights and to understand the probability that an individual household had for selection. The question was also asked of the Web, cell phone,

		Percent Not Responding			
Variable Name		Mail	Phone	Web	
		(N)	(N)	(N)	
Do you or does anyone in your household have a working cell phone ²¹	CELL	2.1% (1,140)	1.2% (426)	0% (81)	
How many cell phones ²²	CNUM	0% (1,140)	3.9% (102)	0% (78)	
Proportion of calls received on cell phone ²³	CCALL	22.2% (1,140)	4.9% (102)	0% (78)	
Minimum Non-response		0.00%	0%	0%	
Maximum Non-response		46.3%	14.3%	11.1%	
Average Non-response		5.11%	2.72%	0.52%	

Across survey modes, we observe a slight tendency for increasing item non-response as respondents progressed through the questionnaire, particularly for the telephone mode. This is not a common occurrence. Two factors could be contributing to this phenomenon:

- A. Respondent fatigue, and/or
- B. Respondent inability to understand the question and recall an answer.

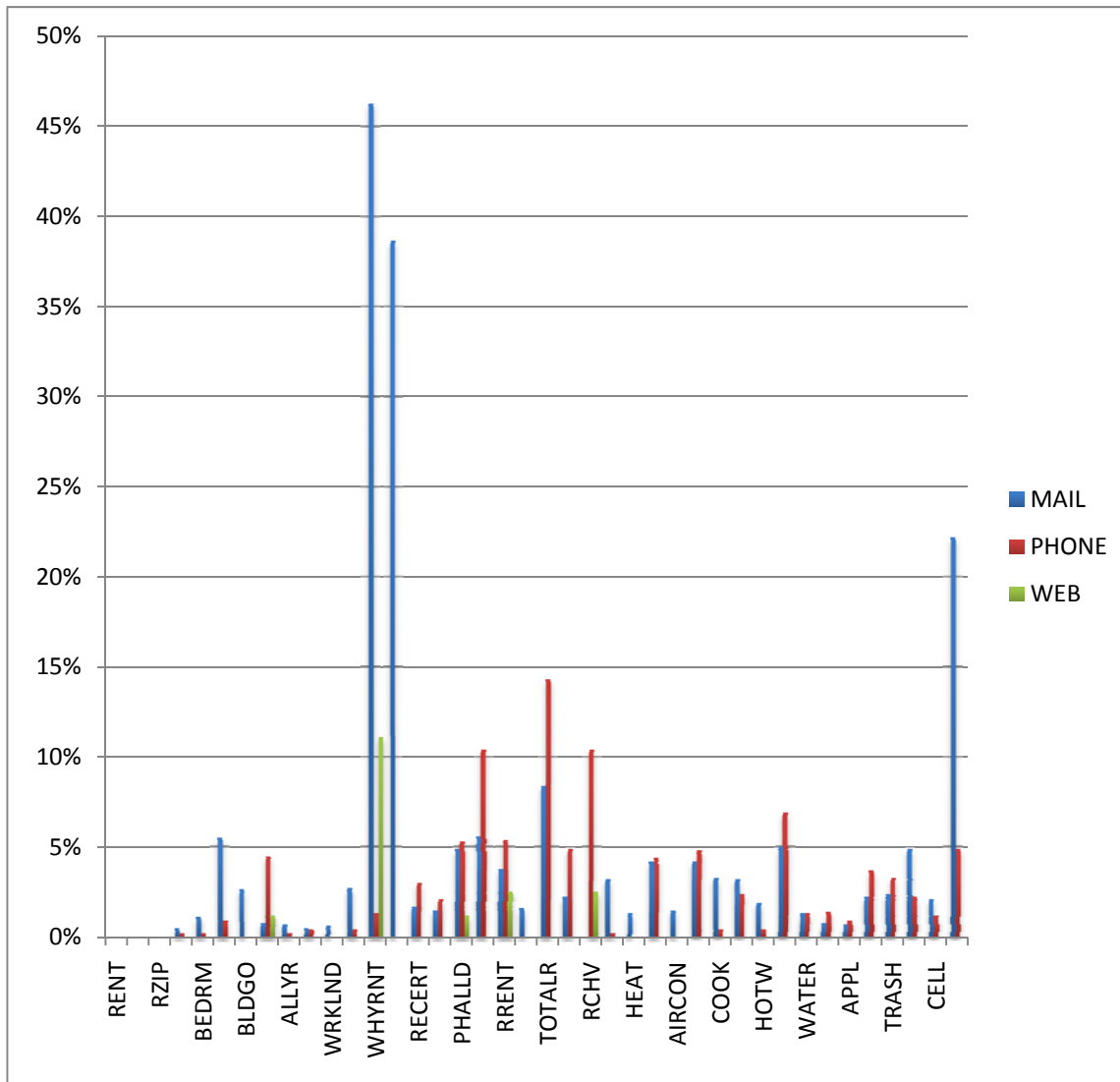
and ABS respondents to have a better understanding of the comparability of the different sets of respondents. This question would not be retained for an ABS mail survey, but it would be necessary for any RDD/cell phone survey or mixed-mode survey involving the telephone and the Web.

²¹ This question is needed for determining appropriate sample weights when using a mixed RDD landline and cell phone sample. The question was also asked of the Web, cell phone, and ABS respondents to have a better understanding of the comparability of the different sets of respondents. This question would not be retained for an ABS mail survey, but it would be necessary for any RDD/cell phone survey or mixed-mode survey involving the telephone and the Web.

²² This question is needed for determining appropriate sample weights when using a mixed RDD landline and cell phone sample. The question was also asked of the Web, cell phone, and ABS respondents to have a better understanding of the comparability of the different sets of respondents. This question would not be retained for an ABS mail survey, but it would be necessary for any RDD/cell phone survey or mixed-mode survey involving the telephone and the Web.

²³ This question is needed for determining appropriate sample weights when using a mixed RDD landline and cell phone sample. The question was also asked of the Web, cell phone, and ABS respondents to have a better understanding of the comparability of the different sets of respondents. This question would not be retained for an ABS mail survey, but it would be necessary for any RDD/cell phone survey or mixed-mode survey involving the telephone and the Web.

Figure 2-1. Item Non-Response by Survey Mode



2.3.1. Respondent Fatigue

A pattern of increasing item non-response is sometimes an indicator respondent fatigue – people start to choose not to answer questions as a way to more quickly finish the questionnaire while expending less cognitive effort. However, for the RDD landline/cell phone questionnaire, fatigue is unlikely to be the cause behind the increasing item non-response we observe. Consider the following:

- First, the RDD landline/cell phone questionnaire is not long. Typically, respondent fatigue does not set in until after 10 minutes, unless the survey content is sensitive or cognitively demanding. The revised RDD landline/cell phone questionnaire took, on average, seven minutes and seven seconds²⁴ to complete on the telephone. The ABS mail and Web surveys

²⁴ The minimum was three minutes and 18 seconds and the maximum was 25 minutes and 26 seconds. The cell phone times were not significantly different: minimum of four minutes and 26 seconds, average of seven minutes and 48 seconds, and maximum of 22 minutes and two seconds.

would have taken even less time for most people, as not every question or response category would have been read or answered. In fact, the most common error on the mail survey was answering items that were not necessary; that is, people spent more time than was necessary responding to the survey – behavior that is most definitely not a sign of fatigue.

- Second, we see that a particular type of question drives the trend of item non-response for the latter half of the survey. More people seem not to answer questions about which fuels are used to power utilities than whether or not they pay for a particular utility. Both the telephone and mail modes demonstrate higher item non-response rates for the fuel types used than for payment of specific utilities. In addition, the series of questions concerning the number of residential landlines and cell phones, positioned just before the questionnaire’s close, have comparatively lower item non-response rates than the fuel-type questions (see *Table 2-1*). This change in pattern would indicate that recalling the fuel type information was possibly a factor in the item non-response fatigue.
- Third, with survey fatigue, there are generally a large number of partially completed surveys, as some individuals choose to stop rather than continue and be frustrated. The revised FMR Area Survey questionnaires had few, if any, partial responses. There were only two partially completed surveys on the Web and everyone who started the telephone survey interview completed it. The mail survey is much more difficult to evaluate, as our experimental design was not well suited for measuring “partial” mail responses. For the mail survey, anyone who returned a survey questionnaire and answered the first question was considered to have completed the interview and all information was recorded in the data entry program – response, blank, written answer, etc. It is possible to define a “minimal” interview where the respondent needs only to provide substantive answers to the questions necessary to calculate the gross FMR²⁵ – we observe a very small proportion of minimal interviews, again indicating that fatigue is most likely not an issue.

Table 2-2. Less than “Minimal” Information Interviews

	Overall	Mail	Phone	Web
“Minimal” Interviews	7.3%	8.6%	5.3%	2.5%
Total Number Interviews	1,749	1,140	528	81

- Fourth, feedback from CATI interviewing staff and monitoring of interviews indicate that frustration, possibly more than fatigue, could have been contributing to the increasing item non-response rates. Many respondents became annoyed by having to answer all of the utility questions, feeling as if they had already given that information. Respondents often spontaneously started to list the utilities that were their responsibility after responding that utilities were not included in their rent. In other cases, respondents listed all of the utilities powered by a particular fuel type – for example, gas or electricity – and were then frustrated by having to respond separately to these questions. CATI interviewers also regularly reported that respondents could easily identify the utilities that they pay for, but had more difficulty in recalling the fuel type. Essentially, CATI interviewers reported that respondents experienced disfluency, leading to negative attitudes about participating in the survey effort. Other research has illustrated that people use the ease with which they process information as an

²⁵ We defined a “minimal” interview as anyone providing a substantive response to whether or not they rented, their building type, number of bedrooms, and if they paid for utilities.

indicator for how much they like the object it describes (Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatka, & Simons, 1991). Difficult or complicated questions, therefore, can lead respondents to like the survey less, and become less motivated to respond.

2.3.2. Respondents' Inability to Understand and/or Recall

It is possible to argue that the revised FMR survey questionnaire becomes cognitively more difficult to answer as the survey progresses. Therefore, it is possible that the increasing level of difficulty for respondents could be contributing to increasing item non-response. The questionnaire starts with questions that anyone remotely familiar with the housing unit may be able to answer – namely, the location, ownership status, building description, relative age of the building (e.g. was it built within the last two years), etc. However, the series of questions concerning the residential unit's rent are more difficult, even for people who live within the unit, especially if the person is not familiar with the lease and who it is with, or is not involved in paying the rent or utilities. The more removed an individual is from the household finances (i.e. because someone else pays or the billing is automated through his or her financial institution or service provider), the more difficult it might be for that person to complete the questionnaire. Item non-response is also higher for fuel types than it is for questions about any of the individual utilities.²⁶ A significant number of individuals are unable or unwilling to recall important utility information necessary for calculating the gross FMR value. *Estimating Fair Market Rents*, starting on page 35, details how item non-response influences the cases available for the purposes of calculating FMRs, as well as different approaches that might compensate for the missing information.

2.4. DATA QUALITY

A good indicator of a questionnaire's data quality is when the average number of questions respondents leave unanswered is small (Couper, Blair, & Triplett, 1999); (Schaefer & Dillman, 1998). Using this indicator, the revised FMR Area Survey questionnaire performs well; more than half of the respondents answer all of the questions required of them (see *Table 2-3*).²⁷ Respondents whose utilities are included in their rent overwhelmingly provide a response when asked; 70% answer all of the 18 questions asked, and the mean number of responses is 17. While the average number of questions answered by respondents who pay for their utilities remains quite high, only half to two-thirds answer all of the questions possible. This drop-off in response, while appearing quite small and mathematically inconsequential, impacts HUD's ability to use the survey data to calculate accurate gross rents for the areas, as these cases either need to be dropped from the analysis due to missing data or have values imputed (see *Estimating Fair Market Rents*, starting on page 35).

²⁶ This is most apparent on the mail survey questionnaire where respondents tended to answer all of the questions. CATI and Web respondents skipped fuel type questions if they said they did not know or refused the questions concerning the specific utilities.

²⁷ Questions excluded from this analysis: geographic eligibility (county, town, ZIP), any of the "other-specify" type questions, the number of cell phones (not asked on the telephone survey), the cell phone safety questions, why the rent changes (problematic question due to high item non-response, see above), and the proportion of calls made on a cell phone (high item non-response problematic question), total rent (survey logic was added once fielding started so individuals without roommates were not asked this question), and what rent would be if the respondent had to pay it all herself.

Table 2-3. Data Quality as Measured by Proportion of Questions Answered

Number of questions answered	Respondents who pay separately for rent answer 31 Questions Possible		Respondents who pay separately for utilities (excluding fuel type questions) answer 27 Questions Possible		Respondents whose utilities are included in rent answer 18 Questions Possible	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
8					1	0.1
10					1	0.1
11					3	0.3
12	1	0.1	1	0.1	1	0.1
14	1	0.1	2	0.2	3	0.3
15	1	0.1	1	0.1	15	1.3
16	5	0.4	4	0.3	66	5.7
17	18	1.6	18	1.6	250	21.5
18	29	2.6	29	2.5	822	70.7
20			2	0.2		
21	2	0.2	3	0.3		
22	2	0.2	4	0.3		
23	2	0.2	8	0.7		
24	1	0.1	29	2.5		
25	4	0.4	86	7.5		
26	4	0.2	256	22.3		
27	15	1.3	705	61.4		
28	46	4.1				
29	95	8.5				
30	283	25.2				
31	615	54.7				
Total	1,124		1,148		1,162	
Missing	625		601		587	
Total	1,749	100	1,749	100	1,749	100
Minimum	12		12		8	
Maximum	31		27		18	

	Respondents who pay separately for rent answer 31 Questions Possible	Respondents who pay separately for utilities (excluding fuel type questions) answer 27 Questions Possible	Respondents whose utilities are included in rent answer 18 Questions Possible
Mean # Questions answered	29.64	26.01	17.58
Standard Error of the Mean	0.09	0.07	0.03
Standard deviation	3.05	2.19	0.85

2.5. HOUSING ASSISTANCE QUESTIONS

The most substantial content change made to the revised FMR survey questionnaire involved the questions used to determine if individuals live in public housing or receive some sort of housing assistance. Individuals who lived in public housing were deemed to be ineligible for the survey. Individuals who received some sort of housing assistance were eligible (as they presumably lived in market rate units) and were asked what their rent would be if they had to pay it all themselves (i.e. their out-of-pocket rent expense plus their subsidy amount). Historically, telephone interviewers had reported that respondents struggled with answering these questions. As a result, for the revised FMR survey questionnaire, we decided to use questions that the AHS had developed and cognitively tested:

As part of your rental agreement, do you have to recertify your income every year to determine how much rent you pay?

Is your rent amount lower because you are in a government-housing program?

Is the housing authority your landlord?

Does a local housing authority own this house, apartment, or mobile home?

Does your household have a housing voucher that allows you to choose where you live and pays for rent?

In many ways, the questions designed to determine housing assistance status are the most difficult questions on the revised FMR survey questionnaire. Qualitatively, the problems of this section were noted for both the telephone and mail. Telephone respondents indicated that they did not know who owned their building or if a Public Housing Authority (PHA) was the landlord or not; often their leases did not clearly indicate this since some housing authorities have names that do not include “housing authority”.²⁸ Some respondents confused management companies with PHAs. Some telephone respondents confused “recertification” with completing an application to live in a large apartment

²⁸ Some very motivated telephone respondents asked interviewers to wait while they went to look at their lease, find their Section 8 documentation, etc. Some PHA’s use a third party management firm and that is who is named on the lease (at least most prominently).

complex or residential community; this situation is somewhat further complicated because these applications often require people to declare detailed financial information. In some cases, apartments may not be PHA-owned or operated, but because of the terms of their development, lease some units to individuals with fixed incomes or lower incomes on a sliding scale basis. The situation is further complicated by the fact that some PHAs rent out units at market rates. Some mail respondents wrote that they did not know, or could not tell, if a PHA owned their home or if a PHA was their landlord. Not surprisingly, item non-response also increased in this section of the questionnaire.

Given feedback from the CATI staff concerning how respondents were reacting to the housing assistance questions, and because this was the first time HUD had used this series of questions to identify public assistance status for FMR eligibility, we decided to look more closely at how well the questions worked and examined how the series of questions correlated with each other. Because the questions are all related to receiving housing assistance, we hypothesized that the questions would be highly correlated and that respondents' answers would be relatively consistent with each other. Participating in a government program and having to go through recertification were highly correlated with each other (and significant), but not as strongly with the questions concerning living in public housing or receiving a voucher. The public housing questions were correlated with each other, but not very strongly with receiving a voucher. Furthermore, the alpha coefficient for these five items is 0.772, suggesting that the items have a relatively high internal consistency.²⁹

Table 2-4. Correlations of Public Housing Assistance Questions

		RECERT	GOVTHP	PHALD	PHAOWN	HCV
RECERT	Pearson Correlation	1	.722**	.357**	.405**	.416**
	N	1,714	1,693	1,639	1,606	1,672
GOVTHP	Pearson Correlation	.722**	1	.383**	.359**	.426**
	N	1,693	1,721	1,647	1,614	1,680
PHALD	Pearson Correlation	.357**	.383**	1	.587**	.135**
	N	1,639	1,647	1,664	1,583	1,630
PHAOWN	Pearson Correlation	.405**	.359**	.587**	1	.068**
	N	1,606	1,614	1,583	1,631	1,600
HCV	Pearson Correlation	.416**	.426**	.135**	.068**	1
	N	1,672	1,680	1,630	1,600	1,698

** Correlation is significant at the 0.01 level (two-tailed).

Exploratory factor analysis reveals that perhaps there are two dimensions at work within these five items. One of the dimensions is related to participating in a government-housing program, going through recertification, and having a voucher. The other dimension concerns living in a home owned or managed by a PHA. These two factor dimensions explain 75% of the variance of these five items.

²⁹ Note that a reliability coefficient of .70 or higher is considered "acceptable" in most social science research situations.

Table 2-5. Housing Assistance Questions Factor Analysis Results³⁰

	Factor 1	Factor 2
RECERT_	.767	.334
GOVTHP	.804	.314
HCV	.569	.020
PHALLD	.226	.626
PHAOWN_	.118	.890

The factor analysis substantiates the correlational analysis. There are two groups of highly related items – questions concerning participation in government housing programs and questions concerning living within PHAs. Receipt of a housing choice voucher seems to be moderately related to participation in a government housing program and recertification, but not to living in public housing. Participation in a government housing program and recertification are related to living in public housing and to receipt of a housing choice voucher.

While the public housing questions performed better than expected, asking respondents to report how much their rent would be if they had to pay it all was highly problematic – 10% of the individuals responding via the telephone did not answer this question, and CATI interviewers report high degrees of respondent confusion with the question too. Marginal notes in the mail questionnaire indicate similar confusion by respondents as to what the question was trying to ask. Furthermore, there is evidence that respondents could not tell the difference between a question asking them what their total monthly rent was and what their total monthly rent would be if they had to pay it all themselves. These two rental values were highly correlated with a Pearson’s Correlational Coefficient of 0.924 (significant to the .01 level).

RRENT. How much do YOU or does YOUR FAMILY pay for rent each month for this [INSERT BLDTYPE]?

RHCV. (All Mail, and CATI respondents indicating they have a housing voucher) How much would your rent be IF you had to pay it all yourself?

Therefore, while the survey questionnaire would seem to be able to reliably identify people receiving housing assistance of different kinds – living in public housing or receiving a voucher – it does not seem to reliably collect different rent amounts. Respondents either do not know what the market rate rent for their home would be, or they are unwilling to provide this information.

2.6. UNIQUE FEATURE OF THE WEB AND CATI MODES

The CATI and Web programs designed to navigate respondents through the revised FMR survey questionnaire included some features designed to help minimize item non-response. While these features were rarely utilized, they do appear to be effective.

³⁰ *Extraction Method:* Principal Axis Factoring. *Rotation Method:* Varimax with Kaiser Normalization. Rotation converged in three iterations.

2.6.1. Refusal Conversion Statements

A common approach to minimizing item non-response is to provide a customized statement encouraging response and then asking again for the same piece of information. The FMR Area Survey questionnaire always had such a refusal conversion statement that was read to respondents who did not provide a specific monetary amount.

The results of this survey will be used by the U.S. Department of Housing and Urban Development to ensure that rental assistance is provided as cost-effectively as possible to area residents who most need it.

CATI interviewing staff had often reported that the statement was not effective in convincing respondents to provide a value. Three common reasons for non-response at the rent questions were identified from discussions with staff and from monitoring interviews:

- A. !Some respondents indicated that it was not necessary to provide this information because they believed “HUD” or “the government” already had this information, and that this question was a waste of their time.
- B. !Some respondents had privacy and confidentiality concerns, indicating fear that somehow reporting the value might change their benefits, impact their housing, etc.
- C. !Some respondents did not seem to understand the importance of the requested information. Interviewers reported that if they could convey the importance of the answers to these questions, then people were willing to provide an amount.

In revising the FMR Area Survey questionnaire, the refusal conversion statement was expanded and changed to address these three common reasons for non-response. If respondents indicated that they did not want to provide a numeric response for their monthly rent, their total rent (this would be rent including roommates’ portions), or how much their rent would be without housing assistance, the following statement was presented to them:

This is the most important piece of information in this study. Without knowing how much you pay in rent, HUD cannot evaluate the cost of rental housing in this area. The best most accurate way we have to learn about rents is to ask renters like you. Your information is never reported separately. We use everyone’s information together when we do our analysis.

Respondents were then given one more opportunity to provide a monetary value. *Table 2-6* illustrates that the refusal statement was rarely presented on the telephone and not at all to Web respondents. When the refusal conversion statement was read, it appears to have been effective for encouraging people to provide a valid response.

Table 2-6. Effectiveness of Refusal Conversion Statements within the CATI /Web Questionnaires

	Phone (Number of people)	Web (Number of people)
Number of people indicating “don’t know,” or “decline to answer” to monthly rent (RRENT)	21	0
..... After refusal statement	7	0
Number of people indicating “don’t know,” or “decline to answer” to TOTAL monthly rent (TOTR)	14	0
..... After refusal statement	4	0
Number of people indicating “don’t know,” or “decline to answer” to how much the monthly rent would be without housing assistance. (RHCV)	24	0
..... After refusal statement	9	0

2.6.2. **Bracketing**

One common approach to addressing non-response to questions about complex household finances is to use "unfolding brackets" questions. When a respondent responds "don't know" or refuses to answer a question, the next question is a “yes/no” question in the form of "is it more than x/is it less than y?" By asking questions in this form with different values, it is possible to narrow down the range in which the target value lies. This range can then be used to impute the true value (by constraining the set of possible value donors), or, if the values are combined analysis, the range can be used directly. For experimental purposes, we incorporated bracketing into the questionnaire; however, the resulting ranges were quite broad. For bracketing to be truly useful for the FMR Area Survey, it would be necessary to create ranges that were within \$25 of the “true” value.

On the revised FMR Area Survey questionnaire, unfolding brackets were presented to respondents who did not provide a specific value to the monthly rent or the total monthly rent questions.³¹

Is the RENT/TOTAL MONTHLY RENT less than \$1000?
Is it less than \$500
Is it less than \$250?
Is it less than \$750?
Is it less than \$1500?
Is it less than \$1250?
Is it less than \$1750?

For the telephone survey, only seven individuals were presented with the brackets for the monthly rent question. Of those individuals, only one individual did not respond when presented with the first bracket

³¹ Usability testing had indicated that reluctant respondents might become very frustrated to be presented with a third set of brackets for what many individuals perceived to be very similar questions. Therefore, it was decided not to provide brackets for the hypothetical counterfactual “What would your rent...” question.

question, and the others started to refuse as they were presented with more questions (see *Table 2-7*). Four individuals were presented with brackets for their total monthly rent. The brackets were able to gather some additional information for all four cases, but respondents did not complete the full series of questions.³² While these numbers are too small to base generalizations on, they do indicate that the brackets eliminated some of the potential non-response by either helping to cue an individual's memory or by providing a more appealing response set. It is also possible that individuals became frustrated by the series of questions, rather than a list of categories—resulting in refusals occurring further along in the series. While technically, it is possible to bracket questions to the point where the desired data point is achieved, what is not known is whether or not respondents would be willing to answer the number of questions required to reach that level of precision. How much bracketing would be necessary can depend on the range of rents within a particular area.

Bracketing may also make sense from a cost perspective. On average, it costs \$2.63 dollars to screen an additional respondent. In the original FMR Area Survey, if an individual refused to provide a rent value after hearing the refusal conversion statement, the interview would end and it would be necessary to screen for another eligible respondent. Given that few individuals were unable or unwilling to provide a rent, and that it does not cost much to replace, it is not necessary to retain bracketing.

³² Note, while brackets were also included on the Web Survey, they were never utilized by any of the 81 respondents who chose this mode.

Table 2-7. Response Patterns to Bracketing Rent Values

	Monthly Rent	Total Monthly Rent
Re-asked the question after initial “refusal” or “don’t know”	7 asked 4 refused 3 did not know	14 asked 2 refused 2 did not know
Less than \$1,000	7 asked 1 refused 5 yes 1 no	4 asked- said yes
Less than \$500	5 asked 2 refused 3 said yes	4 asked 2 did not know 2 say yes
Less than \$750	3 asked 1 refused 2 said yes	2 asked 1 refused 1 said no
Less than \$1,500	1 asked – said yes	Not asked
Less than \$1,250	1 asked – said yes	Not asked
Less than \$1,750	Not asked of anyone	Not asked

2.7. QUALITATIVE EVALUATION OF THE REVISED FMR SURVEY QUESTIONNAIRE

Item non-response is an important measure for indicating how effectively a questionnaire obtains the desired information. High item non-response can indicate points at which individuals are encountering difficulties with comprehending a question, recalling information, or formulating a response. Yet the absence of information does not reveal why this is the case or how to improve the situation. Qualitative information gathered from debriefing interviewing staff, listening to telephone interviewers, and examining notes respondents left on their paper survey questionnaires provide some insight into the patterns of item non-response.

2.7.1. Telephone Survey Introduction

The first few seconds of a telephone interview are critical (Groves, 1990). Respondents tend to make the decision of whether or not to answer questions in those first moments based on what they hear, their impressions of the interviewer, perceptions about how inconvenient participation may be, and salience of the topic. Feedback from our interviewing staff about the introduction was offered in two forms:

- A. **!Stylistic:** Telephone interviewers report finding the introduction difficult to read, that it did not flow well, that it was both choppy and wordy, and that it confused respondents. They also felt it was too long especially since it flowed right into the first question without a break, not providing an early opportunity for respondents to interact with the interviewer. Some respondents indicated that they felt the introduction was impersonal and sounded like a machine.
- B. **!Salience:** Interviewers felt that people hung-up the telephone on hearing the word “HUD.” Some telephone interviewers felt it was because people did not know what or who “HUD” was. Other

interviewers felt people were deciding, prior to hearing the full introduction or any of the questions, that the survey did not apply to them because they owned their home or did not rent (e.g. lived in a group home, dormitory, etc), or did not need housing assistance.³³

These findings are somewhat surprising for several reasons. First, the shorter, choppiest sentences had been developed for the telephone survey introduction based on interviewer feedback that the previous introduction was too long and that they felt the introduction should flow directly into the first question. Second, previous experience had indicated greater name recognition among respondents for “HUD” compared to “the U.S. Department of Housing and Urban Development.”

A successful introduction would greatly facilitate the screening for geographically eligible rental units. Improving the readability of the introduction and respondents’ recognition of survey’s sponsor and the purpose would contribute to more efficient screening of telephone respondents and improve response rates (see *Evaluation of the Different Approaches*, starting on page 63, for a discussion of response and cooperation rates). Also, adopting a more conversational tone and style during the screening component could reduce survey non-response by half (Houtkoop-Steenstra & Bergh, 2000) while addressing respondent perceptions that the introduction is impersonal.

2.7.2. **Eligibility Questions**

In general, the eligibility questions were well understood across modes and provoked little in the way of feedback either from the telephone interviewing staff or from respondents themselves on their paper forms. On the paper questionnaire, most of these questions had very low item non-response rates, cases of individuals marking more than one answer, providing an invalid response, or making comments—as compared to the other questions on the survey questionnaire. However, while rare, there were some common situations that came up on the telephone and in written comments on the mail questionnaire that bear noting because of their importance to identifying the eligible sample:

- The first question, “Is this house, apartment, or mobile home, rented, occupied without payment of rent, owned...” was most challenging for respondents using the mail and telephone questionnaires. The question wording did not effectively differentiate among individuals living in group quarters, halfway homes, barracks, dorms, etc. Individuals owning mobile homes but renting the land that the mobile home was situated on did not know how to answer the question. Also, senior respondents living in retirement communities (full-spectrum independent living through end-of-life facilities) did not know if this question pertained to them or how to respond to it.³⁴ Aside from questions concerning geographic location, this is probably the most important eligibility question on the questionnaire.
- “Which best describes this building” also seemed challenging for some respondents across all of the survey modes. People seemed to be searching in the list of responses for specific or exact terms such as “duplex,” “townhouse,” “two-bedroom house,” “villa,” “building with an apartment above and business on first floor,” “elder housing,” etc. Often it was at this point in the survey questionnaire that a telephone interviewer might learn that a housing unit should

³³ While this may have been the impression of telephone interviewers, it is difficult to establish if it is true or not, as cases that may be a hang-up on one attempt can be successfully screened on another. Based on the last attempt on records for the RDD, cell phone, and ABS telephone follow-up samples, it would appear that at any one time less than 1% of the numbers dialed resulted in a hang-up.

³⁴ This question had come from the ACS, a data collection effort that starts as a field survey, where this problem would have been less likely to occur.

not be considered eligible. This question is important for how utility information is later included for calculating the gross FMR value using utility data where appropriate.

- The first question, “Is this house, apartment, or mobile home, rented, occupied without payment of rent, owned...” was new to the revised FMR questionnaire used for the experiment; it had been borrowed from the ACS. The original FMR Area questionnaire had a question asking respondents to describe their building type, but the revised questionnaire adopted the ACS version, again to facilitate comparisons. This indicates that the more simplified question structure previously used on the FMR questionnaire might be the more appropriate method for collecting the necessary data; the experience also indicates the need to provide additional instructions to respondents whose living arrangements posed certain common challenges for response (e.g. group homes, senior housing, etc).

2.7.3. Rent

Mail and telephone respondents reacted differently to the three questions eliciting rent values: monthly rent, their total rent (that is including a roommate’s portion), and what their rent would be if they had to pay it all out of pocket.

RRENT. How much do YOU or does YOUR FAMILY pay for rent each month for this [INSERT BLDTYPE]?

*TOTALR. (All Mail, and CATI respondents indicating they have a roommate) How much is the TOTAL monthly rent for this [INSERT BLDTYPE]? [IF NECESSARY: This should be how much you pay, what all other roommates pay, and any assistance you or your roommates might receive. Do not include **separate** parking fees or utility costs.]*

RHCV. (All Mail, and CATI respondents indicating they have a housing voucher) How much would your rent be IF you had to pay it all yourself?

- Mail respondents wrote commentaries on how much their rent was or how they paid it (e.g. “taken out of pay,” “late fees,” “every two weeks,” or “every week”). A few respondents indicated if they had a voucher, were waiting for one, or if their housing complex accepted them. The most common note on paper forms was a rental amount – but not listed within the space provided.
- Telephone respondents seemed to become confused, frustrated, and annoyed by the three questions and provided less, rather than more, information. Initially, all respondents in the telephone mode were asked all of the rent questions, but respondent frustration was so high that skips were inserted into the CATI script to help minimize respondent confusion and annoyance at being asked for their rent three times.
- According to telephone interviewing staff, respondents were confused by the last counterfactual question. This question made no sense to people who did not have a housing voucher or were not receiving any housing assistance. When asked this question, respondents reacted somewhat negatively, feeling the need to make it clear that they did pay all of the rent, and some seemed concerned that the interviewer might be implying something disparaging about them. Even people who acknowledged receiving a housing voucher, and who were knowledgeable about what that meant, could not reliably or with confidence report the amount—even after searching their paper records. Respondents also indicated that they did not know what the landlord told HUD or their PHA. Or, respondents said it was too long ago

for them to remember, that they only knew how much they paid. Often a response was preceded with, “Well, if I had to guess...”—and only after prompting, reminding, and encouragement from CATI interviewers.

2.7.4. Utility Questions

The utility questions were problematic for the revised FMR Area Survey questionnaire in both the mail and telephone modes of administration, but for apparently different reasons.

- For the paper survey questionnaires, marginal notes on the returned forms and response patterns indicate that individuals did not understand how, or when, to respond to the utility-related questions.
- On the telephone, the utility section appeared redundant and repetitive. CATI staff indicated that respondents felt they had already answered questions. As soon as respondents were asked if utilities are included in their rent, their natural reaction was to immediately list what they are responsible for. As a result, when they were specifically asked if heat or water is included, the reaction was, “I already told you that,” or “Weren’t you listening to me?” Related to this, in cases where gas or electricity fuels more than one utility in the home, respondents seem to indicate that asking about cooking, air conditioning, heating, hot water, etc. was repetitive and redundant. The questions were so similar in style and structure that if respondents were not listening carefully, or there was a poor telephone connection, respondents sometimes became confused over which utility they were talking about.

2.8. GENERAL RECOMMENDATIONS

Overall, the revised FMR Area Survey questionnaire performed well in identifying the eligible population and collecting the necessary information for calculating FMRs. Depending on the final methodology that HUD selects, we would make the following recommendations:

Across all modes of administration:

- ***Preserve current wording for most of the survey questions.*** There is strong evidence that questions were well understood by most respondents; moreover, these existing questions can be directly compared to previous surveys or the ACS and AHS. Each mode of administration had its strengths and weaknesses, and these were in line with previous survey methodological research.
- ***Consider revising categories for building type.*** This could be done in two different ways depending on the methodology HUD selects: (1) for telephone questionnaires, it might be easier for respondents if the list of building types was expanded to include more of the types individuals freely volunteer and decrease the coding burden on interviewers; or (2) for mail and Web questionnaires, it might be easier to condense the categories into broader ones and provide examples for each category. If all modes of data collection are maintained, the finer categories recommended for the telephone could be condensed after data collection for calculating the FMRs and comparing the data to other survey results.
- ***Refrain from asking individuals who receive housing assistance “What would your rent be if...”.*** Qualitative and quantitative evidence indicates that respondents do not differentiate the market rate rent for their home from what they pay out-of-pocket for their home. Respondents find it difficult to estimate what their total rent would be if they had to pay it all themselves.

For the mail questionnaire:

- Consider revising the format to help respondents more easily follow the instructions. This may necessitate adding pages to the paper form, but this would not significantly impact printing or mailing costs. For example, printing an introduction and the first question only on the front cover could result in fewer homeowners answering all of the questions.
- Investigate other methods for collecting utility information and/or developing a “grid” method for collecting utility information.
- Refine skip pattern instructions to improve respondents’ ability to accurately follow the appropriate order of questions for their situation.
- Consider adding language similar to the telephone refusal statement read when someone does not provide a rent value.
- Conduct usability and cognitive testing of a revised mail questionnaire.

For the telephone questionnaire:

- Adopt a “conversational” introduction technique to improve screening. !
- Maintain the refusal statements.
- Investigate alternative methods for collecting utility information such as first asking which utilities are paid for separately as part of a “select all that apply” type question, and then following up for indicated fuel types.
- Conduct cognitive testing or pilot testing of a revised telephone questionnaire.

3. ESTIMATING FAIR MARKET RENTS

3.1. INTRODUCTION

This section of the report investigates the relative merits of the two experimental survey methodologies for collecting rent data: RDD landline/cell phone surveys and ABS mail surveys. While the goal of the FMR Area Survey is to obtain an accurate and more current estimate of FMR in a given area, the goal of the experiment was to see how different methodologies would perform in collecting the necessary information to estimate the FMR as well as how that information could be used. This section evaluates how well the experimental survey methodologies collected the necessary data by calculating the FMR.

HUD's Statement of Work within the aforementioned RFP, and our original analysis plan outlined in the literature review and study design, envisioned calculating FMRs using the methods HUD had prescribed in the past for RDD surveys. This classic approach based the FMRs on data collected from a subset of rental units that met the following eligibility criteria:

- The respondent lived in a one- or two-bedroom rental unit;
- The individual moved into the unit within the previous 15 to 24 months;
- The rental unit was built more than two years ago;
- The individual lived at the residence year-round;
- The individual did not live in public housing;
- The owner of the rental unit was not a relative of the respondent; and
- The individual did not perform any work for the landlord in exchange for reduced rent.

With the FMR Survey Experiment, the sample sizes obtained for this subset were disappointingly small given the budget that had been allotted for the effort, necessitating that we explore other approaches for calculating FMRs from the survey data. The most obvious approach was to take advantage of the flexibility HUD has allowed in past RDD surveys. Historically, HUD has allowed large HAs to use both one- and two-bedroom units with appropriate adjustments for the one-bedroom rents and small PHAs to use one-, two-, and three-bedroom units with appropriated adjustments for the one- and three-bedroom rents. We calculated FMRs with these two variations, along with a third variation that used all the units meeting other conditions, again with appropriate adjustments.

Table 3-1. 2011 FMR Area Survey Experiment Eligible Rental Units Meeting the “Classic” Eligibility Criteria

Area	Number of Classic Rental Units (Unweighted)			
	Two-bedroom units	One-bedroom plus two bedrooms units	One-, two-, and three- bedrooms units	All units meeting other requirements
Columbia, SC	21	24	42	47
Peoria, IL	17	25	29	34
Charleston, SC	110	140	218	235
Fort Wayne, IN	84	144	183	202

Table 3-1 shows how this added flexibility increased the number of units available for the FMR calculation. Still within the FMR Survey Experiment budget, the landline/cell phone surveys produced inadequate sample sizes even when we went beyond the flexibility that HUD has allowed in the past. In Columbia and Peoria, we were able to obtain the necessary information on fewer than 50 recent-mover units of all bedroom sizes meeting the other criteria. We will discuss the FMR calculations based on the classic criteria and the more flexible variations later in this section, along with alternative approaches.

This section is divided into three subsections:

- The first reports the size of the usable samples obtained in each survey site and explains how we increased sample size by imputing missing data.
- The second examines the samples for conformity with information obtained from the ACS and compares, for the RDD sites, data obtained from landline calls with data obtained from cell calls and, for the mail survey sites, data obtained from the mail surveys with data obtained from telephone follow-ups.
- The third uses the survey data to produce alternative estimates of FMRs for each site and compares these estimates to HUD’s 2012 FMRs for each site.

3.2. SAMPLE COUNTS AND IMPUTATION

Table 3-2 reports sizes for the overall sample in each locality and the sizes of relevant subsamples. Row A lists the number of telephone numbers selected in each dual-frame RDD landline/cell phone site and the number of addresses selected in each ABS mail survey site; previous experience had indicated that these sample sizes would be adequate to achieve the experiment’s objectives. The strategy for the dual-frame RDD landline/cell phone surveys was to stop calling in a site when we obtained rent information on 200 two-bedroom units occupied by respondents who moved into the units within the past two years.

In the past, HUD referred to these cases as recent-mover units and recent-mover households and had traditionally sought a sample size of 200 two-bedroom units where inhabitants had recently moved. However, with the 2011 FMR Area Survey Experiment, it was necessary to settle for far smaller final sample sizes with the RDD landline/cell phone survey; the level of effort required to obtain 200 recent-mover two-bedroom rental units far exceeded the experiment’s budget.

Row B reports the number of successful contacts with housing units that were rented for cash. The large drop-off between rows A and B results from unit non-response and also from housing units identified as ineligible because they were owner-occupied or were rentals for which the tenants paid no rent. Units provided to relatives or to persons who performed services for their landlords are examples of non-cash rent units. The discussion of response and cooperation rates in *Section 4. Evaluation of the Different Approaches* depicts the movement from telephone numbers and addresses to completed interviews.

Row C counts the number of rental units for which we were able to obtain usable information on contract rent and the number of bedrooms.³⁵ *Contract rent* is the amount a tenant pays directly to his or her landlord. On average, we obtained usable information on contract rent and the number of bedrooms from 90% of the cash-rent units. The success rates were substantially higher for the ABS surveys (95.3% for Charleston and 94.9% for Fort Wayne) than for the RDD surveys (77% for Columbia and 74.3% for Peoria).

The D rows count the number of rental units for which we were able to obtain usable information on gross rent and the number of bedrooms. *Gross rent* is the sum of the amount a tenant pays directly to his or her landlord and what the tenant pays for utilities. Housing analysts generally base their analyses of housing costs on gross rent because two units with the same contract rent can represent widely different housing costs depending upon the extent to which landlords include utilities in the rent. HUD defines FMRs in terms of gross rent.

Adhering to previous HUD guidance on FMR Area Surveys,³⁶ neither the RDD landline/cell phone nor the ABS questionnaire asked how much respondents paid for utilities because previous experience had shown that answers to questions about the amount paid were unreliable. Instead, the questionnaires asked respondents whether they paid for specific utilities and what fuels were used for those utilities. HUD provided information on the costs of specific utilities by locality, by number of bedrooms, and (where applicable) by structure type. On a case-by-case basis, we used respondents' answers and the information provided by HUD to calculate the cost of tenant-paid utilities.³⁷

The counts in row D1 are equal to the counts in row C because we imputed information on utility costs if the respondent failed to provide the information. Row D2 shows what the counts would have been without imputation. Imputation allowed us to save 210 cases across the four survey sites. Throughout *Table 3-2*, the "2" rows show what the sample size would have been without imputation. The absence of

³⁵ In the case of the bedroom question, *useable* means that the respondent answered the question about the number of bedrooms in his or her unit. In the case of contract rent, *useable* means that the respondent provided either non-contradictory information on the amount of rent paid to the landlord or answered enough of the "bracket" questions to allow us to provide a reasonable estimate of rent. An example of contradictory information is a case where the respondent gives a dollar rent only in answer to the question of how much the unit would rent for without a voucher but also said that his or her household does not have a voucher. We were able to read the rent and bedroom information directly off electronic records for 1,485 interviews; we checked an additional 195 cases manually and were able to create useable rent for 27 of these cases.

³⁶ See *Random Digit Dialing Surveys: A Guide to Assist Larger PHAs* (U.S. Department of Housing and Urban Development: Washington, DC, 2000) found at <http://www.huduser.org/portal/publications/pubasst/rdd.html> for a description of HUD's RDD survey methodology.

³⁷ HUD provided us with utility cost data for all four sites. We had to make certain adjustments in using this information. Our code groups four-bedroom units together with units containing more than four bedrooms. The HUD utility estimates distinguish four-bedroom units from five-bedroom units. We used the four-bedroom estimates for all units with four or more bedrooms. HUD did not provide estimates for zero-bedroom units; we used the estimates for one-bedroom units for these units. HUD did not provide heating estimates for mobile homes; we used the estimates for single-family, detached units for these units. The HUD estimates do not cover units in multiunit structures; we used the estimates for single-family, attached units for these units. Our code asks separately who pays for water and who pays for sewer but HUD provides estimates for water and sewer combined. We used these estimates for units where the respondent reported paying for either water or sewer.

information on utility expenses eliminates roughly 11% to 13% of the units overall; there is little site-by-site variation in these percentages. We explain more about imputation after discussing the counts in the remaining rows in *Table 3-2*.

Table 3-2. Unweighted Counts of Samples and Subsamples³⁸

Row	Sample and Subsamples -- Unweighted Counts	RDD Surveys		ABS Surveys		Total
		Columbia	Peoria	Charleston	Fort Wayne	
A	Telephone numbers/addresses	20,641	20,648	10,000	10,000	61,289
B	Rental units with cash rents	269	206	658	730	1,863
C	Rental units with contract rent and bedroom information	207	153	627	693	1,680
D1	Rental units with gross rent and bedroom information (imputed)	207	153	627	693	1,680
D2	Rental units with gross rent and bedroom information (none imputed)	180	130	548	612	1,470
E1	Regular rental units ³⁹ with good information (imputed)	165	124	515	571	1,375
E2	Regular rental units with good information (none imputed)	144	104	449	505	1,202
F1	Non-project regular rent units with good information (imputed)	150	105	465	491	1,211
F2	Non-project regular rent units with good information (none imputed)	130	86	404	431	1,051
G1	Unassisted regular rent units with good information (imputed)	132	101	438	458	1,129
G2	Unassisted regular rent units with good information (none imputed)	115	83	381	402	981
H1	Non-project two-bedroom, recent-mover, not-new rental units (imputed)	21	17	110	84	232
H2	Non-project two-bedroom, recent-mover, not-new rental units (none imputed)	19	14	97	76	206
I1	Unassisted two-bedroom, recent-mover, not-new rental units (imputed)	19	17	106	82	224
I2	Unassisted two-bedroom, recent-mover, not-new rental units (none imputed)	18	14	94	74	200
J1	Two bedroom, not new rental units above HUD low-rent (imputed)	70	54	262	248	634
J2	Two bedroom, not new rental units above HUD low-rent (none imputed)	63	49	228	223	563
K1	Rental units with information after eliminating rent outliers (imputed)	199	148	610	683	1,640
K2	Rental units with information after eliminating rent outliers (none imputed)	173	126	534	602	1,435

³⁸ The highlighted rows (H-K) contain the samples used later to estimate FMRs. !

³⁹ Regular rental units *exclude* units if the tenant was related to landlord, did work for the landlord, or did not routinely live in the unit for the entire year or if the contract rent varied over the year. !

Because information on both gross rent and the number of bedrooms are essential in calculating FMRs, row D1 represents the maximum number of units available to determine FMRs in our survey sites. The ABS mail surveys provided substantially large samples to work with (627 for Charleston and 693 for Fort Wayne) compared to the RDD landline/cell phone surveys (207 for Columbia and 153 for Peoria).

Following HUD practice, we eliminated certain types of rental units before proceeding with two of the four approaches for calculating FMRs. Specifically, we eliminated units if the tenant was related to landlord, did work for the landlord, or did not routinely live in the unit for the entire year or if the contract rent varied over the year. The E rows show that this step eliminated approximately 20% of the rental units from the corresponding D row; the percentage eliminated varied little across the four sites.

The next issue was how to treat assisted housing units. We had five questions that attempted to identify whether a respondent lived in assisted housing:

- *RECERT: As part of your rental agreement, do you have to recertify your income every year to determine how much rent you pay?*
- *GOVTHP: Is your rent amount lower because you are in a government- housing program?*
- *PHAOWN: Does a local housing authority own this unit?*
- *PHALLD: Is the housing authority your landlord?*
- *HCV: Does your household have a housing voucher that allows you to choose where you live and pays for rent?*

Just like the similar battery of questions asked in the AHS, these questions overestimate the assisted housing stock.⁴⁰ Among the units in row D1, 40% of the respondents answered positively to one or more of the five questions. Nationally, assisted housing comprises less than 15% of rental housing.⁴¹

We definitely wanted to eliminate units located in public housing projects or in privately owned assisted housing projects because contract rents in these units are not true market rents. HUD's approach to estimating FMRs has consistently sought to eliminate these units as well. We were also concerned about units for which tenants receive assistance under the housing choice voucher program. The contract rents in these units are not true contract rents, but it is possible that the tenants know the true rents because they located their units in the private market or because they know the market rents of identical units whose tenants do not have vouchers.

We asked voucher holders if they knew the market rent of their units; *Section 2. The Questionnaire* notes that respondents could not differentiate between what they paid out-of-pocket and what the market rent of their unit would be. The analysis subsection below compares estimates based on unassisted housing units plus housing units rented with a voucher and those based only on unassisted units.

⁴⁰ The 2007 AHS found 6.8 million renters who claimed to be in subsidized housing.

⁴¹ Based on a 2009 AHS estimate of 35,378,000 renter households, HUD's 2009 budget estimate of 4.8 million units assisted by HUD, and an estimated of 434,000 units assisted under the Department of Agriculture's programs.

To keep from eliminating too many units because of assistance, we adopted the following procedures.

Procedure A: We classified a unit as a project-based, assisted housing unit if the respondent said he or she did not have a voucher and if the respondent answered positively to at least two of the following questions: RECERT, GOVTHP, PHAOWN, and PHALLD.

Procedure B: We classified a unit as a housing voucher unit if the respondent claimed to have a housing voucher and if the respondent said either that a PHA was his or her landlord or that he or she needed to recertify income every year.

Row F1 reports the results of applying Procedure A, and row G1 reports the results of applying both Procedures A and B. Overall, row F1 contains 88% of the units in row E1, and row G1 contains 82% of the units in row E1.

Rows H1, I1, J1, and K1 list the sample sizes for the four primary techniques we employed to estimate 2012 FMRs for the four metropolitan areas. The techniques are:

Technique 1: *Use the survey to identify regular two-bedroom units, which are not in assisted projects and which were built more than two years before the survey and which house recent-mover households; find the 40th percent gross rent for these units; and trend the 40th percentile rent to April 2012 using a 3.0% inflation rate (Row H1).* We will calculate FMRs based on Technique 1 and on three variations of Technique 1 as described in the discussion of *Table 3-1*. Row H1 is the first column in *Table 3-1*; the remaining columns correspond to the three variations. The variations increase sample size by including units other than two-bedroom units. This is the same as Technique 2 except that it includes voucher units in the sample.

Technique 2: *Use the survey to identify regular two-bedroom unassisted units, which were built more than two years before the survey and which house recent-mover households; find the 40th percent gross rent for these units; and trend the 40th percentile rent to April 2012 using a 3.0% inflation rate (Row I1).* Except for the magnitude of the inflation rate, this is the procedure that HUD used to set FMRs with decennial census data prior to 2005 and the procedure used for the classic FMR Area RDD surveys in the past. We will calculate FMRs based on Technique 2 and on three variations of Technique 2 as described in the discussion of *Table 3-1*.

Technique 3: *Use the survey to identify unassisted, two-bedroom rental units, which were built more than two years earlier; calculate a 40th percentile; adjust the percentile for recent movers; and trend to April 2010 using a 3.0% inflation rate (Row J1).* This is the technique that HUD currently uses to set FMRs. This technique expands the sample by keeping all two-bedroom units, not just those occupied by recent movers. In our calculations, we employ the same recent-mover adjustments used by HUD and the same rent cut-offs (updated from 2009 to 2011) that HUD uses to eliminate assisted units.

Technique 4: *Use the HUD 2009 40th percentile estimate; use the survey to identify all rental units and use these units to calculate an update factor, and trend the update value from the date of the survey to April 2012 using a 3.0% inflation rate (Row K1).* This technique expands the sample by using all rental units but since it relies on means rather than percentiles, we eliminated outliers from the sample.

Row H1 counts the sample available for Technique 1 and row I1 counts the sample available for Technique 2. The difference between the rows is that row H1 includes housing choice voucher units. While this was a major design consideration, there was no practical effect from including the housing choice voucher units. The total of row H1 is only eight units greater than the total of row I1, two in Columbia, four in Charleston, and two in Fort Wayne.

The combined effects of limiting the analysis to two-bedroom units, units occupied by recent movers, and units built more than two years prior to the survey eliminate 80% of the units in rows F1 and G1. The resulting sample sizes are not large enough to support meaningful estimates for the RDD sites. The sample sizes for the ABS mail survey sites are also small and produce FMR estimates of about +/-10%. As we shall see, the three variations of Techniques 1 and 2 increase the adequacy of the ABS samples but fail to increase the RDD samples enough to make them adequate for these techniques.

Using all two-bedroom units with HUD's recent-mover adjustment,⁴² as measured in row J1, substantially expands the usable sample. The ABS mail survey samples are now adequate while the RDD landline/cell phone samples move into the barely adequate range. HUD began using two-bedroom units occupied by non-recent movers as well as those occupied by recent movers in its estimates of the FY 2012 FMRs.⁴³ HUD has chosen to calculate FMRs based on gross rent data from the American Community Survey (ACS) collected over a five-year period since the FY2012 FMRs. HUD reasoned that the concept of "recent mover" loses its logical appeal when the data are collected over a 60-month period, and therefore developed an adjustment factor to fulfill the requirement that FMRs be based on the experience of recent movers. The ACS publishes population and housing information based on one-year, three-year, and five-year periods of data. HUD uses the five-year data because the one-year estimates are not available for the small metropolitan areas and the three-year data are not available for the smallest metropolitan areas. Even when the Census Bureau publishes one-year, three-year, and five-year data for a given metropolitan area, the five-year estimates are the most precise because they are based on the largest samples.

Technique 4 uses more sample cases and results in adequate sample sizes in the RDD landline/cell phone survey sites and strong sample sizes in the ABS mail survey sites. Note that the row K1 counts sum to 40 fewer units than the row D1 counts because we eliminate gross rents below \$100 or above \$2,500 and units where respondents gave rent ranges rather than precise rent amounts.

As noted earlier, regardless of the technique used to estimate FMRs, the sample sizes would have been substantially lower if we had not imputed the information needed to estimate utility costs, namely the type of fuel used for those utilities respondents paid for separately from their rent.⁴⁴ Based on past FMR Area Survey RDD practice, we used a series of 12 questions to estimate tenant payments for utilities. *Table 3-3* lists the percentage of times that we imputed the answer to a question.⁴⁵

⁴² See "Proposed Fair Market Rents for the Housing Choice Voucher Program and Moderate Rehabilitation Single Room Occupancy Program Fiscal Year 2012," 76 Federal Register 161 (19 August 2011), pp. 52508 - 52129.

⁴³ HUD has initiated the use of an adjustment factor instead of relying on only rents from recent movers. See http://www.huduser.org/portal/datasets/fmr/fmr2012p/Preamble_FY2012P_FMRs.pdf The section is titled "B. Recent Mover Bonus Factor" and "Proposed Fair Market Rents for the Housing Choice Voucher Program and Moderate Rehabilitation Single Room Occupancy Program Fiscal Year 2012," 76 Federal Register 161 (19 August 2011), pp. 52508 – 52129, or http://www.huduser.org/portal/datasets/fmr/fmr2012f/FY2012_FR_Preamble.pdf beginning on page 60969.

⁴⁴ We did not impute the cost of any utilities. HUD already has well established imputation rules for how to handle the cost of fuels for utilities where information is not available from HUD.

⁴⁵ An initial question asked whether utilities in general are included in the rent or whether the household pays for utilities separately. If the respondent indicated that utilities were included in the rent and failed to answer any of the subsequent questions, we presumed negative answers to each unanswered question about whether the household paid for a specific utility-related services. However, if the respondent answered positively to a subsequent question, then we presumed the household paid for that utility-related service despite the negative answer to the initial general question.

Table 3-3. Percentage of Cases Imputed

	Imputed
Pay for heat	0.7%
Fuel used for heat	3.6%
Pay for hot water	1.0%
Fuel used for hot water	2.9%
Pay for cooking	2.0%
Fuel used for cooking	1.6%
Pay for lighting	0.7%
Pay for air conditioning	0.8%
Pay for water	1.2%
Pay for sewer	2.2%
Pay for trash	2.1%
Pay for refrigerator or stove	0.6%

These percentages are smaller than those reported in the discussion of item non-response for the questionnaires in *Section 2. The Questionnaire* because we do not count non-responses if the respondent said “yes” in answer to the general question that utilities are included in the rent. Because missing information for any one of these questions can prevent computation of gross rent, these small percentages could, and do, have a sizeable impact on the potential usefulness of the sample. Table 3-4 indicates the number of imputations needed to compute utility costs for the 1,680 cases with good contract rents (row C in Table 3-4).

Table 3-4. Distribution of Cases with Good Contract Rents by Number of Imputations

Number of questions requiring imputations	Number of cases	Percent of cases not requiring imputation to compute gross rent
0	1,470	87.5%
1	151	9.0%
2	36	2.1%
3	13	0.8%
4	3	0.2%
5	1	0.1%
6	2	0.1%
7	0	0.0%
8	1	0.1%
9	3	0.2%
Total	1,680	100.0%

Of the 1,680 cases with good contract rents, 12.5% required imputation to compute gross rent and, of these, only 1.5% required imputation of the answers to more than two questions.

At some point in the past, HUD had provided instructions for imputing utility costs to ICF International when the company had conducted FMR Area RDD Telephone Surveys. However, the instructions only covered the imputing of fuel costs when either: (a) the PHA did not provide estimates for that fuel cost, or (b) the respondent did not provide information on fuel usage.⁴⁶ Only 40% of the imputations recorded in *Table 3-4* were related to fuel usage, so we needed a technique that could be used for both these cases and the other 60% of cases with missing information.

We used a hot-decking procedure to impute the missing information. "Hot-decking" selects a similar unit at random and uses the information from that unit to provide the missing information.⁴⁷ We selected similar units based on site, number of bedrooms, and structure type for heat, heat fuel, lighting, air conditioning, cooking, hot water, water, sewer, trash, and the provision of refrigerator or stove and selected similar units based on site, number of bedrooms, structure type, and heating fuel for cooking fuel and hot water fuel. We formed these decisions from an analysis of answers provided by the 1,470 households that answered the utility questions successfully. Structure type is very important in determining what utilities are included in the contract rent, and location and number of bedrooms have a moderate influence of what utilities are included and on what fuels are used. We also found that respondents incorrectly associated heat fuel with the fuel used for cooking and heating water.

In this research, a substantial level of effort was devoted to imputing whether or not the cost of a particular utility is included in the rent and, where appropriate, what fuel was used for the utility when the respondent failed to provide this information. However, the experience that we gained should greatly reduce the effort involved in imputing utility data in future FMR surveys. By carefully examining the patterns of utility payments and fuel choice across sites, structure types, unit sizes, and other factors, we determined the appropriate selection factors (as described in the preceding paragraph) to use in future hot-decking. We also devised a computational procedure for hot-decking that, with some work, could be formalized and provided to HUD for use in other circumstances. *Section 5. Cost Effectiveness of the Experimental Conditions*, starting on page 77, shows that the CPCI is substantial; therefore, every reasonable effort should be made to salvage records with missing utility data. For each of the four techniques used to estimate FMRs, imputation increased sample size by more than 10%.

3.3. CONFORMITY OF THE SAMPLES

Table 3-5 compares, site by site, the bedroom distribution and the average gross rent of the subsample consisting of all rental units with gross rent and bedroom information (Row D1) to the same data found in

⁴⁶ We obtained HUD's instruction from *Appendix A of FMR Area-Specific Procedures Guide* produced by Macro Incorporated, October 1, 2002.

⁴⁷ The previous HUD instructions used an average cost across all fuels if the fuel used was unspecified. We chose not to adopt the average cost approach because, when it is applied to situations where we do not know whether the household pays for the utility, all units receive an average of zero (for the x% of units for which that utility is included in the rent) and the full cost of the utility (for the 100-x%) of units whose households pay separately for that utility). The end result is a distribution of sample units with gross rents that not found in distribution of the population. Hot-decking provides a more realistic portrayal of the real distribution. The previous HUD instructions did help by confirming our decision to always assume that electricity is used for air conditioning unless another fuel is specified.

the three-year 2010 ACS tables.⁴⁸ The bedroom distributions are presented in percentage terms; the actual counts can be found in *Appendix F: Bedroom Distributions*.

Table 3-5. *Conformity of Survey Data to Published ACS Data*

Three-year 2010 ACS Bedroom Distribution				
Bedrooms	Columbia % (n)	Peoria % (n)	Charleston % (n)	Fort Wayne % (n)
0	1.7% (1,574)	3.7% (1,476)	2.9% (2,416)	2.6% (1,159)
1	18.3% (16,939)	28.0% (11,169)	15.8% (12,164)	28.2% (12,573)
2	41.5% (38,413)	42.4% (16,913)	41.2% (34,327)	38.2% (12,031)
3	31.6% (29,250)	19.2% (7,659)	32.6% (27,162)	24.4% (10,878)
4 or more	6.9% (6,387)	6.7% (2,673)	7.4% (6,166)	6.5% (2,898)
Number of cases	92,562	39,890	83,318	44,584

Survey Bedroom Distribution				
Bedrooms	RDDs		Mail Surveys	
	Columbia % (n)	Peoria % (n)	Charleston % (n)	Fort Wayne % (n)
0	1.5% (30)	1.4% (2)	1.3% (8)	2.0% (14)
1	17.1% (34)	31.1% (46)	18.9% (115)	30.5% (208)
2	38.2% (76)	39.2% (58)	44.1% (269)	38.9% (266)
3	33.2% (66)	15.5% (23)	31.5% (192)	22.7% (155)
4 or more	10.1%	12.8%	4.3%	5.9%

⁴⁸Originally, we had proposed making these comparisons using the five-year 2009 ACS tables. The three-year 2010 ACS tables became available recently, and we believe it is better to make this comparison using the most recent data.

	(20)	(19)	(26)	(40)
Number of cases	199	148	610	683
Calculated Chi-square	3.711	12.257	18.887	3.444
Critical value (0.05 level)	9.488	9.488	9.488	9.488
Mean Gross Rents: ACS-based vs. Survey-based				
Mean gross rent	RDDs		Mail Surveys	
	Columbia	Peoria	Charleston	Fort Wayne
2010 3-yr ACS	\$805.19	\$688.57	\$948.86	\$656.32
ACS adjusted to mid-2011	\$834.17	\$713.36	\$983.02	\$679.95
Survey	\$736.10	\$671.83	\$953.50	\$655.87
Sample size	199	148	610	683
Z-score for difference in means	3.91	1.38	1.15	1.17

Visually, the survey bedroom distributions are reasonably similar to the ACS distributions. The chi-square tests indicate that the survey distributions and the ACS distributions are not the same in Peoria and Charleston.⁴⁹ The differences in these two sites do not seem substantial enough to affect calculations based on the sample and the bedroom distribution in Peoria would not have been statistically different at the 0.01 level.

We compared the mean gross rents for all survey units in each site to the mean gross rents for all units from the 2010 ACS three-year data. Because the ACS mean gross rents are trended to mid-2009 and the survey mean gross rents were collected in July and August 2011, we trended the ACS mean gross rents to mid-2011 for a more valid comparison. The mean gross rents calculated from the surveys are all smaller than those derived by trending the 2010 ACS three-year data to mid-2011. Statistical testing confirms that the samples drawn in Peoria, Charleston, and Fort Wayne are consistent with the ACS information on those metropolitan areas. The survey mean for Columbia is approximately four standard deviations smaller than the ACS-based mean. This is a very significant difference that implies that the survey sample for Columbia is biased downward with respect to gross rents. The effects of this possible bias are revealed in the estimation of 2012 FMRs for Columbia in the next section of this report.⁵⁰

We also looked at the conformity of the subsamples. In the two RDD sites, Columbia and Peoria, contact was made both by landline and by cell phone. In the two ABS sites, Charleston and Fort Wayne, most of the responses were mail responses, but a small percentage was also telephone follow-ups. For each site, *Table 3-6* compares the distributions by number of bedrooms for the different types of responses.

⁴⁹ We ran the chi-square test by applying the percentages from the ACS distribution to the sample counts in each site. The chi-square test is subject to some instability when the number of categories is five or fewer and the cell sizes are small. We tried combining cells to increase cell sizes, but the results were qualitatively the same.

⁵⁰ It is unlikely that housing market conditions in Columbia changed so much between the ACS data collection and the collection of our survey data. Even the untrended ACS estimate is more than three standard deviations larger than the survey estimate. Both estimates are based on all rental units and are comparable in concept.

Table 3-6. Bedroom Distributions by Type of Response

Columbia	Landline	Cell
Zero-bedrooms	1.3%	0.0%
One-bedroom	19.5%	13.3%
Two-bedrooms	35.6%	44.4%
Three-bedrooms	34.2%	26.7%
Four- or more bedrooms	9.4%	15.6%
Number of cases	149	45
Chi -square	3.166	
Critical value	7.815	
Peoria	Landline	Cell
Zero-bedrooms	2.2%	0.0%
One-bedroom	34.4%	25.0%
Two-bedrooms	32.2%	50.0%
Three-bedrooms	16.7%	15.4%
Four- or more bedrooms	14.4%	9.6%
Number of cases	90	52
Chi -square	5.257	
Critical value	7.815	
Charleston	Landline	Mail
Zero-bedrooms	1.3%	1.5%
One-bedroom	10.3%	21.0%
Two-bedrooms	37.2%	45.1%
Three-bedrooms	39.7%	28.9%
Four- or more bedrooms	11.5%	3.5%
Number of cases	78	519
Chi -square	14.043	
Critical value	7.815	
Fort Wayne	Landline	Mail
Zero-bedrooms	1.0%	1.9%
One-bedroom	24.2%	31.9%
Two-bedrooms	38.4%	39.2%
Three-bedrooms	25.3%	22.0%
Four- or more bedrooms	11.1%	4.9%
Number of cases	99	567
Chi -square	7.230	
Critical value	7.815	

In both Columbia and Peoria, the cell phone interviews produced bedroom distributions that had higher percentages of two-bedroom units than the landline interviews and lower percentages of all the other bedroom counts. However, in both cases, the chi-square test failed to find that the landline and cell phone samples were statistically different with respect to their bedroom distributions at the 0.05% level. In both

Charleston and Fort Wayne, the mail responses had higher percentages of zero-, one-, and two-bedroom units than the telephone follow-ups but lower percentages of three- and four or more bedroom units. The two distributions were statistically different in Charleston at the 0.05% level but not in Fort Wayne.⁵¹ The Fort Worth distributions were statistically different at the 0.10 level.

Table 3-7 compares the distribution of two-bedroom units by gross rent for all four sites. Because of the paucity of cases in important cells, we were unable to test for statistically significant differences.

Table 3-7. Two-bedroom gross rent distributions by type of response

Columbia	Landline	Cell
< \$200	0.0%	0.0%
\$201-300	11.3%	0.0%
\$301-500	13.2%	0.0%
\$501-750	37.7%	60.0%
\$751-1000	30.2%	40.0%
\$1001+	7.5%	0.0%
Number of cases	53	20
Peoria	Landline	Cell
< \$200	3.4%	0.0%
\$201-300	3.4%	3.8%
\$301-500	27.6%	15.4%
\$501-750	41.4%	50.0%
\$751-1000	24.1%	26.9%
\$1001+	0.0%	3.8%
Number of cases	29	26
Charleston	Landline	Mail
< \$200	0.0%	0.4%
\$201-300	3.4%	2.6%
\$301-500	6.9%	5.6%
\$501-750	31.0%	28.2%
\$751-1000	34.5%	35.9%
\$1001+	24.1%	27.4%
Number of cases	29	234
Fort Wayne	Landline	Mail
< \$200	2.6%	0.9%
\$201-300	0.0%	1.8%
\$301-500	10.5%	11.3%
\$501-750	71.1%	52.3%
\$751-1000	13.2%	31.1%

⁵¹ In all four sites, the zero- and one-bedroom units were combined into one category for the chi-square tests because of the paucity of zero-bedroom units in the sample.

\$1001+	2.6%	2.7%
Number of cases	38	222

In Columbia, only 20 of the 73 cases were cell phone interviews; all of these cases had gross rents between \$501 and \$1,000. Approximately one-third of the landline two-bedroom responses in Columbia were outside of this interval. In Peoria, a higher percentage of the cell phone responses were in the three highest gross rent categories. In Charleston, the landline and mail responses had gross rent distributions that were similar. Finally, in Fort Wayne, both distributions had approximately 85% of the cases in the \$501-\$750 and the \$751-\$1,000 categories but the landline distribution was more heavily concentrated in the \$501-\$750 category. It is important to remember that the differences noted in this paragraph could not be tested for statistical significance.

3.4. SURVEY ESTIMATES OF 2012 FMRs

This section derives estimates of 2012 FMRs based on the survey samples using the four different techniques described above. Before discussing the FMR estimates, we explain Technique 4 in greater depth and, in the process, draw distinctions among the four techniques to conceptualize how HUD's FMR estimates might become disjointed from the 40th percent of recent-mover two-bedroom rents.

Technique 4

The discussion of the four techniques in the subsection on *Sample Counts* was adequate for the first three techniques. Technique 2, with the three variations, is the previous HUD methodology and Technique 1 is the same as Technique 2 except that it includes voucher units in the sample calculation. Technique 3 is the current HUD methodology. While Technique 4 is similar to the approach HUD used in the past to create regional update factors, some additional explanation is required for Technique 4.

Unlike the other three techniques, Technique 4 conceptually presumes that the base used by HUD to construct the 2012 FMRs, namely the *ACS2009 5-Year 2-Bedroom Adjusted Standard Quality Rent*, is accurate. It posits that the HUD 2012 FMR will be inaccurate only if the approach used by HUD to go from the 2009 ACS data to an April 1, 2012 FMR is inaccurate. This implies that any error has to be in the CPI adjustment from mid-2009 to the end of 2010 or the 3.0% inflation factor used to trend from January 1, 2011 to August 2011.⁵² However, if the ACS base was inaccurate, estimates of FMRs based on Technique 4 would also adjust for this inaccuracy because Technique 4 uses ACS aggregate gross rent as the base point in computing a growth rate and any inaccuracy in the ACS base would be reflected in the ACS aggregate gross rent estimates.⁵³

If the base used by HUD to construct the 2012 FMRs, namely the *ACS2009 5-Year 2-Bedroom Adjusted Standard Quality Rent*, and HUD's recent-mover adjustment were accurate as of 2009, then a specific HUD 2012 FMR will be inaccurate only if the recent-mover adjustment has changed in that locality or the trending used by HUD to go from the 2009 ACS data to an April 1, 2012 FMR is inaccurate for that locality. Techniques 1 and 2 (and their variations) address both of these possibilities by focusing directly on recent movers and by providing a more recent estimate of the 40th percentile. Techniques 3 and 4 presume that the recent-mover adjustment is still appropriate and focus on the trending. Technique 3

⁵² The survey data are incapable of finding any error in the trending after August 2011 when the surveys were conducted.

⁵³ The ACS use large, carefully drawn samples but the derived estimates are still subject to sampling error. The use of five-year ACS data introduces an additional possible source of inaccuracy. The Census Bureau uses the Consumer Price Index (CPI) to make gross rent data collected over multiple years consistent. If gross rents were increasing faster than the CPI, then the 5-year estimates will underestimate gross rents in the final year of the period.

produces a more recent (but not a current) measurement of the 40th percentile of all two-bedroom gross rents, and therefore reduces the trending period while Technique 4 provides a localized trending factor for part of the period.⁵⁴

Technique 4 constructs a localized trending factor by constructing an updated estimate of mean gross rent and comparing it to the estimate of mean gross rent from ACS2009 five-year data. Technique 4 uses:

- ACS Table B25065 to obtain aggregate gross rent for 2009 (centered at mid-2009);
- ACS Table B25063 to obtain a count of rental units with cash rents by bedroom size; and
- The surveys to estimate mean gross rent by bedroom size for mid-2011.

The Technique 4 combines the survey estimates of mean gross rent by bedroom size with the ACS estimate of units by bedroom size *in 2009* to compute an aggregate gross rent for 2011 subject to the constraint that the number of cash-rent units and their distribution by bedroom size has not changed. This constraint implies that any change in aggregate gross rent must be attributable to a change in mean gross rent. The change in aggregate gross rent is used to update the *ACS2009 5-Year 2-Bedroom Adjusted Standard Quality Rent* to mid-2011, HUD's recent-mover adjustment is applied, and the product is trended to April 1, 2012 using HUD's 3.0% inflation factor.⁵⁵

The advantage of this technique is that it uses all the rental units that responded to the surveys with adequate information on rent and bedrooms.

Because Technique 4 concentrates its focus on the period between mid-2009 and mid-2011, we can compare its estimate of change to the change that HUD assumed. *Table 3-8* makes that comparison using information from the 2012 FMRs found on the HUDUSER Website. The surveys found that rents changed less than HUD predicted for Columbia, Peoria, and Fort Wayne and more than HUD predicted in Charleston. The HUD estimates were based on regional CPI data. HUD has informed us that the Department is investigating using ACS data for trending. This shift would produce a more localized trending factor.

Table 3-8. Comparison of Change HUD and Technique 4 Estimates of Change

	Columbia	Peoria	Charleston	Fort Wayne
Survey-calculated-change June 30, 2009-August 4, 2011	0.9252	0.9712	1.0646	0.9937
HUD-predicted change June 30, 2009-August 4, 2011	1.0203	1.0369	1.0203	1.0369

The advantage of Techniques 3 and 4 is that they provide more useable samples from a given survey by using more of the surveyed units. Technique 3 uses non-recent-mover two-bedroom units in addition to recent-mover two-bedroom units and Technique 4 uses all the rental units that responded to the surveys

⁵⁴ All four techniques deal with an additional source of error. The use of five-year ACS data introduces an additional possible source of inaccuracy. The Census Bureau uses the Consumer Price Index (CPI) to make gross rent data collected over multiple years consistent. If gross rents were increasing faster than the CPI, then the five-year estimates will underestimate gross rents in the final year of the period.

⁵⁵ Technique 4 is similar to but not the same as an approach HUD formerly used to compute regional adjustment factors. Previously HUD surveyed the same rental units in two separate years to obtain an estimate of rent inflation. The difference between Technique 4 and the former HUD approach is that HUD surveyed the same units in both years.

with adequate information on rent and bedrooms. The disadvantage of both approaches is that they cannot detect changes in the ratio of recent-mover rents to all rents, that is, changes in the recent-mover adjustment.

HUD has long believed that recent-mover rents are more representative of current conditions in local housing markets. HUD's rationale for focusing on recent movers is reasonable. One would expect an increase in rents to first appear in newly rented units and then only later in currently rented units as their leases come up for renewal. Moreover, landlords might not raise the rents of current tenants to the new market level in an effort to reduce turnover and the loss of revenue during the rent-up period. The same pattern might apply during a period of declining rents with the rents of newly rented units falling faster than overall rent. However, there has been very little research on recent-mover rents. We do not know how the relationship between all rents and recent-mover rents changes over time and whether the pattern of change in this relationship varies across metropolitan areas and regions. The absence of research on recent-mover rents is not surprising. Until very recently, there has been no data to study these relationships. The availability of ACS rent data by locality for several consecutive years now makes this important research possible. Without more research, we cannot know how serious is the failure to measure changes in the ratio of recent-mover rents to all rents.

Comparison of FMR Estimates

Table 3-9 presents, for each site, four different estimates of the 2012 FMRs—four estimates per site each for Techniques 1 and 2 and their variants, and one estimate per site using each of the techniques described above for Techniques 3 and 4. *Appendix G* provides details on the construction and testing of each estimate.⁵⁶ In the following discussion, we will attempt to draw useful lessons from this large collection of numbers.

An obvious first question is: *"Why have we devoted so much attention to the different ways HUD could use the survey data to estimate FMRs?"* The answer is that HUD needs an unbiased, precise survey methodology to calculate FMRs for selected areas. The presence and extent of bias varies by both survey methodology and estimation technique and, because we do not have an independent estimate of the actual 40th percentile, recent-mover rent, we can only speculate about bias. Precision depends most importantly upon the number of cases used to estimate FMRs, and the number of cases derived from a particular survey depends upon the technique used to estimate FMRs. *Table 3-9* shows that the number of cases available to calculate the FMR ranges from 17 to 683. The instance of 17 cases occurred in Peoria where we used an RDD survey, estimated the 40th percentile directly from the survey, and limited the analysis to unassisted two-bedroom rental units built more than two years ago and occupied by recent movers. The instance of 683 cases occurred in Fort Wayne where we used an ABS mail survey and estimated the change in the 40th percentile FMR indirectly using changes in mean gross rent based on all surveyed units. In the discussion below, we will examine how choices of survey methodology and estimation technique affect precision and bias.

⁵⁶ Because the comparison of aggregate gross rent is equivalent to a comparison of mean gross rent, we base our test of whether the Technique 4 FMR is equivalent to the HUD 2012 FMR by comparing the mid-2011 mean gross rent from the survey to a mid-2011 mean gross rent computed by taking the 2009 ACS mean gross rent and trending it forward to mid-2011 using HUD's FMR methodology. *Appendix G* contains the details.

Table 3-9. FMR Estimates Using Different Techniques

2012 FMRs (April 1, 2012)		Columbia	Peoria	Charleston	Fort Wayne
	HUD-published	\$769	\$689	\$874	\$634
H1	Non-project two-bedroom, recent-mover, not-new rental units (trended)	\$617	\$631	\$812	\$634
	Sample size	21	17	110	84
	Trended 95% confidence interval lower-bound	\$516	\$491	\$772	\$566
	Trended 95% confidence interval upper-bound	\$689	\$732	\$863	\$656
	Statistically different from HUD 2012 FMR	Yes	No	Yes	No
H1 1 and 2 bedrooms	Non-project two-bedroom, recent-mover, not-new rental units (trended)	\$617	\$633	\$819	\$634
	Sample size	24	25	140	144
	Trended 95% confidence interval lower-bound	\$517	\$617	\$780	\$605
	Trended 95% confidence interval upper-bound	\$691	\$726	\$869	\$659
	Statistically different from HUD 2012 FMR	Yes	No	Yes	No
H1 1, 2, and 3 bedrooms	Non-project two-bedroom, recent-mover, not-new rental units (trended)	\$633	\$632	\$876	\$644
	Sample size	42	29	218	183
	Trended 95% confidence interval lower-bound	\$606	\$622	\$835	\$618
	Trended 95% confidence interval upper-bound	\$729	\$723	\$937	\$671

2012 FMRs (April 1, 2012)		Columbia	Peoria	Charleston	Fort Wayne
	Statistically different from HUD 2012 FMR	Yes	No	No	No
H1 All bedrooms	Non-project two-bedroom, recent-mover, not-new rental units (trended)	\$637	\$638	\$884	\$652
	Sample size	47	34	235	202
	Trended 95% confidence interval lower-bound	\$609	\$623	\$835	\$632
	Trended 95% confidence interval upper-bound	\$730	\$726	\$939	\$687
	Statistically different from HUD 2012 FMR	Yes	No	No	No
I1	Unassisted two-bedroom, recent-mover, not-new rental units (trended)	\$615	\$631	\$822	\$635
	Sample size	19	17	106	82
	Trended 95% confidence interval lower-bound	\$515	\$504	\$777	\$555
	Trended 95% confidence interval upper-bound	\$650	\$732	\$874	\$657
	Statistically different from HUD 2012 FMR	Yes	No	No	No
I1 1 and 2 bedrooms	Unassisted two-bedroom, recent-mover, not-new rental units (trended)	\$616	\$633	\$834	\$635
	Sample size	22	25	135	140
	Trended 95% confidence interval lower-bound	\$515	\$617	\$783	\$602
	Trended 95% confidence interval upper-bound	\$675	\$726	\$881	\$662
	Statistically different from HUD 2012 FMR	Yes	No	No	No

2012 FMRs (April 1, 2012)		Columbia	Peoria	Charleston	Fort Wayne
I1 1, 2, and 3 bedrooms	Unassisted two-bedroom, recent-mover, not-new rental units (trended)	\$631	\$632	\$885	\$646
	Sample size	40	29	211	175
	Trended 95% confidence interval lower-bound	\$604	\$622	\$835	\$619
	Trended 95% confidence interval upper-bound	\$730	\$723	\$951	\$674
	Statistically different from HUD 2012 FMR	Yes	No	No	No
I1 All bedrooms	Unassisted two-bedroom, recent-mover, not-new rental units (trended)	\$636	\$638	\$892	\$654
	Sample size	45	34	227	192
	Trended 95% confidence interval lower-bound	\$608	\$623	\$835	\$633
	Trended 95% confidence interval upper-bound	\$730	\$726	\$975	\$694
	Statistically different from HUD 2012 FMR	Yes	No	No	No
J1	Two bedroom, not new rental units above HUD low-rent (trended)	\$700	\$680	\$873	\$643
	Sample size	70	54	262	248
	Trended 95% confidence interval lower-bound	\$671	\$655	\$842	\$618
	Trended 95% confidence interval upper-bound	\$731	\$700	\$903	\$673
	Statistically different from HUD 2012 FMR	Yes	No	No	No
K1	Rental units with information after eliminating rent outliers (trended)	\$699	\$650	\$915	\$610

2012 FMRs (April 1, 2012)		Columbia	Peoria	Charleston	Fort Wayne
	Sample size	199	148	610	683
	Statistically different from HUD 2012 FMR	Yes	No	Yes	Yes
	Trended 95% confidence interval lower-bound	\$659	\$606	\$885	\$592
	Trended 95% confidence interval upper-bound	\$739	\$693	\$946	\$628

Inclusion of voucher units: This research tested whether HUD could successfully include rental units occupied by housing voucher recipients in future FMR surveys. *Section 2. The Questionnaire* explained the difficulties in obtaining accurate information on market rents for these units. The primary lesson learned is that their inclusion only marginally increases the number of cases available to calculate FMRs. As noted earlier, when the analysis is confined to two-bedroom recent-mover units only, the inclusion of housing voucher units added only eight cases total, two in Columbia, four in Charleston, and two in Fort Wayne. Even when we include all bedroom sizes in the direction of the 40th percentile recent-mover rent (H1 all bedrooms), the increase in sample size (over I1 all bedrooms) is small, two in Columbia, none in Peoria, eight in Charleston, and 10 in Fort Wayne.

RDD vs. mail surveys: The choice facing HUD regarding RDD versus mail is not related to statistics. *section 2. The Questionnaire* explained how we were able to obtain suitable data using both methods. *section 4. Evaluation of the Different Approaches* will show that the CPCI is substantially lower for mail surveys. The combined implication of these two sections is that both RDD and mail surveys can produce estimates with the same precision (that is, based on the same number of cases) but that the cost of achieving the desired sample size will be substantially higher for RDD surveys. While more expensive, RDD surveys have the advantage of producing results more quickly. Mail surveys take more time because of mail delays, the need for additional mailings with an intervening period, and keypunching written responses into an electronic file. This section illustrates the precision produced by various sample sizes, and therefore provides guidance on how many calls or mailings HUD will need to plan in order to achieve those samples.

Additional considerations

In planning a special survey, HUD should set a target level of precision. HUD would probably want to set the target level in terms of the cost difference that would trigger a revision to the existing FMR. For example, HUD would want to avoid explaining to a PHA (and the PHA's member of Congress) that, while the Department's survey found that the proposed FMR is \$50 too low, the finding was not statistically significant and therefore no change would be made. The four test surveys furnish valuable empirical information on the sample needed to generate the appropriate confidence intervals.⁵⁷

Table 3-9 shows that the width of the confidence intervals varies greatly by both the site and the number of cases used to construct the estimate. The measured width of confidence intervals from small samples can be particularly volatile. If HUD wanted to be sure that a difference of \$50 would be statistically significant, it would aim for a confidence interval of \$100 (2x\$50) to account for a \$50 difference on either side. Ignoring the very small sample, *Table 3-9* shows that samples of 150-200 produced confidence intervals of \$100 or less most, but not all, of the time.

Table 3-9, in combination with *Table 3-2*, can be used to estimate how large the survey would have to be to gather a target sample size, depending upon the technique used to calculate the FMR. For example, mailing out 10,000 survey forms produced 135 unassisted, one- and two-bedroom units built more than two years ago and occupied by recent movers in Charleston and 140 of them in Fort Wayne. If HUD wanted to make sure it achieved 200 such cases, then the initial mailing should be 15,000 (approximately $200 * 10,000 / 135$). If instead, HUD wanted to

⁵⁷ Confidence interval boundaries depend on the characteristics of the sample. For example, statistical theory says that a sample of 200 cases will produce a 5% confidence interval around the 40th percentile that ranges approximately from the 33 percentile to the 47 percentile. But we need to know the distribution of the population (or, in the absence of that, the distribution of the sample) to identify the dollar rents associated with the 33th and 47th percentiles.

use an RDD to obtain the same 200 cases, then it should draw 165,000 telephone numbers (approximately $200 * 20,600 / 25$).⁵⁸

Use of other bedroom sizes with direct estimation of the 40th percentile: In the past, HUD allowed large PHAs to survey both one- and two- bedroom recent-mover rental units and small PHAs to survey one-, two-, and three-bedroom recent-mover rental units. For these surveys, HUD based its estimate of the 40th percentile on two-bedroom equivalent rents.⁵⁹ Our surveys offer an opportunity to assess the use of equivalent two-bedroom rents. *Table 3-9* contains the 2012 FMRs derived from 4 variants of the HUD approach, estimates based only on two-bedroom recent-mover units, estimates based on one- and two-bedroom recent-mover units, estimates based on one-, two-, and three-bedroom recent-mover units, and estimates based on all recent-mover units.⁶⁰ Because the 2012 FMRs are trended, any differences in the estimates derived from the different variants are inflated by the trending factor. For this reason, we present the actual 40th calculated by each variant in *Table 3-10*. *Table 3-10* contains the samples sizes upon which the 40th percentiles are based.

Table 3-10. Comparison of 40th Percentiles Calculated Using Two-Bedroom Equivalent Rents

40th percentile rents as of August 2011 based on surveys of unassisted, recent-mover, not-new rental units	Columbia	Peoria	Charleston	Fort Wayne
Two bedroom rental units	\$603	\$619	\$806	\$622
One- and two-bedroom rental units	\$604	\$621	\$818	\$623
One-, two-, and three-bedroom rental units	\$619	\$620	\$868	\$634
Zero-, one-, two-, three-, and four or more-bedroom rental units	\$624	\$626	\$875	\$642

Table 3-10 shows that the inclusion of one-bedroom units increases the sample sizes substantially except in Columbia while the addition of three-bedroom units increases the sample sizes substantially in Columbia and Charleston, moderately in Fort Wayne, and only slightly in Peoria. The addition of the units having no bedrooms or four or more had a moderate effect on sample sizes in all four sites.

⁵⁸ In these examples, the 10,000 and 20,600 numbers came from Row A of *Table 3-2*. The 135 and 25 numbers came from the 11 one- and two-bedroom panel in *Table 3-7*.

⁵⁹ For one-bedroom units, the two-bedroom equivalent rent is the unit's gross rent times the two-bedroom FMR divided by the one-bedroom FMR. For three-bedroom units, the two-bedroom equivalent rent is the unit's gross rent times the two-bedroom FMR divided by the quotient of the three-bedroom FMR and 1.087. The 1.087 factor removes the bonus that HUD provides to three-bedroom units in setting the FMR.

⁶⁰ The estimates based on all recent movers calculated the two-bedroom equivalent rent of zero-bedroom units as the unit's gross rent times the two-bedroom FMR divided by the zero-bedroom FMR. For four-bedroom units, the two-bedroom equivalent rent is the unit's gross rent times the two-bedroom FMR divided by the quotient of the four-bedroom FMR and 1.077. The 1.077 factor removes the bonus that HUD provides to four-bedroom units in setting the FMR. In our surveys, units with four or more bedroom were given the same code and therefore are grouped together in this analysis. We do not think this is a serious distortion for our purposes as units with five or more bedrooms compose only 1% of the rental stock nationwide. In future surveys, it would be advisable to record the actual bedroom count rather than lump together those with four or more bedrooms.

Table 3-10 shows that the inclusion of one-bedroom units had only marginal effects on the estimate of the 40th percentile in Columbia, Peoria, and Fort Wayne and a small effect in Charleston. The addition of three-bedroom units had a marginal effect on the 40th percentile in Peoria but increased the estimate substantially in Columbia, Charleston, and Fort Wayne. The addition of units having no bedrooms or four or more increased the estimate of the 40th percentile in all four sites. The \$875 and \$868 estimates for Charleston are statistically different at the 5% level from the \$806 estimate; none of the other site-specific pairs are statistically different.

Using two-bedroom equivalent rents can enhance the usable sample size considerably. The addition of one-bedroom units increased the usable sample size by an unweighted average of 40%, but the gain varied from 14% in Columbia to 71% in Fort Wayne. The addition of both one- and three-bedroom units increased the usable sample size by an unweighted average of 97%, with a low of 71% in Peoria and a high of 118% in Fort Wayne. While there are only two statistically valid differences, the pattern of changes in Table 3-10 raises concerns about the appropriateness of the factors used to make the rents equivalent for three-bedroom, zero-bedroom, and four-bedroom units. In Table 3-10, the 40th percentile estimates trend upwards as the sample is expanded. This could be normal sample variation or it could indicate a possible upward bias in some of the factors used to create equivalent rents.

Direct vs. Indirect Estimates of Changes in the 40th percentile: The I and H panels in Table 3-10 use *direct* methods to estimate the 40th percentile of recent movers, that is, they use the survey to create a frequency distribution of recent-mover rents and find the 40th percentile of that distribution. Panels J and K use *indirect* methods to estimate the 40th percentile of recent movers, that is, they trend the most recent HUD estimate forward. Conceptually, Panel J (Technique 3) uses the trend in the 40th percentile of all two-bedroom units as the trending factor. Panel K (Technique 4) uses changes in fixed-weight mean gross rents to perform the trending.⁶¹ The indirect techniques use more of the surveyed units in calculating the FMR, so their estimates should be more precise.⁶² In the discussion of Technique 4, we explained that both Techniques 3 and 4 presume that any errors in the FMR are accounted for by a failure to accurately track trends in rents since the last ACS data used to calculate FMRs. Both techniques implicitly assume that there is no change in the recent-mover adjustment. Therefore, conceptually one should favor the direct estimation methods, Techniques 1 and 2, over Techniques 3 and 4 in order to capture all the changes in the rental market.

Table 3-11 collects the relevant information from Table 3-9 so that we can easily compare the FMR estimates from both the direct and indirect methods. Table 3-11 includes only the direct estimate based on unassisted units because, as explained earlier, we believe that nothing useful is gained from looking at the estimates based on non-project units, including voucher units.

Table 3-11. Comparison of 2012 FMR estimates from Techniques 2, 3, and 4

	Columbia	Peoria	Charleston	Fort Wayne
HUD-published	\$769	\$689	\$874	\$634
Technique 2: Unassisted two-bedroom, recent-mover, not-new rental units (two-bedroom units only)	\$615	\$631	\$822	\$635

⁶¹ "Fixed-weight" means that the mean gross rent of both periods is based on the first-period bedroom distribution from the ACS so that comparison is not affected by changes in the bedroom composition of the rental stock.

⁶² While precision is a desirable property, there are other equally important properties to be considered, in this case, accuracy.

	Columbia	Peoria	Charleston	Fort Wayne
Technique 3: Two bedroom, not new rental units above HUD low-rent (trended)	\$700	\$680	\$873	\$643
Technique 4: Rental units with information after eliminating rent outliers (trended)	\$699	\$650	\$915	\$610

In Columbia and Charleston, the estimates from both Techniques 3 and 4 are statistically different from the Technique 2 estimates. In Fort Wayne, only the Technique 4 estimate is statistically different from the Technique 2 estimate. In Peoria, neither the Technique 3 nor Technique 4 estimates are statistically different from the Technique 2 estimate. The within-site patterns are interesting in the three sites where techniques produce some statistically different estimates.

Columbia: All three estimates are lower and statistically different than the HUD 2012 FMR. Technique 2 estimates are lower than the Technique 3 and 4 estimates. This could be interpreted as all three techniques uncovering a downward trend in rents while Technique 2 also picked up an associated decline in the appropriate adjustment for recent. However, this observed pattern may simply be the result of a problem with the survey sample. Our earlier comparison with the 2010 ACS three-year data indicated that the rents in the surveyed units were substantially and statistically lower than those in the 2010 ACS.

Charleston: Both Technique 3 and 4 find an upward trend in rents. The trend based on Technique 3 is close to the trend used by HUD and results in a 2012 FMR very close to HUD's. The trend based on Technique 4 is higher and results in a 2012 FMR that is statistically higher than the HUD FMR. The data from the 2010 three-year ACS suggest a trend in rents almost twice that measured by Technique 4.⁶³ The Technique 2 estimate implies that the recent-mover adjustment has declined substantially in the face of what appears to be an upward trend in rents, a puzzling result.

Fort Wayne: Technique 4 found a slight decline in rents between 2009 and 2011. Based on its higher estimate of the 2012 FMR, Technique 2 implies some combination of a higher trend than that found in Technique 4 or an increase in the appropriate recent-mover adjustment.

Imputation: *Table 3-12* examines whether imputation had a noticeable effect on the estimates. Using cases with imputed data had little impact on the estimated FMR, regardless of technique, but did increase the number of cases used in the estimation, sometime substantially.

⁶³ Technique 4 found that rents increased 6.5% from 2009 to 2011 in Charleston. The ACS measured a 6.4% increase from 2009 to 2010, which extrapolated to 2011 would be an increase of 13.8%.

Table 3-12. Comparison of FMR Estimates Based on All Cases and Cases without Imputed Data

2012 FMRs (April 1, 2012)		Columbia	Peoria	Charleston	Fort Wayne
	HUD-published	\$769	\$689	\$874	\$634
H1	Non-project two-bedroom, recent-mover, not-new rental units (imputed)	\$617	\$631	\$812	\$634
	Number of cases used	21	17	110	84
H2	Non-project two-bedroom, recent-mover, not-new rental units (none imputed)	\$617	\$628	\$828	\$636
	Number of cases used	19	14	97	76
I1	Unassisted two-bedroom, recent-mover, not-new rental units (imputed)	\$615	\$631	\$822	\$635
	Number of cases used	19	17	106	82
I2	Unassisted two-bedroom, recent-mover, not-new rental units (none imputed)	\$616	\$628	\$831	\$636
	Number of cases used	18	14	94	74
J1	Two bedroom, not new rental units above HUD low-rent (imputed)	\$700	\$680	\$873	\$643
	Number of cases used	70	54	262	248
J2	Two bedroom, not new rental units above HUD low-rent (none imputed)	\$700	\$672	\$879	\$647
	Number of cases used	63	49	228	223
K1	Rental units with information after eliminating rent outliers (imputed)	\$699	\$650	\$915	\$610
	Number of cases used	199	148	610	683
K2	Rental units with information after eliminating rent outliers (none imputed)	\$702	\$654	\$928	\$609
	Number of cases used	173	126	534	602

Finally, we explored developing variants of Techniques 1 and 2 that used three-bedroom units as well as two-bedroom units. The variants would adjust the rents of the three-bedroom units by the ratio of mean two-bedroom rents to mean three-bedroom rents, based on ACS data. We abandoned this approach because the gain in sample size did not seem worth having to assume that the ratio was a valid way to make three-bedroom and two-bedroom rents equivalent. *Table 3-13* compares the sample sizes and confidence intervals for the first two techniques using just two-bedroom units and using both two-bedroom and three-bedroom units. While the sample size increases are large in all the sites except Peoria, the gain in increased precision is relatively small. For example, the two-bedroom sample for Columbia is 21 units while the two- and three-bedroom sample contains 39 units, yet the confidence interval is still very wide (30.8 percentage points).⁶⁴

Table 3-13. Comparison of Samples Based on Two-Bedroom vs. Two- and Three-Bedroom Units

Count of units meeting criteria for the Techniques 1 and 2	Random Digit Dialing Surveys		Address Based Surveys	
	Columbia	Peoria	Charleston	Fort Wayne
Technique 1: two-bedroom units only	21	17	110	84
Two- + three-bedroom units	39	21	188	123
Technique 2: two-bedroom units only	19	17	106	82
Two- + three-bedroom units	37	21	182	117
Distance between lower- and upper-bounds of percentiles used to set confidence intervals	Columbia	Peoria	Charleston	Fort Wayne
Technique 1:two-bedroom units only	41.9%	46.6%	18.3%	21.0%
Two- + three-bedroom units	30.8%	41.9%	14.0%	17.3%
Technique 2:two-bedroom units only	44.1%	46.6%	18.7%	21.2%
Two- + three-bedroom units	31.6%	41.9%	14.2%	17.8%

We also considered a second variant that would have added zero-bedroom, one-bedroom, and three-bedroom units to Techniques 1 and 2. We also found this approach as significantly less attractive than Technique 4. Including zero- to three-bedroom units produced sample sizes only one-fifth to one-third as large as the sample sizes for Technique 4 but required assuming a set of fixed ratios of gross rents by bedroom size.

3.5. LESSONS LEARNED

In the FMR context, the goal of surveying is to give the analyst enough quality information to be able to estimate an area-specific FMR. The right population has to be identified, their cooperation obtained, the necessary information elicited accurately, and a sufficient number of interviews completed. This chapter has focused on the concept of "a sufficient number". Analysts can estimate FMRs using different techniques, yet each has its own merits and drawbacks. One important element of whatever technique is

⁶⁴ The range is from 24.6 to 55.4 (40 + or - 30.8/2). To determine whether the estimated FMR is statistically different than the HUD-published FMR, we would use the sample to determine the gross rents associated with the 24.6 percentile and with the 55.4 percentile. If the HUD-published rent falls between these values, then the estimated FMR is not statistically different than the HUD FMR. The impact on the confidence intervals is small because they are based on the square root of the sample size.

employed is how efficiently it uses the sample provided by the survey. Every technique uses only a subsample.

In this final section, we examine four techniques to draw some conclusions about the choices that HUD has to make in designing surveys around a given technique based on the lessons from the four-site experiment.

RDD vs. mail surveys: Both surveys can produce reliable information on which to base FMRs. So the choice between these methodologies does need to be based on statistical considerations alone. As discussed within this report, mail surveys are less expensive. However, RDD surveys can produce information more quickly.

Direct vs. indirect estimates of changes in the 40th percentile: The indirect techniques use more of the surveyed units in calculating the FMR, and therefore their estimates should be more precise. The indirect techniques measure trends in rents and implicitly assume that there is no change in the recent-mover adjustment. Conceptually, HUD should favor the direct estimation methods, Techniques 1 and 2, over Techniques 3 and 4 in order to capture all the changes in the rental market. Now that ACS data are available annually for multiple metropolitan areas, HUD should conduct more research to test if using recent-mover rents would actually hold up in practice.

Use of other bedroom sizes with direct estimation of the 40th percentile: Using recent-mover rental units other than two-bedroom units and basing the FMR on two-bedroom equivalent can result in valuable increases in usable sample. However, the data from the four-site experiment raises some concerns about a possible upward bias in the factors used to calculate two-bedroom equivalent rents for some bedroom categories.

Inclusion of voucher units: HUD should not include voucher units in the calculation of FMRs, and therefore its FMR surveys should not gather information on these units. The inclusion of voucher units increased usable sample only marginally and, as discussed *Section 2. The Questionnaire*, the accuracy of the rent information collected from these units is not reliable.

Imputation: Using cases with imputed data had little impact on the estimated FMR, regardless of technique, but imputation did increase the number of cases used in the estimation, sometimes substantially. HUD should use imputed data.

In essence, this analysis has been about sample sizes. HUD funded this research because it had become too expensive to obtain its prescribed minimum sample size using their FMR Area Survey RDD methodology. We devoted great attention to questionnaire design and survey procedure to maximize the number of usable cases. The survey modes tested various techniques to increase response rates. Finally, this experiment and report have explored enhancing sample size through imputation and choice of estimation technique.

4. EVALUATION OF THE DIFFERENT APPROACHES

4.1. INTRODUCTION

The primary objective of the FMR Area Survey experiment was to determine design features that would improve response rates and/or reduce survey costs. To this end, we investigated the influence each of the 27 different experimental conditions listed below had on survey response rates, cooperation rates, resolution rates, and refusal rates.

RDD landline/cell phone methodology (nine experimental conditions)

Pre-notification treatment:

- A. *!Pre-notification, Web:* Randomly selected respondents sent pre-notification letters with an invitation to conduct the survey on the Web.
- B. *!Pre-notification, no Web:* Randomly selected respondents sent pre-notification letters without an invitation to conduct the survey on the Web.
- C. *!No pre-notification:* Those not randomly selected to receive either of the pre-notification conditions did not receive any.

Non-response letter treatment:

- A. *!Non-response letter, Web:* Randomly selected respondents to receive a non-response letter (with an invitation to conduct the survey on the Web) after we made at least three telephone attempts to the household.
- B. *!Non-response letter, no Web:* Randomly selected respondents to receive a non-response letter (without an invitation to conduct the survey on the Web) after we made at least three telephone attempts to the household.
- C. *!No non-response letter:* Those not randomly selected to receive either of the non-response letter conditions.

ABS mail survey methodology (18 experimental conditions)

Pre-notification treatment:

- A. *!Pre-notification, Web:* Randomly selected respondents sent pre-notification letters with an invitation to conduct the survey on the Web.
- B. *!Pre-notification, no Web:* Randomly selected respondents sent pre-notification letters without an invitation to conduct the survey on the Web.
- C. *!No pre-notification:* Those not randomly selected to receive either of the pre-notification conditions.

Reminder postcard condition:

- A. *!Postcard, Web:* Randomly selected individuals were sent a reminder postcard with an invitation to conduct the survey on the Web.

- B. *!Postcard, no Web*: Randomly selected respondents were sent a reminder postcard without an invitation to conduct the survey on the Web.
- C. *!No postcard*: Those respondents not randomly selected to receive either of the postcard conditions.

Non-response Follow-up Condition:

- A. *!Mail and phone follow-up*: Mailed second survey packets to all non-respondents; two-week follow-up by telephone to cases with a matched telephone number.
- B. *!Mail follow-up*: Mailed second survey packets to non-respondents without a matched telephone number; follow-up by telephone to cases with a matched telephone number (no second mailing)
- C. *!Telephone follow-up*: Follow-up by telephone to cases with a matched telephone number but did not send a second mailing.

4.2. RESPONSE AND COOPERATION RATES

Response rates to surveys are often taken as a short-hand gross indicator of survey quality – the more people who respond to a survey request means less risk of bias due to non-response. However, response rates alone are crude indicators of quality as there are numerous factors that might prevent respondents from participating (e.g. call blocking, caller ID, answering machines, undelivered/lost mail, language barriers, etc.). Similarly, cooperation rates are yet another indicator of quality, as the greater the number of people who have been contacted and agree to participate, the less risk of bias.

The survey response rate is the number of complete interviews divided by the number of eligible units. For the FMR Area Survey experiment, we conducted RDD landline/cell phone interviews with all respondents who indicated that they rented their household. Therefore, all respondents who rent and who were located in the geographic area of study were considered *eligible*. Those who indicated that they own their household or reside outside the area were considered *ineligible*. A unit was also ineligible if it was not a residential household; this would include telephone numbers that were non-working, reached a business, and any other numbers that were confirmed to be non-residential. If the rental and geographic status was not determined, the status was *unknown*. Since we were screening for renters, we distinguished between two types of unknown cases: 1) those where the residential status was unknown, and 2) those that were confirmed residences, but the rental and geographic status was unknown. *Table 4-1* presents the final outcomes for the dual-frame sample. These dispositions are based on AAPOR guidelines (AAPOR, 2009) for RDD surveys. Similarly, *Table 4-2* presents the final outcomes for the ABS mail sample. The ABS dispositions are a combination of information gathered from the mail returns, the Web survey, and the telephone follow-up.

Table 4-1. Final Outcome Codes for RDD Landline/Cell Phone Survey

		Peoria		Columbia	
Eligible, completed interview		Landline	Cell	Landline	Cell
1.100.3	complete: phone (I)	91	55	152	47
1.100.4	complete Web (I)	11	0	13	
Eligible, non-interview					
2.111.3	Telephone refusal (R)	1	7	1	5
2.2	Non-contact (NC)	1	1	1	1
Unknown eligibility, non-interview					
3.100.1	Unknown if housing unit (UH)	824	147	476	93
3.14.1	Answering machine-don't know if household (UH)	123	761	609	631
3.14.2	Answering machine household-don't know eligible (UO)	601	644	815	625
3.2	Housing unit, unknown if eligible respondent (UO)	300	283	456	284
3.3	Household refusal, unknown if eligible respondent (UO)	671	1,362	819	1,196
3.4	Hang-up, unknown if eligible respondent (UO)	121	352	181	292
3.5	Mental/physical impairment: communicated by Web (UO)	10	4	1	21
Not eligible					
4.2	Fax/data line (XH)	397	4	514	4
4.31	Non-working number (XH)	9,562	1,337	8,184	1,797
4.33	Temporarily out of service (XH)	22	436	23	558
4.4	Special technological circumstances, number changed (XH)	27	14	15	28
4.5	Non-residence (XH)	717	72	885	90
4.700.2	Not a rental unit, phone (XO)	1,101	474	1,144	394

4.700.3	DK/REF type of HH, phone (XO)	73	43	85	35
4.700.4	Not in sampled area (invalid county), phone (XO)	5	44	7	50
4.700.6	Ineligible Teen Line, phone (XO)	1	31	1	27

Table 4-2. Final Outcome Codes for ABS Mail Survey

		Fort Wayne	Charleston
Eligible, completed interview			
1.100.1	complete: mail first survey (I)	428	371
1.100.2	complete: mail second survey (I)	168	173
1.100.3	complete: phone (I)	103	80
1.100.4	complete Web (I)	27	30
Eligible, non-interview			
1.2	partial complete: Web (P)	1	1
Unknown eligibility, non-interview			
3.1.1	Mail refusal, unknown if eligible respondent (UO)	7	22
3.1.3	Telephone refusal, unknown if eligible respondent (UO)	699	588
3.14.1	Answering machine-don't know if household (UH)	252	267
3.14.2	Answering machine household-don't know eligible (UO)	418	398
3.2.1	Housing unit, unknown if eligible respondent (UO)	3,337	4,581
3.2.2	Hang-up, unknown if eligible respondent (UO)	137	130
3.31	Non-working number (UO)	760	690
3.33	Temporarily out of service (UO)	20	8
3.4	Special technological circumstances, number changed, fax (UO)	46	83
3.5	Mental/physical impairment: communicated by Web (UO)	23	8
Not eligible			
4.5	Non-residence (XH)	51	57

4.700.2	Not a rental unit, phone (XO)	3,396	2,431
4.700.3	DK/REF type of HH, phone (XO)	118	79
4.700.4	Not in sampled area (invalid county), phone (XO)	3	3
4.700.6	Ineligible Teen Line, phone (XO)	0	6

To determine the response rate, we classify each disposition into one of the following categories:

I = Complete interview

P = Partial interview

R = Refusal or break-off (mid-terminate)

NC = Noncontact

O = Other non-interview (such as a language barrier)

U = Unknown eligibility

UH = Unknown if a household

UO = Unknown if the household is eligible

X = Ineligible

XH = Not a working residential number (i.e. nonworking number, business, etc.)

XO = Household is not eligible (i.e. the household owns their residence)

We calculated the response rate, the cooperation rate, the refusal rate, and the eligibility resolution rate according to the American Association of Public Opinion Research's (AAPOR's) standards and guidelines. The resolution rate is the percentage of residential records where we confirm eligibility.

$$\text{Response rate, RR3} = I / (I + P + R + NC + O + e(UH + UO))$$

$$\text{Cooperation rate, COOP1} = I / (I + P + R + O)$$

$$\text{Refusal rate, REF3} = R / (I + P + R + NC + O)$$

$$\text{Resolution rate, RESOLVE} = (I + P + R + NC + O + XO) / (I + P + R + NC + O + XO + UO)$$

$$e(UH + UO) = e1 \times UO + e1 \times e2 \times UH,$$

where $e1 = (I + P + R + NC + O) / (I + P + R + NC + O + XO)$, the proportion of known residences that are eligible for the survey; and

$e2 = (I + P + R + NC + O + XO + UO) / (I + P + R + NC + O + XO + UO + XH)$, the proportion of records with known status that are residential.

4.2.1. Area Response Rates

The response rates for the RDD landline/cell phone and ABS mail surveys for each geographic area are listed in *Table 4-3*. Overall, the ABS mail survey response rate of 37.3% was 11 percentage points higher than the RDD landline/cell phone survey (26.6%). Fort Wayne had the highest response rate, 42.6%. The other ABS mail site, Charleston, was over 10 points less than Fort Wayne. This is a result of a much lower resolution rate in Charleston, which was driven by a lower mail return rate; this hampered our ability to determine eligibility of sampled units (24.5% total; 15% on the first mail survey), compared to Fort Wayne (32.9% total; 22.3% on the first mail survey).

The RDD cell phone response rate was considerably lower than the RDD landline response rate. This was expected and is consistent with other surveys (AAPOR Cell Phone Task Force, 2010). The lower cooperation rate among renters on RDD cell phones indicates that many more eligible respondents reached on their cell phones did not complete the survey after we confirmed that they rent. The refusal rate for renters on their cell phones was much higher than the refusal rate for the RDD landline phones, so the lower cooperation for the RDD cell phones does not seem to be a result of dropped calls or other types of survey break-offs. As a result of our inability to gain cooperation and the higher refusal rate, the resolution rate is also much lower for the RDD cell phones—indicating that we could not even determine eligibility after a contact with an individual. The choice to respond or not is different for cell phone and landline users. Some cell phone users pay for incoming calls, while landline users do not. As a result, some cell phone users may choose not to participate in the survey before they even know the importance of the study, how long it will take, or even if they are eligible.

The response rates and cooperation rates for the RDD landline survey and ABS mail survey were very similar, 37.7% and 37.3% respectively, and renter cooperation was near 100% for the ABS mail and landline RDD surveys. Cooperation is defined as eligible renters who complete the entire survey. Since virtually all people who mailed back the survey and indicated that they rent completed the rest of the survey, we did not compute cooperation rates for the ABS sample. Similarly, we could not calculate refusal rates, as most people simply do not return mail surveys if they choose not to participate and only rarely do individuals take the time to write back or call to explicitly refuse. The resolution rate for the RDD landline survey and the ABS mail survey are both 41%, indicating a similar level of success with screening households for eligibility.

Table 4-3. Area Response Rates

	Area		RR3	Coop1	Ref3	Resolution Rate
Total RDD		41,289	26.6%	95.8%	3.4%	30.6%
	Landline	29,040	37.7%	98.5%	1.1%	41.5%
	Cell	12,249	15.0%	89.5%	8.8%	19.3%
Peoria		20,648	27.2%	95.7%	3.7%	31.2%
	Landline	14,577	40.9%	99.0%	1.0%	44.2%
	Cell	6,071	15.2%	90.2%	8.2%	19.8%
Columbia		20,641	26.0%	95.9%	3.2%	30.0%
	Landline	14,463	35.2%	98.2%	1.2%	39.3%

	Cell	6,178	14.7%	88.7%	9.4%	18.8%
Total ABS		20,000	37.3%	Not computed	Not computed	40.6%
Fort Wayne	ABS	10,000	42.6%	Not computed	Not computed	46.6%
Charleston	ABS	10,000	31.9%	Not computed	Not computed	34.6%

4.2.2. Dual-Frame RDD Landline/Cell Phone Design Features

Pre-notification Letter

The RDD landline telephone numbers were matched to telephone directories to determine if an address was associated with the telephone number; this is not possible with RDD cell phone numbers as they are generally not listed in telephone directories. The response rate for cases with a matched address was much higher than for non-matched addresses. This was expected since a matched address indicates that the telephone number is listed in a telephone directory, and therefore is more likely to be a residence. The higher resolution rate for matched cases supports also this statement. Two-thirds of the matched cases received a pre-notification letter, which confounds the comparison between matched and unmatched cases. However, even when comparing the matched cases where we did not send a pre-notification, the response rate was nearly five points higher than the unmatched cases. Sending the pre-notification increases the response rate by another five to six points.

Table 4-4. Response by Address Match Status for Landline RDD Cases

Telephone Reverse Directory Address Matching	N	RR3	Coop1	Ref3	Resolution Rate
Did not Match to Address	20,155	28.2%	97.9%	0%	30.8%
Matched to Address	8,885	38.5%	98.6%	1.3%	43.4%
No pre-notification sent	2,954	32.9%	97.5%	1.5%	36.2%

For those cases where we were able to match an address, we had the option of sending a pre-notification letter to the residence. Pre-notification letters typically increase response rates. To evaluate the increase in response, we randomly split the sample into three groups prior to address matching: (1) received a pre-notification letter with a Web invitation; (2) received a pre-notification letter without a Web invitation; and (3) control group – did not receive a pre-notification letter of any type. Therefore, all three groups had telephone numbers with matched and unmatched addresses. *Table 4-5* illustrates specifically the number of records in each of our different treatment groups and the subsequent survey responses. Note the treatment group names do not represent the actions taken on the group. For example, 9,680 records were assigned to the pre-notification letter offering a Web invitation treatment group. Of these records, about 30% matched to an address and therefore could be sent a pre-notification. Similarly, 9,687 were assigned to the non-Web-invitation pre-notification treatment group. Again, only about 30% matched to an address and could be sent the pre-notification. The remaining 9,673 were assigned to the control group. About 30% of the control group sample members matched to an address, but we still did not send a pre-notification to them. By structuring the treatment groups in such a manner, we were then able to assess the impact on overall response when sending any kind of pre-notification.

For the RDD landline survey, we found that the pre-notification letter had a positive impact on survey response in several ways, as illustrated in *Table 4-5*. First, the pre-notification letter increased the response rate by about seven to eight percentage points; this is consistent with other survey industry

research and experience (Dillman, Smyth, & Christian, 2009). Second, we observed that the renter cooperation rate was roughly the same regardless of whether pre-notification was sent or not – this result is also consistent with other research. Third, the benefit of the pre-notification letter was how it increased the success rate of screening respondents for eligibility. There was no difference between the pre-notification letter with the Web option and the one without the Web option. The pre-notification letters can be found in *Appendix C: Survey Materials*.

Table 4-5. Response by Pre-notification Letter Treatment for the RDD Landline Survey

Treatment Group	N	RR3	Coop1	Ref3	Resolution Rate
Landline RDD	29,040	37.7%	98.5%	1.1%	41%
Pre-notification, Web	9,680	41.0%	99.0%	0%	45%
Pre-notification, no Web	9,687	40.1%	97.9%	2.1%	45%
No pre-notification	9,673	32.2%	98.8%	1.3%	35%

Non-response Letter for the RDD Landline/Cell Phone Survey

Another of the experimental conditions we tested was sending a non-response letter after several calls to the RDD telephone number.⁶⁵ The letter informed people that we were still trying to reach them to conduct the survey and encouraged them to participate. The letter reiterated the importance of the research and offered a telephone number to call in to complete the survey at the respondent’s convenience. Similar to the pre-notification, some of the respondents were invited to complete the survey on the Web, and others were not. The experimental condition to complete the survey via the Web in the non-response letter was assigned independently of the pre-notification letter. Unfortunately, the timing of the letter was not ideal because only one or two calls had been made to the household before the letter was mailed to them.⁶⁶ Ideally, we would have made four to six calls to the household before the letter was mailed. In any case, the letter did significantly improve response. Whether or not we offered the Web option yielded somewhat inconsistent results: when the Web option was not offered, the response rate was 2.4 points higher than the no-letter group, and when the Web option was offered, the response rate increased by an additional 2.2 points. This pattern of response to offering a Web alternative with another mode of data collection is consistent with other surveys (Griffin, Fischer, & Morgan, 2001); (Israel, 2009); (Messer & Dillman, 2010).

⁶⁵ Note, it was not possible to send letters to the cell phone portion of the sample because we could not obtain addresses through reverse cell phone number matching.

⁶⁶ The printer responsible for printing, assembling, and mailing the non-response letters was not able to mail the non-response letters as planned due to delays in the initial launch of the telephone survey. The printer’s scheduling conflict was only revealed to ICF after fielding had started, and there was not time to identify another printer given the short period of time of only a week between survey launch, dialing halfway through the calling protocol, and sending the non-response letter.

Table 4-6. Response by Non-response Letter Treatment for the RDD Landline Survey

Treatment Group	N	RR3	Coop1	Ref3	Resolution Rate
Landline	29,040	0%	97.4%	0%	41.5%
Non-response letter, Web	9,681	40.0%	100.0%	0%	43.5%
Non-response letter, no Web	9,683	37.8%	97.8%	1.1%	41.7%
No non-response letter	9,676	35.4%	97.6%	2.4%	39.3%

Web Invitations for the RDD Landline/Cell Phone Survey

Both the ABS mail survey and the RDD landline/cell phone surveys offered some respondents the opportunity to participate via the Web. For both surveys, some respondents received a Web invitation in their pre-notification letter, and for the RDD landline/cell phone survey some respondents also received the offer in the non-response letter. Sixteen out of 96 respondents (17% of those offered and responding to the survey) chose the Web option when it was offered in the pre-notification letter. Fourteen out of 98 respondents (14% out of those offered and responding) responded via Web when the offer to do so was made in the non-response letter.

Table 4-7. Response Rate by Web Invitation Treatment for the RDD Landline/Cell Phone Survey

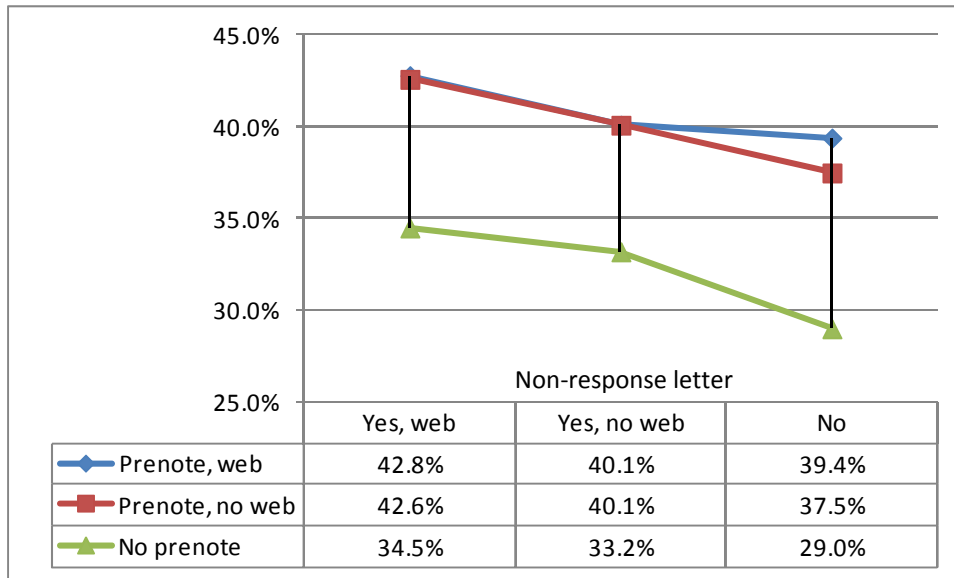
Treatment Group		Non-response Letter			
		Total	Web	No Web	Control (No letter)
Total	Total	267	98	88	81
	Telephone complete	243	84	87	72
	Web complete	24	14	1	9
Pre-notification, Web	Total	96	40	22	34
	Telephone complete	80	34	21	25
	Web complete	16	6	1	9
Pre-notification, no Web	Total	92	31	38	23
	Telephone complete	88	27	38	23
	Web complete	4	4	0	0
No pre-notification	Total	79	27	28	24
	Telephone complete	75	23	28	24
	Web complete	4	4	0	0

Design Combinations for the RDD Landline/Cell Phone Survey

The highest response rate for the RDD landline/cell phone survey (42%) occurred when we sent a pre-notification letter (with or without Web option) and a non-response letter without a Web option to the RDD landline telephone sample. The pre-notification and the non-response letter each individually increased response, and response was highest when the two elements were used together—with or without a Web option. However, the cost effectiveness of this approach improves as the percentage of

RDD cell phone sample increases and RDD landline sample decreases since it is not possible at this time to send pre-notification letters to cell phone sample (see *Section 5.1. Cost Models* for more discussion).

Figure 4-1. Design Combinations for the RDD Landline/Cell Phone Survey



4.2.3. **ABS Mail Survey Design Features**

Pre-notification Letter for the ABS Mail Survey

In both of the ABS mail survey areas, the pre-notification letter had no significant impact on response rates. This is an interesting result because it is contrary to other survey research and experience (Dillman, 1991; Dillman, Clark, & Sinclair, 1995; Crask & Kim, 1998; Kanuk & Berenson, 1975). Pre-notification letters have become accepted as a reliable means to increase survey response for all modes of data collection; most surveys see a three- to six-point increase in response due to pre-notification letters (Dillman, Smyth, & Christian, 2009). The pre-notification letter in the RDD landline/cell phone survey did have a significant positive impact on response as expected. The pre-notification letter apparently increased the likelihood that telephone numbers would be screened for eligibility, but not mailed households. This is particularly interesting as the gold standard of mail survey methodology is Dillman’s Tailored Design approach using five contacts: the pre-notification letter, first questionnaire mailing, a reminder/thank you postcard, second questionnaire mailing, and final contact via a different mode of delivery. Differences between the two FMR Area Survey experiments and other research can possibly be attributed to the following:

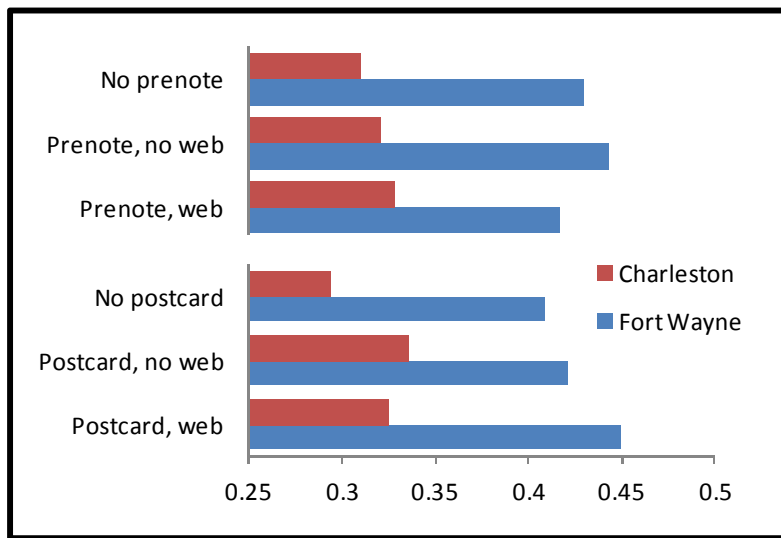
1. ! The experiment is the only instance in the literature that specifically tests the efficacy of a pre-notification letter for an RDD landline/cell phone survey and an ABS mail survey. It is possible that people consider differently the request to complete a mail survey versus one to complete a telephone survey. When receiving a survey request via phone, the respondent must make a quick decision on whether to participate or not. With advanced awareness of the request, the respondent is not surprised by the request and attributes it greater legitimacy. When receiving a mail request or advance notification, the surprise factor is eliminated, and the respondent is not pressured to decide.

2. ! Our pre-notification letter closely adhered to Dillman’s Tailored Design Method, incorporating all of the suggested elements except two: (1) a pre-incentive (this was beyond the project’s budget); and (2) personalization (only the address was known and not the names of individuals living at that address).
3. ! The specific timing of the pre-survey notifications for the experiments was not optimal. Instead of respondents receiving the pre-notification letter just a couple of days before the actual survey request, due to logistics, the letter was received a week or more before the survey request.⁶⁷ As a result of this slightly longer time period between the pre-notification letter and the survey request, respondents may have forgotten the advance notice.

Postcard Reminder for the ABS Mail Survey

For the ABS mail survey, the postcard reminder increased the response rate by three to four percentage points, a finding consistent with other survey research (Dillman, Smyth, & Christian, 2009). Response rates for the postcard with the Web invitation and the one without it were not significantly different, but both garnered better response than not sending a postcard at all. The key factor seems to be the number of contacts made to a respondent more than the form of the contact or the particular content of that contact.

Figure 4-2. Response Rates for the Postcard Reminder Treatment in the ABS Mail Survey



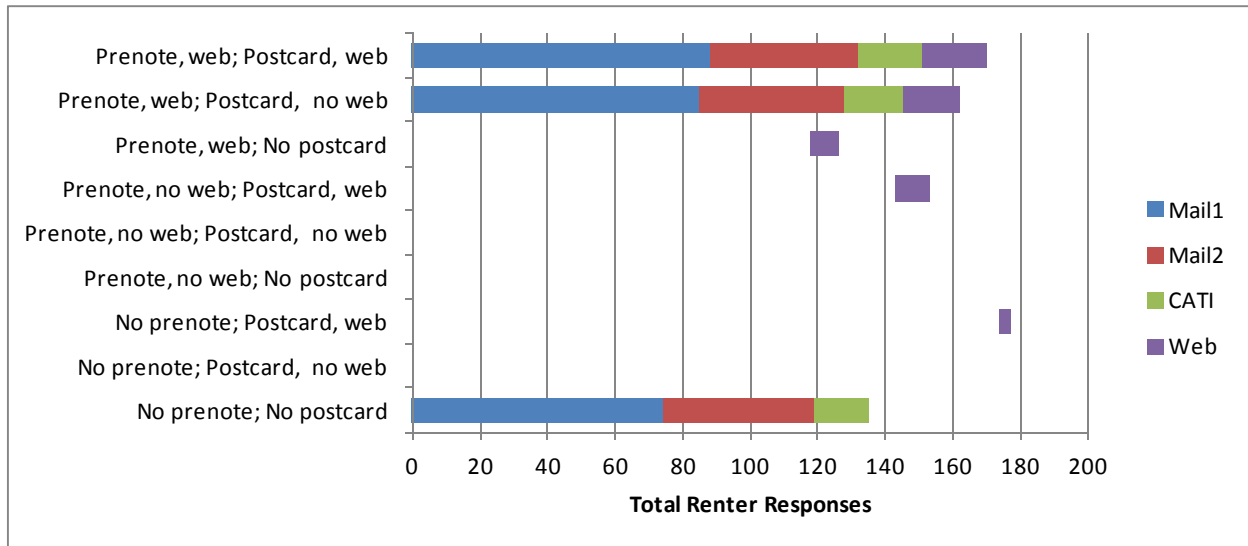
The Web Option and the ABS Mail Survey

We offered a Web option to respondents in the pre-notification letter and in the postcard reminder; however, we did not offer a Web option with either of the survey packet mailings. Forty-four out of 406 respondents (11%) completed the survey via Web when the option was offered in the pre-notification letter. Thirty-two out of 427 respondents (7%) used the option when it was offered in the postcard reminder. When the Web option was offered on both the pre-notification and the postcard, 19 out of 132 respondents (13%) completed the survey via Web. Although these are small numbers, it appears that

⁶⁷ This was due to challenges of coordinating the subcontracting printer and the CATI call center after periods of delays in launching.

offering a Web option in the non-response letter does not increase the number of Web respondents when the Web option is also included in the pre-notification letter.

Figure 4-3. Mode of Response for Web option Conditions in the ABS Mail Survey



Follow-up Options for the ABS Mail Survey

One of the disadvantages of mail surveys is that they typically take much longer to field than telephone surveys. FMR Area RDD surveys have historically taken four to six weeks and mail surveys with a first and second survey packet typically require 10 to 12 weeks. Therefore, we wanted to evaluate the impact on response rates by eliminating the second survey packet and proceeding directly to a telephone follow-up; theoretically, this approach would decrease the data collection time period for an ABS mail survey, but we did not know what the cost implications would be. Specifically, we tested:

- A. !Mailing second survey packets to all non-respondents with a two-week follow-up by telephone to cases with a matched telephone number.
- B. !Mailing second survey packets to non-respondents without a matched telephone number and follow-up by telephone to cases with a matched telephone number (no second mailing).

The response rate for the group not receiving the second survey packet mailing (i.e. telephone follow-up started earlier) was four points lower than the group receiving the second survey packet mailing. The second mailing appears to have been important in reaching households without a matching telephone number. Forty-five percent of the ABS sample did not match to a telephone number. The second survey mailing to these cases accounted for 20% of the completed interviews.

Eleven percent of the completed interviews came from telephone follow-up after mailing two survey packets. As expected, the contribution of the telephone follow-up is greater when we did not send a second survey packet, 15.6%. We estimate that the telephone follow-up increased response by approximately four percentage points overall. When isolated to cases where we matched addresses to telephone numbers, mailing the second survey packet increased the response by over seven points. As with the telephone-to-address matching, the addresses that match to a telephone number are more likely to be a residential unit since they have a telephone number listed in a residential telephone directory – 23% of the addresses returned a survey when we had a matching telephone number versus 14% returning a survey when we did not have a telephone number.

Table 4-8. Response Rates for Second Mailing versus No Second Mailing

Treatment Group	N	RR3	Resolution Rate
Second mailing and telephone follow-up	10,000	39.3%	42.4%
Telephone match	5,540	52.4%	60.4%
No telephone match	4,460	23.3%	23.3%
Second mailing or telephone follow-up	10,000	35.2%	38.7%
Telephone match	5,540	45.0%	53.4%
No telephone match	4,460	23.3%	23.5%

ABS Mail Survey Design Combinations

When evaluating all possible ABS mail survey combinations of the experimental conditions tested, the highest response rate occurred when we did not send a pre-notification letter, we sent a postcard with a Web option, and we sent a second survey packet to all non-respondents and followed-up by telephone with those respondents where we had matched telephone number. This combination produced a response rate of 52.4% and was significantly higher than the other response rates, with exception of two that have response rates of 41%:

- A. !Pre-notification letter with Web option, postcard with Web option, second survey to all non-respondents; and
- B. !Pre-notification letter without Web option, postcard without Web option, second survey to all non-respondents.

To evaluate the individual design features without confounding effects of other features, we constructed a logistic regression model. The model results are in *Appendix H*. Each condition was included as a model parameter, and we estimated odds ratio—or the odds of response with the feature relative to the odds without the feature. High odds ratios indicate that the feature increases the probability of response; low odds ratios indicate that the feature decreases the probability of response. The odds ratios for the design combinations are all relative to one survey mailing with either telephone follow-up to matched cases or a second mail survey to unmatched cases. For the logistic regression model, we defined a response as a survey from which we could determine rental status.

We evaluated the response propensity for addresses where we had a matching telephone number versus those where we did not. When we had a matched telephone number, we had the ability to conduct follow-up calls. Sending a second survey packet before conducting telephone follow-ups increased response by 34% over not sending a second survey packet. Sending a postcard increased response by 16%—and this increased an additional 3% when it was combined with a pre-notification letter with a Web invitation. When a pre-notification letter was sent without a Web invitation, the postcard did not increase response. This effect could be the result of reduced mail response when the Web invitation is offered on the pre-notification. Presumably, some respondents did not return the mail survey because they intended to participate on the Web. When they did not do so, either because they forgot, lost the link, or some other reason, the postcard (particularly with a Web invitation) reminded them to complete the survey. However, when not offered the Web invitation on the pre-notification letter, respondents returned the mail surveys at a higher rate and thus reduced the effectiveness of the postcard reminder.

For cases where we could not match an address with a telephone number, the pre-notification letter did not benefit response propensity. The postcard reminder did increase response propensity by as much as 40% when a pre-notification letter was not sent. As with the matched address and telephone cases, the postcard was also effective when a pre-notification letter with a Web invitation was sent.

Table 4-9. Response Rates and Odds of Response Propensity

Treatment Groups			Sample Size	RR3	Odds Ratios	
					Matched	Non-matched
Pre-notification, Web option	Postcard, Web option	Mail and phone follow-up	1,112	41.1%	1.72	1.19
		Mail or phone follow-up	1,112	36.0%	1.28	1.20
	Postcard, no Web option	Mail and phone follow-up	1,112	39.0%	1.67	1.22
		Mail or phone follow-up	1,112	38.3%	1.25	1.23
	No postcard	Mail and phone follow-up	1,112	36.6%	1.44	0.88
		Mail or phone follow-up	1,112	31.3%	1.07	0.88
Pre-notification, no Web option	Postcard, Web option	Mail and phone follow-up	1,112	38.6%	1.73	1.07
		Mail or phone follow-up	1,112	37.4%	1.29	1.08
	Postcard, no Web option	Mail and phone follow-up	1,112	40.9%	1.72	1.12
		Mail or phone follow-up	1,112	35.4%	1.28	1.13
	No postcard	Mail and phone follow-up	1,110	39.4%	1.79	0.97
		Mail or phone follow-up	1,110	36.1%	1.34	0.98
No pre-notification	Postcard, Web option	Mail and phone follow-up	1,110	44.0%	1.67	1.41
		Mail or phone follow-up	1,110	35.5%	1.25	1.42
	Postcard, no Web option	Mail and phone follow-up	1,110	37.7%	1.42	1.25
		Mail or phone follow-up	1,110	35.9%	1.06	1.26
	No postcard	Mail and phone follow-up	1,110	36.6%	1.34	0.99
		Mail or phone follow-up	1,110	31.0%	1.00	1.00

In summary, this response propensity analysis suggests that the best design treatment for matched telephone and address cases may not be the best for unmatched cases. For unmatched cases, the design that produced the highest response propensity was sending a postcard reminder with a Web invitation (no pre-notification letter). This design was also one of the top designs for the matched cases as well, but there are other pre-notification, postcard reminders, and Web invitation combinations that were as equally effective.

5. COST EFFECTIVENESS OF THE EXPERIMENTAL CONDITIONS

The final aspect of the FMR Area Survey experiment that we wanted to evaluate was the cost-effectiveness of the different experimental conditions for the ABS mail survey and the RDD landline/cell phone survey. Furthermore, we wanted to know which features of the survey protocol are cost effective, or which provide an increase to survey response for a comparatively low financial investment. The 18 independent experimental conditions for the ABS mail surveys and the nine for the RDD landline/cell surveys allowed us to measure the incremental change in cost as well as the benefit to response rates.

We evaluated the design features based on:

- A. A CPCI equal to the total cost divided by the total number of interviews collected; and
- B. Response rates (presented in the previous section).

Ideally, we will find a balanced approach that has low cost and high response rate. *Table 5-1* presents the specific design features with their corresponding cost components.

Table 5-1. Cost Components for the Experimental Design Conditions

Sampling Frame	Design Features		Cost Components
Landline RDD	Landline CATI	L0:	Interviewer and call center management labor
	Pre-notification	L1:	Print materials: letter, #10 Envelope
	Web option		First class postage
	No Web		Printing and mailing labor
Cell phone RDD	Non-response letter	L2:	Print materials: letter, #10 Envelope
	Web option		First class postage
	No Web		Printing and mailing labor
Cell phone RDD	Cell CATI	C0:	Interviewer and call center management labor
ABS	Mail survey 1 (inc data entry)	A0:	Print materials: cover letter, survey, #10 Envelope, BRE envelope First class postage Printing and mailing labor BRE Postage Data entry and management labor
	Pre-notification	A1:	Print materials: letter, #10 Envelope
	Web option		First class postage
	No Web		Printing and mailing labor
ABS	Postcard	A2:	Print materials: postcard (folded and sealed for Web option)
	Web option		Postcard postage
No Web		Printing and mailing labor	
ABS	Mail survey 2 (inc data entry)	A3:	Print materials: cover letter, survey, #10 Envelope, BRE envelope First class postage

Sampling Frame	Design Features	Cost Components	
			Printing and mailing labor BRE Postage Data entry and management labor
	Telephone follow-up	A4:	Interviewer and call center management labor

For our evaluation, we only included costs that are variable and specifically attributable to an experimental treatment. For example, we did not include project management costs in this analysis because we could not parse the overall labor hours into individual components. We also did not include the cost of purchasing telephone or address samples in our analysis as these costs are minimal relative to the labor, printing, and mailing costs. Lastly, we did not include development costs for the survey instruments: Web, CATI, and the mail survey data entry programs. The costs to build these programs and instruments are one-time investments that can be used for multiple FMR surveys, and under some specific conditions even possibly transferable among contractors.⁶⁸ Programming costs would have a significant impact on the unit cost in our experiment if only two areas were included for the ABS mail survey and two areas for the RDD landline/cell phone survey. However, since the survey methodology that HUD will ultimately select will likely be used for numerous areas over many years, the programming cost component will have a less significant impact on the true CPCI as these programming costs would be amortized over time. Therefore, we do not include these programming costs in the CPCI estimates below. However, we do examine the overall cost of adding a Web option to determine the point at which the CPCI reaches a break-even point with the cost per response rate point (CPRR) realized by the Web option.

Table 5-2 details the cost for the RDD landline/cell phone survey experiment, and

Table 5-3 lists the cost for the ABS mail survey experiment. Note, we used the overall cost for the dual-frame RDD landline/cell phone design versus the overall cost for the ABS design. Each table presents the number of completed interviews, gross costs for each design component, and the CPCI for conducting the survey using the stated set of protocols. Random variation in response for different treatment groups results in some unintuitive CPCIs.

⁶⁸ Theoretically, if contractors used the same software for CATI, Web, data programming, etc., programs could be shared. However, the issue can be further complicated by the unique configurations of systems and networks as well as licensing agreements. The ability to share these programs is not guaranteed and would need to be investigated on a case-by-case basis.

Table 5-2. Costs for Survey of Renters for each Experimental Condition

			Sample	Landline Survey completes			Survey Costs				Cost per Interview (CPCI)		Total (T)
				CATI	Web	Cell Survey Completes	LL Labor (L0)	Cell Labor (C0)	Pre-notificat ion (L1)	NR Letter (L2)	Land-line (L)	Cell* (C)	
1	All Pre-notification options	All letter options	29,040	243	24	102	\$18,141.00	\$14,788.00	\$3,569.45	\$2,796.40	\$91.79	\$144.98	\$106.49
2		NR letter, Web	9,681	84	14	35	\$6,085.32	\$4,921.88	\$1,189.82	\$1,398.44	\$88.51	\$140.63	\$102.22
3		NR letter, no Web	9,683	87	1	34	\$5,955.90	\$4,959.88	\$1,189.82	\$1,397.97	\$97.09	\$145.88	\$110.68
4		No letter	9,676	72	9	33	\$6,099.78	\$4,906.24	\$1,189.82	\$0.00	\$90.00	\$148.67	\$106.98
5	Pre-notification , Web option	All letter options	9,680	80	16	40	\$6,050.55	\$4,924.56	\$1,785.03	\$932.92	\$91.34	\$123.11	\$100.68
6		NR letter, Web	3,225	34	6	10	\$2,030.64	\$1,632.58	\$595.21	\$466.46	\$77.31	\$163.26	\$94.50
7		NR letter, no Web	3,226	21	1	14	\$1,990.29	\$1,651.80	\$595.21	\$466.46	\$138.73	\$117.99	\$130.66
8		No letter	3,229	25	9	16	\$2,029.62	\$1,640.18	\$594.61	\$0.00	\$77.18	\$102.51	\$85.29
9	Pre-notification , no Web option	All letter options	9,687	88	4	25	\$5,948.79	\$4,942.00	\$1,784.43	\$931.98	\$94.19	\$197.68	\$116.30
10		NR letter, Web	3,229	27	4	11	\$1,980.39	\$1,640.63	\$594.61	\$465.99	\$98.10	\$149.15	\$111.47
11		NR letter, no Web	3,229	38		6	\$1,952.73	\$1,667.45	\$594.61	\$465.99	\$79.30	\$277.91	\$106.38

		Landline Survey completes			Survey Costs				Cost per Interview (CPCI)			
		Sample	CATI	Web	Cell Survey Completes	LL Labor (L0)	Cell Labor (C0)	Pre-notification (L1)	NR Letter (L2)	Land-line (L)	Cell* (C)	Total (T)
12	No letter	3,229	23		8	\$2,015.67	\$1,633.92	\$595.21	\$0.00	\$113.52	\$204.24	\$136.93
13	No pre-notification	9,673	75	4	37	\$6,141.65	\$4,921.44	\$0.00	\$931.51	\$89.53	\$133.01	\$103.40
14	NR letter, Web	3,227	23	4	14	\$2,074.29	\$1,648.67	\$0.00	\$465.99	\$94.08	\$117.76	\$102.17
15	NR letter, no Web	3,228	28		14	\$2,012.88	\$1,640.63	\$0.00	\$465.52	\$88.51	\$117.19	\$98.07
16	No letter	3,218	24		9	\$2,054.49	\$1,632.13	\$0.00	\$0.00	\$85.60	\$181.35	\$111.72

* The letter conditions have no impact on cell phone costs since no addresses are available for cell phone sample. The variation in the cell phone CPCI is due to variation in the number of completes obtained.

Table 5-3. Costs for ABS Mail Survey of Renters for each Experimental Condition

		Survey completes					Cost components					Cost per Interview (CPCI)		
		Sample	Mail1	Mail2	CATI	Web	1st mail (A0)	Pre-notification (A1)	Postcard (A2)	2nd mail (A3)	Phone Labor (A4)	Mail1 (M1)	Mail2 (M2)	Mail1, Mail2, Phone (T)
1	All pre-notification options	20,000	799	341	183	57	\$59,604.60	\$8,028.41	\$5,988.60	\$32,965.10	\$18,141.00	\$86.01	\$89.04	\$90.38

			Survey completes					Cost components					Cost per Interview (CPCI)		
			Sample	Mail1	Mail2	CATI	Web	1st mail (A0)	Pre-notification (A1)	Postcard (A2)	2nd mail (A3)	Phone Labor (A4)	Mail1 (M1)	Mail1 Mail2 (M2)	Mail1, Mail2, Phone (T)
2		Mail and phone follow-up	10,000	421	208	83	29	\$29,987.61	\$4,014.21	\$2,994.30	\$23,751.05	\$8,615.97	\$82.21	\$92.32	\$93.61
3		Mail or phone follow-up	10,000	378	133	100	28	\$29,616.99	\$4,014.21	\$2,994.30	\$9,214.05	\$9,525.03	\$90.21	\$85.05	\$86.64
4	Postcard, Web option	All follow-up options	6,668	284	111	73	32	\$20,360.44	\$2,676.94	\$3,590.29	\$10,878.39	\$5,971.20	\$84.26	\$87.84	\$86.95
5		Mail and phone follow-up	3,334	139	82	27	15	\$10,160.18	\$1,338.47	\$1,795.14	\$7,923.79	\$2,797.48	\$86.32	\$89.91	\$91.31
6		Mail or phone follow-up	3,334	145	29	46	17	\$10,200.25	\$1,338.47	\$1,795.14	\$2,954.60	\$3,173.72	\$82.31	\$85.28	\$82.12
7	Postcard, no Web option	All follow-up options	6,668	285	119	47	17	\$20,510.69	\$2,676.94	\$2,398.31	\$11,471.24	\$5,937.45	\$84.72	\$88.02	\$91.87
8		Mail and phone follow-up	3,334	161	66	27	7	\$10,360.52	\$1,338.47	\$1,199.16	\$8,114.89	\$2,888.22	\$76.77	\$89.80	\$91.58
9		Mail or phone follow-up	3,334	124	53	20	10	\$10,150.17	\$1,338.47	\$1,199.16	\$3,356.35	\$3,049.23	\$94.69	\$85.80	\$92.24
10	No postcard	All follow-up	6,664	230	111	63	8	\$18,733.47	\$2,674.53	\$0.00	\$10,615.46	\$6,232.36	\$89.95	\$91.76	\$92.85

				Survey completes					Cost components					Cost per Interview (CPCI)		
				Sample	Mail1	Mail2	CATI	Web	1st mail (A0)	Pre-notification (A1)	Postcard (A2)	2nd mail (A3)	Phone Labor (A4)	Mail1 (M1)	Mail1 Mail2 (M2)	Mail1, Mail2, Phone (T)
11			options Mail and phone follow-up	3,332	121	60	29	7	\$9,466.90	\$1,337.27	\$0.00	\$7,712.36	\$2,930.27	\$84.41	\$98.49	\$98.83
12			Mail or phone follow-up	3,332	109	51	34	1	\$9,266.57	\$1,337.27	\$0.00	\$2,903.10	\$3,302.09	\$96.40	\$83.89	\$86.20
13	Pre-notification, Web option	All Postcard options	All follow-up options	6,672	244	118	52	44	\$19,232.74	\$4,015.41	\$1,997.40	\$10,623.67	\$6,074.66	\$87.66	\$88.35	\$91.58
14			Mail and phone follow-up	3,336	130	74	20	23	\$9,891.84	\$2,007.70	\$998.70	\$7,541.00	\$2,907.58	\$84.30	\$90.04	\$94.52
15			Mail or phone follow-up	3,336	114	44	32	21	\$9,340.91	\$2,007.70	\$998.70	\$3,082.67	\$3,167.08	\$91.46	\$86.20	\$88.14
16		Postcard, Web option	All follow-up options	2,224	88	44	19	19	\$6,424.27	\$1,338.47	\$1,197.48	\$3,589.76	\$1,973.62	\$83.74	\$83.11	\$85.43
17			Mail and phone follow-up	1,112	46	30	4	9	\$3,327.33	\$669.23	\$598.74	\$2,536.91	\$917.92	\$83.55	\$83.91	\$90.45
18			Mail or phone	1,112	42	14	15	10	\$3,096.94	\$669.23	\$598.74	\$1,052.85	\$1,055.69	\$83.94	\$82.09	\$79.92

			Survey completes					Cost components					Cost per Interview (CPCI)			
			Sample	Mail1	Mail2	CATI	Web	1st mail (A0)	Pre-notification (A1)	Postcard (A2)	2nd mail (A3)	Phone Labor (A4)	Mail1 (M1)	Mail1 Mail2 (M2)	Mail1, Mail2, Phone (T)	
19	Postcard, no Web option	follow-up														
		All follow-up options	2,224	85	43	17	17	\$6,764.85	\$1,338.47	\$799.92	\$3,725.70	\$1,930.46	\$87.29	\$87.10	\$89.87	
20		Mail and phone follow-up	1,112	49	26	9	7	\$3,427.50	\$669.23	\$399.96	\$2,567.69	\$938.95	\$80.30	\$86.15	\$87.95	
21		Mail or phone follow-up	1,112	36	17	8	10	\$3,337.35	\$669.23	\$399.96	\$1,158.01	\$991.51	\$95.79	\$88.33	\$92.34	
	No postcard	All follow-up options	2,224	71	31	16	8	\$6,043.63	\$1,338.47	\$0.00	\$3,308.21	\$2,170.59	\$93.44	\$97.18	\$102.07	
22		Mail and phone follow-up	1,112	35	18	7	7	\$3,137.01	\$669.23	\$0.00	\$2,436.40	\$1,050.71	\$90.62	\$104.04	\$108.86	
23		Mail or phone follow-up	1,112	36	13	9	1	\$2,906.62	\$669.23	\$0.00	\$871.81	\$1,119.88	\$96.64	\$88.95	\$94.37	
24		Pre-notification, no Web option	All Postcard options	6,668	278	93	63	10	\$21,051.61	\$4,013.00	\$1,997.40	\$10,831.53	\$5,850.58	\$93.97	\$99.46	\$98.52
25		Mail and phone follow-up	3,334	150	52	28	4	\$10,580.90	\$2,006.50	\$998.70	\$7,854.75	\$2,734.40	\$88.22	\$104.08	\$103.31	
26																

			Survey completes					Cost components					Cost per Interview (CPCI)		
			Sample	Mail1	Mail2	CATI	Web	1st mail (A0)	Pre-notification (A1)	Postcard (A2)	2nd mail (A3)	Phone Labor (A4)	Mail1 (M1)	Mail1 Mail2 (M2)	Mail1, Mail2, Phone (T)
27		Mail or phone follow-up	3,334	128	41	35	6	\$10,470.71	\$2,006.50	\$998.70	\$2,976.78	\$3,116.18	\$100.57	\$94.02	\$93.19
28	Postcard, Web option	All follow-up options	2,224	95	24	24	10	\$7,095.41	\$1,338.47	\$1,197.48	\$3,375.11	\$1,929.91	\$91.73	\$100.83	\$97.62
29		Mail and phone follow-up	1,112	44	19	10	4	\$3,387.43	\$669.23	\$598.74	\$2,477.54	\$884.17	\$96.99	\$106.46	\$104.12
30		Mail or phone follow-up	1,112	51	5	14	6	\$3,707.97	\$669.23	\$598.74	\$897.57	\$1,045.73	\$87.30	\$94.73	\$91.04
31	Postcard, no Web option	All follow-up options	2,224	98	34	8	0	\$7,295.74	\$1,338.47	\$799.92	\$3,872.04	\$1,991.87	\$96.27	\$100.80	\$109.27
32		Mail and phone follow-up	1,112	61	19	5	0	\$3,808.14	\$669.23	\$399.96	\$2,805.61	\$958.87	\$79.96	\$96.04	\$101.67
33		Mail or phone follow-up	1,112	37	15	3	0	\$3,487.60	\$669.23	\$399.96	\$1,066.44	\$1,033.01	\$123.16	\$108.14	\$121.02
34	No postcard	All follow-up options	2,220	85	35	31	0	\$6,660.46	\$1,336.06	\$0.00	\$3,584.39	\$1,928.80	\$94.08	\$96.51	\$89.47
35		Mail and phone	1,110	45	14	13	0	\$3,385.32	\$668.03	\$0.00	\$2,571.60	\$891.36	\$90.07	\$112.29	\$104.39

				Survey completes					Cost components					Cost per Interview (CPCI)		
			follow-up	Sample	Mail1	Mail2	CATI	Web	1st mail (A0)	Pre-notification (A1)	Postcard (A2)	2nd mail (A3)	Phone Labor (A4)	Mail1 (M1)	Mail1 Mail2 (M2)	Mail1, Mail2, Phone (T)
36			Mail or phone follow-up	1,110	40	21	18	0	\$3,275.13	\$668.03	\$0.00	\$1,012.78	\$1,037.43	\$98.58	\$81.25	\$75.87
37	No pre-notification	All Postcard options	All follow-up options	6,660	277	130	68	3	\$19,320.25	\$0.00	\$1,993.80	\$11,509.89	\$6,215.76	\$76.12	\$80.06	\$81.67
38			Mail and phone follow-up	3,330	141	82	35	2	\$9,514.88	\$0.00	\$996.90	\$8,355.30	\$2,973.98	\$73.51	\$83.85	\$84.00
39			Mail or phone follow-up	3,330	136	48	33	1	\$9,805.37	\$0.00	\$996.90	\$3,154.60	\$3,241.78	\$78.85	\$75.44	\$78.89
40		Postcard, Web option	All follow-up options	2,220	101	43	30	3	\$6,840.76	\$0.00	\$1,195.33	\$3,913.53	\$2,067.68	\$77.27	\$81.29	\$79.19
41			Mail and phone follow-up	1,110	49	33	13	2	\$3,445.42	\$0.00	\$597.66	\$2,909.34	\$995.38	\$79.28	\$82.77	\$81.94
42			Mail or phone follow-up	1,110	52	10	17	1	\$3,395.34	\$0.00	\$597.66	\$1,004.18	\$1,072.29	\$75.34	\$79.32	\$75.87
43		Postcard, no Web option	All follow-up options	2,220	102	42	22	0	\$6,450.10	\$0.00	\$798.48	\$3,873.50	\$2,015.11	\$71.06	\$77.24	\$79.14

			Survey completes					Cost components					Cost per Interview (CPCI)		
			Sample	Mail1	Mail2	CATI	Web	1st mail (A0)	Pre-notification (A1)	Postcard (A2)	2nd mail (A3)	Phone Labor (A4)	Mail1 (M1)	Mail1 Mail2 (M2)	Mail1, Mail2, Phone (T)
44		Mail and phone follow-up	1,110	51	21	13	0	\$3,124.88	\$0.00	\$399.24	\$2,741.59	\$990.40	\$69.10	\$87.02	\$85.37
45		Mail or phone follow-up	1,110	51	21	9	0	\$3,325.22	\$0.00	\$399.24	\$1,131.91	\$1,024.71	\$73.03	\$67.45	\$72.61
46	No postcard	All follow-up options	2,220	74	45	16	0	\$6,029.39	\$0.00	\$0.00	\$3,722.86	\$2,132.97	\$81.48	\$81.95	\$88.04
47		Mail and phone follow-up	1,110	41	28	9	0	\$2,944.58	\$0.00	\$0.00	\$2,704.36	\$988.19	\$71.82	\$81.87	\$85.09
48		Mail or phone follow-up	1,110	33	17	7	0	\$3,084.81	\$0.00	\$0.00	\$1,018.50	\$1,144.77	\$93.48	\$82.07	\$92.07

5.1. COST MODELS

To summarize the cost data presented in *Table 5-2* and

Table 5-3, we developed separate cost models for each approach – one for the ABS mail survey, and the other for the RDD landline/cell phone survey. The models each start with a base CPCI to conduct a survey using their respective mode. For the ABS mail survey, the base CPCI is the cost-per-interview to conduct a survey with one mailing (A0). For the RDD landline/cell phone survey, the base CPCI is the cost-per-interview to conduct a landline telephone (L0) or cell phone (C0) survey. As each design feature (L1-L2; A1-A4) is added, the CPCI increases (positive number) or decreases (negative number). An increase in CPCI indicates that additional interviews completed as a result of the feature cost more than the base CPCI. A decrease in CPCI indicates that additional interviews completed as a result of the feature cost less than the base CPCI. In the section below, we discuss the specifics of the different cost models.

5.1.1. RDD Landline/Cell Phone Survey Cost Model

The RDD landline/cell phone survey cost model is a weighted average of the cost to conduct a landline survey and the cost to conduct a cell phone survey. The weighting factor is based on the percentage of cell phone versus landline telephone interviewing.

All of the design features we examined are for RDD landline surveys, so these are incorporated into the model. The cost model for cell phone is simply the labor cost of conducting the telephone interviews because it was not possible to send pre-survey notification letters or non-response follow-up letters to the cell phone sample since we lacked addresses for them. The model and the estimated cost components are presented below. Hierarchical relationships are indicated by indentations.

Landline cost model: $L = L0 + L1a + L1b + L2a + L2b$

Cell phone cost model: $C = C0$

Dual-frame cost model: $D = c \times C0 + (1-c) \times L$, where c = the percentage of cell phone interviews.

Table 5-4. Landline RDD/Cell Phone Survey Design Feature Costs

Design Feature	Costs
L0: Landline RDD CATI	\$85.60
+L1a: Pre-notification letter	\$4.65
+L1b: With Web option	-\$2.85
+L2a: Non-response letter	\$7.09
+L2b: With Web option	-\$8.58
C0: Cell CATI	\$144.98

The cell phone CPCI was \$144.98, 69% higher than landline \$85.60. Adding a pre-notification letter increased the CPCI for the landline cost model by \$4.65. When the Web option was added to the pre-notification letter, the increase was only \$1.80. Adding the non-response letter increased the CPCI by \$7.09, but the additional cost was offset if there was also a Web option included in the letter because some people responded via the Web, decreasing the CATI effort necessary to obtain these interviews.

The non-response letter with a Web invitation decreased the cost by \$1.49. In *Section 5.3. Cost Benefit Recommendation*, we examine the number of surveys required to offset the cost of Web survey programming.

The overall CPCI for the RDD landline/cell phone design depends on the allocation of sample between landlines and cell phones. For this experiment, we completed 28% of the renter interviews by cell and 72% by landline. This resulted in an overall CPCI of \$102.02. However, given that half of the renter population in the U.S. is cell-only (meaning they do not have a landline phone, only a cell phone (Blumberg & Luke, 2011), this allocation under-represents the cell-only renter population and is an inefficient design with a design effect of 1.91. Optimal design minimizes sampling error for a fixed cost. In other words, for the same cost, there is no other sampling design that will produce estimates with higher precision.

Based on the above CPCIs for landline and cell phone surveys, the optimal design is 70% cell phone interviews and 30% landline interviews. This would result in a dual-frame sample of about 35% cell-only renters and 65% renters with a landline (about half from the cell sample and half from the landline sample). This would result in a CPCI of \$127.26 and a design effect of 1.04. The cell-only population is under-represented because it is more expensive to conduct cell phone interviews, and this is accounted for in the optimal allocation. However, this does not take into account that pre-notification and non-response follow-up letters cannot be sent to cell phone sample.

Table 5-5. Dual-frame Landline/Cell phone CPCI

Dual-frame Allocation	CPCI	Deff
28 landline/72 cell	\$102.02	1.91
30 landline/70 cell (optimal)	\$127.26	1.04

5.1.2. **ABS Mail Survey**

The ABS mail survey cost model is more complex than the RDD landline/cell phone survey model since there are more design features, increasing the number of possible response options. For example, when a second mail survey packet is added, the respondent can return the first or the second survey packet. Design features that enhance response, such as pre-notification letters and postcard reminders, may have different impacts depending on the other response options available. For example, to evaluate pre-notification and postcard impacts for multiple response combinations, we compared the CPCI increases for three scenarios:

- One survey mailing,
- Two survey mailings, and
- Two survey mailings and telephone follow-up.

If the CPCI increase was similar among these three scenarios, we took the average increase (decrease) for the three scenarios to simplify the model. When the increase varied across these scenarios, we added an interaction term to the model. For instance, the postcard reduced the CPCI by \$6.24 when conducting a survey with only one survey packet mailing. The reduction increased by an additional \$1.73 when a second survey packet was mailed after the postcard. The model and the estimated cost components are presented below. The indentation represents hierarchical relationships.

ABS mail survey cost model: $A = A0 + A1a + A1b + A1b1 + A1b2 + A2a + A2a1 + A2b + A3a + A4 + A4b + A3,4b$

Table 5-6. ABS Mail Survey

Design Feature	Costs
A0: First survey mailing	\$81.48
+A1a: Pre-notification letter	\$19.13
+A1b: With Web option	-\$6.31
+A1b1 w/second mailing interaction	-\$7.73
+A1b2 w/telephone follow-up interaction	\$5.25
+A2a: Postcard	-\$6.24
+A2a1: w/second mailing interaction	-\$1.73
+A2b: With Web option	-\$0.20
+A3: Second survey mailing	\$10.11
+A4: Telephone follow-up	\$13.5429
++A4b: w/second mailing interaction	-\$2.25
+A3,4b: Second mail survey or telephone follow-up	-\$5.17

The CPCI for an ABS mail survey of renters with a single mailing (and nothing more) was \$81.48. A pre-notification letter increased the CPCI by an average of \$19.13. Including a Web invitation to the pre-notification letter reduced the amount by which the CPCI increased, particularly for cases where a second survey packet was mailed. In comparison to the condition of a pre-notification letter without a Web invitation, we received fewer returns for the first survey packet mailing, but this smaller number of returns was more than offset by Web responses. This produced the reduction noted by A1b. We also received more returned surveys from the second survey packet mailing. This is noted as the A1b1 CPCI reduction. The increase in costs associated with the second survey packet mailing could be the result of people who intended to answer by Web and so did not return the first survey mailing, did not respond via the Web, and instead responded to the second survey packet mailing when it was received. However, the reduction in CPCI observed with the second survey packet mailing is offset when telephone follow-up is added. It is possible that this pattern of increasing and then decreasing costs could be the result of random variation in the number of responses. It could also suggest that some respondents are choosing to participate via the Web, resulting in cost savings for the telephone follow-up. As discussed above, the pre-notification letter did not increase response to the ABS mail survey, and therefore the cost is not offset by any benefit. This is not consistent with the literature regarding pre-notification letters (Dillman, Smyth, & Christian, 2009). We recommend a second test of pre-notifications to confirm the result, specifically testing the optimal period of time a letter should be sent to respondents prior to mailing the survey packet and/or the specific content of the letter.

The postcard reminder reduces the CPCI. The CPCI is further reduced when two survey packets are mailed to a respondent. This would seem to support the idea that the critical element for increasing survey response rates is to have multiple contacts with respondents and to vary their form and content enough so that people can differentiate these communications (Dillman, Smyth, & Christian, 2009). Practically speaking, this increase in response could be due to the second survey packet replacing an

already discarded survey when the postcard arrives. Adding a Web option to the postcard was virtually cost neutral (however, this does not account for the up-front programming costs).

Mailing a second survey packet to first survey packet non-respondents increased the CPCI by \$10.11. Telephone follow-ups with non-respondents to either survey packet mailing increased the CPCI by \$3.54 when used with only the first survey mailing and \$1.29 (\$3.54-\$2.25) when coupled with two survey mailings. When we combined a second survey packet mailing to cases where we did not have a telephone number, or when we and conducted telephone follow-ups with cases for which we did have a telephone number, the CPCI was reduced by \$5.17.

Based on the cost models developed, the most economical survey design is a single survey packet mailing with a postcard, estimated at \$75.03 CPCI. However, this produced a response rate under 20%. The estimated cost for a design with all the experimental conditions tested is \$95.03 CPCI, which produced a response rate over 40%, which is significantly better although still not ideal. Some designs for consideration are:

Survey Designs	CPCI
1. First survey packet; postcard reminder; second survey packet; and telephone follow-up	\$84.90
2. First survey packet; postcard reminder; second survey packet (no telephone follow-up)	\$83.62
3. First survey packet; postcard reminder; second survey packet; or telephone follow-up	\$79.73
4. First survey packet; postcard reminder and telephone follow-up (no second mailing)	\$78.78

While the last design is most cost effective, it is also most susceptible to bias since there is no attempt to follow-up with addresses that cannot be matched to a telephone number. The first design has the highest CPCI, but results in the highest response rate. Comparing designs two and three suggests that the combination of telephone follow-up for addresses with a telephone match and a second mail survey for addresses with no telephone match is more cost effective than sending a second survey packet to all addresses.

5.1.3. **Cost Benefit**

Understanding the cost impact of the different experimental conditions revealed which was relatively less or more costly when compared to each other, but the costs alone did not capture the overall value of the condition for the survey effort. While a single mailing may be an inexpensive methodology, it has a low response rate and thus has increased risk of producing biased estimates. Therefore, as a measure of the relative benefit each experimental condition offered, we calculated the CPRR as the CPCI divided by the response rate. The results in *Table 5-7* reveal which experimental conditions offer relatively better value in terms of their impact on survey response rates.

Table 5-7. Cost per Response Rate Point for Each Experimental Treatment

			N	RR3	Estimated Cost	CPRR
Pre-notification, Web option	Postcard, Web option	Second survey	1,112	41.10%	\$95.03	2.31
		No second survey	1,112	36.00%	\$89.86	2.50
	Postcard, no Web option	Second survey	1,112	39.00%	\$95.23	2.44
		No second survey	1,112	38.30%	\$90.07	2.35
	No postcard	Second survey	1,112	36.60%	\$103.21	2.82
		No second survey	1,112	31.30%	\$98.04	3.13
Pre-notification, no Web option	Postcard, Web option	Second survey	1,112	38.60%	\$103.82	2.69
		No second survey	1,112	37.40%	\$98.65	2.64
	Postcard, no Web option	Second survey	1,112	40.90%	\$104.02	2.54
		No second survey	1,112	35.40%	\$98.86	2.79
	No postcard	Second survey	1,110	39.40%	\$112.00	2.84
		No second survey	1,110	36.10%	\$106.83	2.96
No pre-notification	Postcard, Web option	Second survey	1,110	44.00%	\$84.69	1.92
		No second survey	1,110	35.50%	\$79.53	2.24
	Postcard, no Web option	Second survey	1,110	37.70%	\$84.90	2.25
		No second survey	1,110	35.90%	\$79.73	2.22
	No postcard	Second survey	1,110	36.60%	\$92.87	2.54
		No second survey	1,110	31.00%	\$87.71	2.83

The survey design with the lowest CPRR involves: !

- Not mailing a pre-notification letter;
- Mailing an initial survey packet;
- Mailing a postcard reminder with a Web invitation;
- Mailing a second survey packet; and
- Following-up to non-respondents on the telephone.

This particular combination of conditions resulted in a response rate that was considerably higher than others. To evaluate whether this combination is an outlier, we examined the CPRR for each of the experimental conditions separately (independent of the other design features). In each case, the experimental conditions listed above had the lowest CPRR.

Table 5-8. Cost per Response Rate Point for Experimental Treatment Factors

	N	RR3	Estimated CPCI	Cost Per RR Point
Pre-notification, Web	6,672	37.04%	\$91.58	2.46
Pre-notification, no Web	6,668	37.96%	\$98.52	2.59
No pre-notification	6,660	36.77%	\$81.67	2.21
Postcard, Web	6,668	38.75%	\$86.95	2.24
Postcard, no Web	6,668	37.85%	\$91.87	2.42
No pre-notification	6,664	35.17%	\$92.85	2.63
Second mailing, telephone follow-up	10,000	39.30%	\$93.61	2.38
No second mailing, telephone follow-up	10,000	35.20%	\$86.64	2.46

5.2. THE COST OF A WEB SURVEY

The cost analysis above indicates that a Web survey can reduce data collection costs – but why this is the case is unclear. Theoretically, one can hypothesize that a Web option might reduce data entry costs, and telephone follow-up expenses, and that it provides an attractive, convenient response alternative to some individuals. However, while the response rates for the experimental conditions that offered Web invitations were higher than those that did not, they were not higher because people responded via the Web. In most cases, the additional responses collected after offering a Web invitation came through telephone interviews or returned mail surveys. The cost reductions we observe with the Web invitations may not be reliable given the small number of people who actually completed the FMR Area Survey on the Web. Given the rapidly increasing penetration of the Internet into American society and the growing proliferation of smart phones that can support Web surveys, it is reasonable to assume that more and more people will choose to participate via the Web in the future. Therefore, we encourage HUD to consider maintaining the Web option.

For example, if HUD has plans to use the same Web survey over a long period of time, then the upfront costs of programming can be recouped. Consider \$5,000, our estimated cost for set-up and programming the revised FMR Area Survey questionnaire for Web administration, along with the observed CPCIs for the ABS mail survey and the RDD landline survey designs:

Table 5-9. Cost Per Interview with Web Option

Survey Designs	No Web Option	Web Option
ABS mail survey: first survey packet; postcard reminder; second survey packet; and telephone follow-up	\$101.67	\$90.45
RDD Landline: pre-notification letter; non-response letter	\$77.31	\$79.30

The ABS mail design that offers the Web invitation with a postcard resulted in a cost savings of more than \$10 per interview compared to instances where respondents were not offered a Web invitation. At a reduction in \$10 per interview, the upfront costs of Web programming would be recouped after 500 FMR mail surveys. For a landline RDD survey, we estimated that the Web invitation saved about \$2 per

interview. At this level of savings, we would need 2,500 FMR telephone interviews to offset the Web programming cost.

As discussed in the previous section, the ABS mail design that provides the lowest CPRR involves mailing the first survey packet without a pre-notification letter; sending a reminder postcard; mailing a second survey packet; and then following up by telephone with non-responders. When we only offered the Web invitation in the postcard reminder, the CPCI savings was only about \$0.25. At this level, it would require 20,000 FMR surveys to recoup the Web programming. In this case, the cost argument is not strong. However, according to the response propensity analysis, a design with no pre-notification letter and a postcard with a Web option might be effective at achieving response from unmatched cases (no match to a telephone number).

5.3. COST BENEFIT RECOMMENDATION

After considering both the costs and response rate implications of the different experimental conditions for the FMR Area Survey, we recommend an ABS mail survey design that includes the following features:

- Not mailing a pre-notification letter;
- Mailing an initial survey packet;
- Mailing a postcard reminder with or without a Web invitation;
- Mailing a second survey packet; and
- Following-up with non-responders on the telephone where possible.

This design produced the highest response rate for the cost. The estimated CPCI for this design is \$84.69, approximately two-thirds of the \$127.26 CPCI for the optimal RDD landline/cell phone survey design.

6. CONCLUSIONS AND RECOMMENDATIONS

The FMR Area Survey experiments project has been about uncovering the most cost-effective manner to gather accurate information to calculate FMRs for targeted geographic areas. We were ideally searching for a process that would support HUD's current practices for computing FMRs, yield accurate and precise results within a reasonable timeframe, and be applicable to both large and small geographic areas. To this end, the FMR Survey Team examined various aspects of the survey process: sample sources (i.e. addresses versus landline telephones and cell phones), data capture modes (i.e. interviewer-administered telephone questionnaires versus self-administered paper or Web questionnaires), and protocols for encouraging respondent participation (i.e. sending pre-notification letters, offering the opportunity to participate via the Web, mailing letters to non-responders, mailing reminder postcards, offering a replacement mail survey, etc.). The FMR Survey Team also thoroughly examined the collected data in terms of the quality of responses. Finally, the FMR Survey Team evaluated approaches for using the data in order to maximize the utility of the responses provided. This report has attempted to summarize and present the results of our team's analysis of the experimental survey data. This section of the report brings together the various conclusions and recommendations made throughout the document.

What the FMR Survey Team learned is that no matter the sample source, data capture mode, or survey protocols employed, it is relatively expensive to collect the data needed to calculate FMRs. Historically, a driving cost factor for the FMR Area Survey has been the high level of effort needed in order to contact, identify, and subsequently collect rent and utility information from eligible respondents. This remains true today. One- and two-bedroom renters who live in market rate apartments and do not receive housing assistance, who live in the residence year-round, whose landlords are not relatives or PHAs, and who do not perform any work for their landlord in exchange for a rent reduction constitute a relatively low-incidence population who are difficult to locate and identify. The FMR Survey Team was surprised to find that there were not greater cost differences between an ABS mail survey approach and the RDD landline/cell phone approach – in fact, some of the experimental ABS mail design combinations were more expensive than telephone designs.

The FMR Area Survey experiment identified a cost-effective research design that is generally consistent with other survey research and industry trends. The results of the experiments indicate that an ABS sample utilizing a mail survey where an initial survey packet is mailed, followed by a reminder postcard, followed by a second survey replacement packet, and then telephone follow-up calls produces the greatest response rate for the least cost.

A somewhat surprising finding from the experiments was the lack of impact that the pre-notification letter appeared to have on mail survey responses. Overall, numerous other studies have found that pre-notification letters increase response rates for mail, telephone, and Web surveys on a variety of topics and with diverse populations. The pre-notification letter did positively impact response rates for the RDD landline/cell phone survey. One factor that could be confounding our results with the ABS mail survey is the timing of the pre-notification letter – for most respondents, there was most likely a full week between receipt of the pre-notification letter and first mail survey packet; for telephone respondents, dialing began on records much closer to the time of they received the pre-notification. It is possible that this delay between the two mailings lessened the benefit of the pre-notification mailing. Even though we cannot recommend that HUD continue to offer the pre-notification with a mail survey based on the experiment alone, we do think that this could be an area for further methodological research.

Another somewhat surprising finding was the impact of offering a Web alternative mode of response. Previous HUD experience with offering a Web mode had not been successful – very few respondents selected this choice, rendering the mode cost-prohibitive. For the 2011 FMR Area Survey experiments, a Web option was incorporated into both the ABS mail and the RDD landline/cell phone survey

experiments. Relatively few individuals responded through the Web channel (only 81 in total), making it impossible to draw statistically significant conclusions from the data. However, we do find that the mere offering of a Web option seems to have influenced response patterns. Our results from the experiments indicate that the optimal mail survey design would include providing a Web invitation in the reminder postcard mailed to non-respondents. The cost-effectiveness of a Web option continues to be dependent on the number of surveys HUD plans to conduct and the cost of programming the instrument – yet what has changed since HUD’s previous experience is the public’s willingness to participate via the Web, the proliferation of the Internet throughout American society, and the growing use of smart phones for accessing the Web. These trends will continue to influence survey participation of all kinds, and therefore, it is highly likely that more people will seek to complete a survey at their own convenience via the Web instead of the telephone or on paper. If the Web survey does not need to be programmed (i.e. HUD utilizing the existing program, working with one contractor for a long period of time, or if the Web program is portable across vendors/platforms, etc.), then it becomes a very cost-effective option for data collection. As a result, we recommend that HUD consider offering a Web alternative as part of the ABS mail survey design if and when it is cost-effective to do so.

A reassuring outcome to the FMR Area Survey experiments was that the telephone and mail methodologies both produced samples that conform to other sources. The bedroom distributions and the average gross rents were comparable to those found in the 2010 ACS tables. Chi-square tests indicate that Peoria (RDD landline/cell phone survey site) and Charleston (ABS mail survey site) have distributions that deviate from the ACS, but the differences are not substantial enough to effect FMR calculations.

With an ABS mail survey research design, HUD would lose some control over particular aspects of the data collection process that they previously had with an RDD approach. With a telephone survey, it is relatively easy and quick to select and field additional cases in order to obtain sufficient sample sizes to compute accurate and reliable FMR values. With a mail survey design, given the length of time it can take to administer a protocol, this becomes more problematic – especially if there is the need to obtain data quickly. Furthermore, with a mail survey, there is no control over how respondents answer questions and which questions they respond to; item non-response is relatively higher. In a telephone survey, interviewers can guide respondents through the questionnaire to obtain the necessary information, and they can probe for responses that are unclear or non-responsive.

Yet, in the case of the ABS mail survey experiment and our recommended methodology, the obstacles listed above were, and are, surmountable. Timing and item non-response can be adjusted for statistically provided there are enough responding units. While the ABS mail survey design provided the largest number of responding cases in both areas, it still did not provide enough of the “classic” FMR eligible cases to compute an accurate or reliable FMR. However, it did provide adequate numbers to calculate FMRs if all rental units are included in the analysis and not just one- and two-bedroom units; the telephone data could not always provide adequate sample sizes to develop accurate estimates. Furthermore, imputation using a “hot-deck” approach can overcome the problems associated with item non-response associated with utility information and maximize the number of cases that can be retained for analysis.

While item non-response was higher with the ABS mail survey on average, on the questions asking respondents how much they paid in rent or how much their rent would be if they had to pay it all themselves, the mail questionnaire performed better than the telephone. People’s increased willingness to provide financial information via a self-administered form instead of to another person has been observed on other studies. This characteristic of human behavior works to HUD’s advantage with a mail survey approach.

Overall, the FMR Area Survey questionnaire worked well across all modes of data collection – item non-response was relatively low and individuals tended to complete the questionnaire. The questionnaire is also efficient and places relatively little burden on respondents in terms of time (i.e. the telephone survey took on average seven minutes and seven seconds to complete).

Feedback from respondents, interviewers, and data entry staff indicate that further revisions might be helpful to improve respondents' ability to answer questions regarding housing assistance status, utilities, and fuel types. We urge HUD to consider excluding individuals who receive housing choice vouchers in the estimation of FMRs; there is evidence that respondents cannot provide an accurate amount for what their rent would be if they had to pay it all themselves. Respondents also have difficulty identifying if they live in public housing. Furthermore, we strongly encourage HUD to consider investigating and testing alternative ways for obtaining this information and formatting the mail questionnaire.

Finally, the ABS mail survey methodology has a distinct advantage over the RDD landline/cell phone approach – it is easily and efficiently scalable to any size geography. ABS samples are, by definition, based on, and tied to, geography. ABS samples can be purchased and selected for very small areas – ZIP codes and even census tracts. Telephone samples are much more difficult to link to specific geographies, particularly with RDD samples where it is only possible to establish a probability if a particular telephone number is located within a targeted area. Telephone number portability and the proliferation of cell phones further exacerbate the problem. As a result, FMR Area Surveys that study counties or smaller areas tend to face higher data collection costs due to the inefficiency of screening households.

7. WORKS CITED

- AAPOR Cell Phone Task Force. (2010). New Considerations for Survey Researchers When Planning and Conducting RDD Telephone Surveys in the US with Respondents Reached via Cell Phone Numbers.
- AAPOR. (2009). *Standard Definitions, Final Dispositions of Case Codes and Outcome Rates for Surveys*. American Association of Public Opinion Research.
- Blumberg, S., & Luke, J. (2011, December). *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, January-June 2011*. Retrieved from National Center for Health Statistics: www.cdc.gov/nchs/nhis.htm
- Couper, M., Blair, J., & Triplett, T. (1999). A Comparison of Mail and E-Mail for a Survey of Employees in Federal Statistical Agencies. *Journal of Official Statistics*, 15, 39-56.
- de Leeuw, E. (1992). *Data Quality in Mail, Telephone, and Face-to-Face Surveys*. Amsterdam: TT Publications.
- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Internet, mail, and mixed-mode Surveys: The tailored design method*. Hoboken, New Jersey: John Wiley and Sons.
- Edwards, P., Roberts, I., MJ, C., DiGuseppi, C., Wentz, R., Kwan, I., et al. (2009). Methods to increase response to postal and electronic questionnaires (Review). In T. C. Collaboration, *The Cochrane Library*. John Wiley & Sons, Lt.
- Griffin, D. H., Fischer, D. P., & Morgan, M. (2001 йил 17-20-Май). Testing an internet response option for the american community survey. *Paper presented at the Annual conference for the American Association for Public Opinion Research*.
- Groves, R. (1990). Theories and Methods of Telephone Surveys. *Annual Review of Sociology*, 16: 221-240.
- Houtkoop-Steenstra, H., & Bergh, H. (2000). Effects of introductions in large-scale telephone survey interviews. *Sociological Methods and Research*, 281-300.
- Israel, G. (2009). *Obtaining responses by mail or web: Response rates and data consequences*. Hollywood, FL: Paper presented at the annual meeting of the American Association for Public Opinion Research.
- Kirsch, I., Jungeblut, A., Jenkins, L., & Kolstad, A. (1993). *Adult Literacy in America*. Washington, D.C.: National Center for Education Statistics, U.S. Department of Education.
- Krosnick, J. (1991). Response strategies for coping with the cognitive demands of attitude measures in surveys. *Applied Cognitive Psychology*, 213-236.
- Kwak, N., & Radler, B. (2002). A Comparison Between Mail and Web Surveys: Response Pattern, Respondent Profile, and Data Quality. *Journal of Official Statistics*, Vol 18, No 2, 257-273.
- Messer, B. L., & Dillman, D. A. (2010). *Using address based sampling to survey the general public by mail vs. web plus mail*. The National Science Foundation Division of Resource Statistics.
- Pew Research Center. (2010). *Pew Internet & American Life Project*. Retrieved January 10, 2012, from Broadband and Dial-up Adoption 2000-2010: <http://www.pewinternet.org/Static-Pages/Trend-Data/Home-Broadband-Adoption.aspx>
- Schaefer, D., & Dillman, D. (1998). Development of a Standard E-Mail Methodology. *Public Opinion Quarterly*, 62: 378-97.

- Schwarz, N., Bless, H., Strack, F., Klumpp, G., Rittenauer-Schatka, H., & Simons, A. (1991). Ease of retrieval as information: Another look at the availability heuristic. *Journal of Personality and Social Psychology* , 195-202.
- Smith, A. (2011, December 7). *Americans and Mobile Computing: Key Trends in Consumer Research*. Retrieved January 10, 2012, from Pew Research Center:
<http://www.pewinternet.org/Presentations/2011/Dec/Government-Mobility-Forum.aspx>
- Smith, E. R., & DeCoster, J. (2000). Dual-process models in social and cognitive psychology: Conceptual integration and links to underlying memory systems. *Personality and Social Psychology Review* , 108-131.

APPENDICES

APPENDIX A: AREA SELECTION

GEOGRAPHIC AREA SELECTION

To select the pairs (e.g. Columbia, SC/Charleston, SC and Peoria, IL/Fort Wayne, IN) we created a pool of areas with the following characteristics:

- *ACS Type 1 or 4*: Having at least 200 ACS cases with two-bedroom rents. The ACS data for these areas will provide an independent benchmark for comparing the methodologies.¹
- *Population of 800,000 or less*. ACS-1 and ACS-4 areas tend to be larger cities, but most FMRs are conducted in small metropolitan areas. Thus, we limited the size of the population for the Area selection.
- *Not in top 25 percent of communities for percent of population speaking a language other than English at home*. Conducting the survey in languages other than English could add complexity to the experiment and make the results more difficult to interpret.
- In the continental US.

Forty-two Areas remained after eliminating Areas that did not meet all of the criteria above. Our goal was to select two matched pairs that varied on geographic location and demographics with at least:

- One with high minority.
- One with low/average minority.
- One with higher rent-to-income ratio.
- One with lower rent-to-income ratio
- One with younger average rental housing age.
- One with older average rental housing age.
- Two different areas of the country.

We began by finding a pair with a high minority population. We did this by grouping all Areas where at least 20 percent of the population was African-American or Hispanic. These sites all had large black populations, but small Hispanic populations. We evaluated Area similarity based on:

- Geographic location,
- Population size,
- Rent to income,
- Population growth,

¹ACS-1 areas are FMR Areas which have at least 200 sample cases of two-bedroom standard quality rents. ACS-1 areas may be MSAs, subareas that are assigned CBSA base rents, subareas that have their own base rents, or large nonmetropolitan counties.

ACS-4 areas are FMR Areas that have at least 200 sample cases of two-bedroom recent mover rents where the recent mover estimate is statistically different from the standard quality updated rent. ACS-4 areas may be entire MSAs, subareas assigned CBSA base rents, other subareas, or large nonmetropolitan counties. By definition, these areas are a subset of ACS-1 areas.

- Race distribution,
- Housing occupancy rate,
- Foreclosure rate,
- Poverty rate,
- Unemployment rate,
- Average household size, and
- Average rental housing age.

Columbia, SC and Charleston, SC were most aligned on these characteristics. To find the second pair, we contrasted the SC/SC pair based on Areas race distribution, rent-to-income ratio, housing age, and geography.

Table 1: Characteristics of Ideal Location Pairs

	FIRST PAIR CHARACTERISTICS	SEARCH FOR 2ND PAIR LIMITED TO:
Geographic location	South	Northeast, Midwest and West
Race distribution	High minority	Low Minority
Rent-to-income	High	Low
Rental housing age	Young	Old

Based on these limitations, we selected Peoria, IL and Fort Wayne, IN because they met the criteria in Table 1 and were similar to each other on the criteria we used to match the two locations in South Carolina.

APPENDIX B: SAMPLING FRAMES

ABS AND RDD SAMPLE FRAME CONSTRUCTION

Sample Frames for FMR Survey Experiment

Both an ABS frame and a dual-frame RDD will provide near 100 percent coverage of the household population. Another consideration when evaluating sampling frames is efficiency. While efficiency is not related to quality, it does have cost implications. Two critical aspects of efficiency related to FMR Surveys are: 1) the ability to geographically target specific areas, and 2) the efficiency in reaching renter-occupied units.

Landline RDD Frame

Most RDD samples are drawn from a list-assisted sampling frame that is constructed from telephone exchanges associated with residential landlines. All possible numbers in this set of exchanges are grouped into blocks of 100 as in: ZZZ-XXX-XX00- ZZZ-XXX-XX99 where ZZZ is the area code and XXX-XX is the five-digit exchange. These 100 blocks are checked against telephone directories, and blocks with no listed numbers (zero-blocks) are dropped or truncated. The blocks with at least one listed number are considered 1+ blocks, or working banks.

Truncating the RDD sampling frame is done to increase efficiency of the sample, but it opens the possibility of sample under-coverage. If all the numbers in all zero blocks really are unused by households, then there is no sample under-coverage associated with dropping the blocks. If, however, some zero blocks actually have unlisted households in them, then dropping those blocks means dropping some unlisted households.

One recent study estimated that up to 20 percent of landline households are excluded from landline RDD samples in this way (Fahimi, Kulp, & Brick, 2009), but other recent studies have estimated the under-coverage rate at five percent (Boyle, Bucuvalas, Piekarski, & Weiss, 2009) and seven to 14 percent (Barron, et al., April, 2010). The winning perspective in this controversy seems still to be undecided in the literature.

Geographic Stratification

Since the RDD telephone numbers are cross-referenced to telephone directories, there exists a link between telephone number and geography. The directory-listed telephone numbers are mapped and assigned to a specific geographic location (such as a census block group, a census tract, or a ZIP code). Telephone lines are not restricted by geographic borders, but are generally associated with finite geographic areas. The mapping results in a many-to-many association between telephone exchanges and geographic boundaries (i.e. many exchanges associated with many geographic areas). The association between geographic area and telephone exchanges is quantified by tallying the number of directory-listed households in each geographic area by exchange combination. The geographic area is assigned to the telephone exchange with the most number of listed telephones (the rule of plurality). After each geographic area has been assigned to an exchange, the exchanges inherit the demographic and socioeconomic characteristics of the geographic areas. These exchange characteristics can be used for targeting certain geographic areas such as an FMR area or targeting geographic areas with high concentrations of renters.

Cell Phone RDD Frame

Similar to the landline sample, a cell phone RDD sampling frame is constructed from telephone exchanges associated with cellular telephones. The North American Numbering Plan Administration

governs the assignment of area codes, exchanges and 1000-blocks (ZZZ-XXX-XX00- ZZZ-XXX-X999) of telephone numbers in the United States. The cell phone sample is selected from the frame of all 100 blocks assigned for cellular service.

Geographic Stratification

The association with geography is much weaker for cell phones than for landlines. There is no directory listing of cell phones that ties the cell phone to a place of residence. Cell phone geographic stratification is limited to county and is based on the physical location of the “switch-center” where the cell phone is first activated for service. This relationship is tenuous for three main reasons:

- Cell phones are portable and many people will move out of county, but keep their cell phone number;

Table A-1: “In-Area” and “Out-of–Area” Cases by Sample Type

Area	Cell		Landline	
Peoria				
Owner	517	84%	1174	92%
Renter	99	16%	107	8%
Not in area	44	44%	5	5%
In Area	55	56%	102	95%
2 BR recent mover	16	29%	9	9%
Not 2 BR recent mover	39	71%	93	91%
Columbia				
Owner	429	82%	1229	88%
Renter	97	18%	172	12%
Not in area	50	52%	7	4%
In Area	47	48%	165	96%
2 BR recent mover	14	30%	18	11%

Not 2 BR recent mover	33	70%	147	89%
-----------------------	----	-----	-----	-----

- The county where the cell phone is purchased and activated may not be the county where the user lives; and
- Switch-centers are located around larger population centers; over half of the counties in the U.S. do not have a switch-center.

To illustrate the impact of “switch-centers” consider two counties: County A has 75,000 people and a switch-center; County B has 25,000 people, does not have a switch-center, and the nearest switch-center is in County A. Suppose County A is the FMR area. We will select cell phone numbers associated with the switch-center in County A, but since County B is also serviced by the same switch-center, we would expect 25% of the interviews to be ineligible because they live in County B. Now consider County B as the FMR area. In this case, we would still select cell phone numbers associated with the switch-center in County A, but would expect 75% of the interviews to be ineligible because they live in County A.

Address-based Sampling Frame

ABS sample frames come from mailing lists provided by private vendors. Most of these lists are based on the USPS Delivery Sequence File (DSF), although many vendors use proprietary systems to update and clean the lists so that performance may differ across company sources. Norman and Sigman (2009) mention a study (Link, Battaglia, Giambo, Frankel, Mokhad, & Rao, 2005) that compared coverage of mailing lists obtained from five address vendors and found that Marketing Systems Group (the sampling arm of which is known as Genesys) had notably better coverage than three other vendors and better precision in method than the remaining company.

More generally, the list vendor should have a license to use the Computerized DSF because coverage and accuracy of DSF lists updated using this system are higher (Dohrmann, Han, & Mohadjer, 2006). Also, some addresses, especially those in rural areas are “simplified” and do not contain unit or street numbers. Some vendors, including MSG, can use proprietary databases to augment address information and make it usable (Norman & Sigman, 2009).

The DSF contains information about all the deliverable mail addresses in the United States including (Norman & Sigman, 2009) addresses that:

- Receive or have received mail delivery,
- Receive seasonal mail delivery,
- Are city route street addresses but receive mail at a PO Box, and
- Are city route street addresses but do not receive mail because they are vacant.

Studies comparing Census household counts to address list counts have found that mail address list coverage is very high in places with fairly dense populations and much lower in rural areas with sparse populations. Staab and Iannacchione (2003) estimated that national coverage was 97 percent but coverage was only 83 percent in local areas (defined by city names) with populations less than 10,000. Other studies that have used a match method based on trained observer enumeration of dwellings have similarly observed that coverage in urban areas is near 100 percent while coverage of rural areas can be much

lower. One study found that mailing lists and enumerated lists matched only 72 percent of the time in a rural South Atlantic community (Dohrmann, Han, & Mohadjer, 2006).

There are two kinds of households that are not covered by the DSF (Staab & Iannacchione, 2003):

- Households that are not on mail routes and receive mail only through PO Boxes, and
- Rural route and highway boxes.

Rural route and highway boxes must be excluded from survey samples because we cannot know how many households are served by each drop point. However, the number of these boxes will continue to decrease in number as communities move to assign city-style addresses to rural homes to support enhanced 911 systems (Staab & Iannacchione, 2003). In 2007, about three percent of the adult population reported receiving mail at “an address with a rural route number”² but not also at a street address (Data from (National Cancer Institute, 2007)).

PO Boxes are even more problematic. If HUD chooses to include PO Boxes, it will have complete coverage of people who receive mail at PO Boxes but not at home, but people who receive mail in both places may be counted twice in the survey. If HUD chooses to exclude PO Boxes, then each included household will only have one chance of being selected, but no one without a city route street address will be included. Further, it is difficult to locate PO Boxes within a specific geographic location, since the PO Box and the PO Box owner are not necessarily co-located. The ABS sample used for this experiment did not include PO Boxes.

Iannacchione, Staab, and Redden (2003) found that in Dallas County a large majority of PO Box users also received mail at home. However, in a later study the result was not found to generalize to a larger geographic area (Staab & Iannacchione, 2003). Nationally, 88 percent of adults said they received mail at a street address. Seven percent received mail at a PO Box, but 28 percent of those said they also received mail at a street address (Data from (National Cancer Institute, 2007)). So, in general, about five percent of the population of adults would be excluded by a DSF frame that excluded PO Boxes.

The threat of under-coverage, however, varies with the mix of geographies in the survey region. Studies that specifically enumerated housing on DSF routes that do not appear in the DSF (which could be houses that receive their mail through a PO Box) have found that the incidence of such units is low (e.g., 1.8 percent; (Staab & Iannacchione, 2003)).

For the most part, geographies where FMR Surveys are conducted will not be majority rural where the threat of under-coverage of locations with no mail service is high. However, in cases where this may be a problem (e.g., when the frame contains many rural routes), HUD could supplement the survey data with data from the ACS, which is not based on a DSF frame. In such a case, the primary source would be the survey data, but any available ACS data could be combined with the survey data using small area estimation techniques. Thus, it seems that the best option for the FMR Survey is to exclude PO Boxes from the DSF-based frame.

Geographic Stratification

ABS is a selection of addresses, each with a geographic location. Since the sample is directly associated with a location, the address frame can be geographically stratified down to the census block level. This

² This estimate from a mail survey that used a DSF frame but included all PO Box and rural route addresses.

information can be used to precisely locate neighborhoods with high concentrations of renters and ultimately increase the efficiency of reaching respondents qualified for the FMR Surveys.

Further, an ABS sample can be selected for very small geographic areas, such as census tracts with 100 percent geographic accuracy. This is a distinct advantage over RDD sampling.

APPENDIX C: SURVEY MATERIALS

These documents begin on the next page.

APPENDIX D: TIMELINE AND RETURNS*Table 1: RDD and Cellphone*

DATE	EVENT	NUMBER OF RECORDS
7/22/11	First Mailing, Prenotes	10,000
7/27/11	Begin Calling	10,000 Records that received pre-notes
7/30/11	Changed Questionnaire	All
8/4/11	Paused Dialing	All
8/4/11	Sent non-response letters	7,000
8/10/11	Dialing Resumed	All
8/18/11	Dialing complete	All

Table 2: ABS

DATE	EVENT	NUMBER OF RECORDS
7/22/11	First Mailing, Prenotes	13,000
8/18/11	Begin Calling	7,400 Records not receiving second mail effort
8/4/11	Sent non response postcards	12,666
9/19/11	End of Data Collection	All
	Number of Returned Surveys	5,215

Table 3: Numbers of Returned Surveys by Mailing Event

EVENT	DATES	RETURNS
First Survey Mailing (EV2) - Postcard Sent (EV3B)	7/28/2011–8/4/11	0
Postcard Sent (EV3B) - Second Survey Mail (EV4)	8/4/2011–8/21/11	3,483
Second Survey mailing (EV4) - Start ABS calling	8/21/2011–9/4/11	1,142
Start ABS Calling - End Data Collection	9/4/2011–9/19/11	1,174
End Data Collection - Stopped Receiving returns	9/19/2011–11/29/11	252

APPENDIX E: ORIGINAL FMR AREA TELEPHONE QUESTIONNAIRE

U.S. Department of Housing and Urban Development Area-Specific Survey Questionnaire FY2008/9 – annotated for FY2010/1 Experimental Administration

FMR_CATI_Introduction and Screening:

Hello, my name is _____. I am calling on behalf of HUD, the U.S. Department of Housing and Urban Development. HUD is conducting a study of rental housing costs in your area. This information will help the government provide housing assistance to people who need it. This survey will only take a few minutes of your time; all of the information you provide will be confidential, and your participation is voluntary. This call may be monitored for quality assurance.

FMR_Q1 Is this a residential household such as an apartment, a house, or a mobile home? [NOTE: It is NOT a dormitory, hospital room, nursing home, assisted-living facility, barracks, or cellular telephone?]

- 1 Yes
- 2 No [Terminate & Thank]

FMR_Q2a Are you renting this property, or do you own it?

- 1 Rent this property
- 2, Own this property [Thank & Terminate]

FMR_Q2b How long have you lived at this residence?

- 1 Less than 24 months [increment recent mover quota cell]
- 2 24 months or more [increment non-recent mover quota cell]
- 8 Don't know [Terminate & Thank]
- 9 Refused [Terminate & Thank]

FMR_Q3 I need to speak to someone 18 years old or older who knows about your household's housing cost. Would that be you?

- 1 Yes [skip to Q5]
- 2 No

FMRQ4 Is someone who does know available to come to the phone?

- 1 Yes [Read introduction to the second respondent]
- 2 No [Schedule a callback for a time when someone will be available. Make sure to ask for the first name of the person to ask for at that time.]

FMR_Introduction for the Second Respondent:

Hello, my name is _____. I am calling on behalf of HUD, the U.S. Department of Housing and Urban Development. HUD is conducting a study of rental housing costs in your area. The person I just spoke with said you could help me with several questions about your housing costs. This information will help the government provide housing assistance to people who need it. This survey will only take a few minutes of your time; all of the information you provide will be confidential, and your participation is voluntary. This call may be monitored for quality assurance.

FMR_5 First, how many bedrooms do you have? That is how many bedrooms would your residence be advertised as having if it were for rent? [NOTE: Include rooms that are meant to be bedrooms even though they may not be used as bedrooms no – bedrooms converted to dens, storage areas, etc.]

- 1 One
- 2 Two
- 3 Three [If metropolitan area, terminate and thank. If non-metropolitan area continue.]
- 4 Four or more [Terminate & Thank]
- 5 None; efficiency [Terminate & Thank]

Note: For metropolitan areas only 1-bedroom and 2-bedroom units are surveyed. For non-metropolitan areas, 1-, 2-, and 3-bedroom units are surveyed.

FMR_Q6 Do you consider this your permanent residence, where you live all year, or a vacation or seasonal residence?

- 1 Permanent residence
- 2 Vacation/Seasonal residence [Terminate & Thank]
- 8 Don't know [Terminate & Thank]
- 9 Refused [Terminate & Thank]

FMR_Q6a Apart from utility costs, does this unit rent for the same amount every month of the year?

- 1 Yes [Skip to 7]
- 2 No
- 8 Don't Know [Skip to 7]
- 9 Refused [Skip to 7]

FMR_Q6b Why is that? Is it because ...[INTERVIEWER NOTE: PLEASE READ THE ENTIRE LIST]

- 1 Owners charge different rents during the summer or winter vacation season? [If yes, Terminate & Thank]
- 2 Owners charge different rents during the school year? [If yes, Terminate & Thank]
- 3 Because of variation in utility costs, such as air conditioning or heating? [If yes, Terminate & Thank]
- 7 Some other reason? [Skip to Q6b_O]
- 8 Don't know [Terminate & Thank]
- 9 Refused [Terminate & Thank]

“In this question we are trying to make sure the rent can vary from month to month and it is not because of changes in utility costs. Those that answer yes to number 3 and number 7 will continue with the survey, for all other responses, the survey will terminate.”

FMR_Q7 Is your building owned by a public housing authority?

- 1 Yes [Thank & Terminate]
- 2 No
- 8 Don't Know [Thank & Terminate]
- 9 Refused [Thank & Terminate]

“In this question we are trying to determine if the rental unit is owned and operated by a local public housing authority. A public housing authority is a local housing agency that owns and operates rental unit.”

FMR_Q8 Is your residence owned by a relative?

- 1 Yes [Thank & Terminate]
- 2 No
- 8 Don't know [Thank & Terminate]
- 9 Refused [Thank & Terminate]

FMR_Q9 Was the building you live in built within the last 2 years?

- 1 Yes – built within the last 2 years [Terminate & Thank]
- 2 No – over 2 years old
- 8 Don't know [Terminate after probing]
- 9 Refused [Terminate after probing]

FMR_Q10 Do you perform any work for your landlord in exchange for a reduction in rent?

- 1 Yes
- 2 No [Skip TO 12]
- 8 Don't Know [Skip to 12]
- 9 Refused [Skip to 12]

“In this question we are trying to determine if the rent is reduced in return for doing work for the landlord. The survey collects information about market rents.”

FMR_Q11 Does this involve more than maintenance and upkeep of your residence?

- 1 Yes [Thank & Terminate]
- 2 No
- 8 Don't Know [Thank & Terminate]
- 9 Refused [Thank & Terminate]

“In this question we are trying to determine if the work performed for the landlord is more than simple basic maintenance or upkeep on the residence. For example, mowing the lawn would be simple maintenance. Repairs to the building would not be simple maintenance.”

FMR_Q12 Does another family or individual live in the unit who pays for part of the rent?

- 1 Yes
- 2 No [Skip to Q16]
- 8 Don't Know
- 9 Refused

FMR_Q13 How much is your monthly rent? Please do not include separate parking fees, or utility costs.

[INTERVIEWER NOTE: We are trying to determine if the market rent for this unit by adding the amount the respondent pays and other each month. Certain utilities may be included in the rent. If the tenant pays separately for any utilities, do not add them to the rent.”]

- 1 Amount Given _____ [Round to the nearest dollar] [Skip to Q14]
- 8 Don't Know [Probe: “Is there someone else in the household who could tell me about your housing costs?” If no, terminate. If yes, read the introduction to the other respondent and go to Q14b]
- 9 Refused [Read the Refusal statement]

REFUSAL STATEMENT:

The results of this survey will be used by the U.S. Department of Housing and Urban Development to ensure that rental assistance is provided as cost-effectively as possible to area residents who most need it.

FMR_Introduction for the Second Respondent:

Hello, my name is _____. I am calling on behalf of HUD, the U.S. Department of Housing and Urban Development. HUD is conducting a study of rental housing costs in your area. The person I just spoke with said you could help me with several questions about your housing costs. This information will help the government provide housing assistance to people who need it. This survey is brief. Your participation is voluntary, and all the information you provide is confidential. This call may be monitored for quality assurance.

FMR_Q13b How much is your monthly rent? Please do not include separate parking fees, or utility costs.

- 1 Amount Given _____ [Round to the nearest dollar]
- 8 Don't Know [Terminate & Thank]
- 9 Refused [Read the Refusal statement]

“In this question we are trying to determine the total monthly rent of the unit. If the individuals share a rental unit and do not know the full monthly amount, record the amount of each respondent. If the respondent pays separately for utilities or parking, do not include these amounts. If some of the utilities and/or parking are included in the rent, then report the total rent including those amounts that are included.”

FMR_Q14 How much do other people for this unit?

1 Amount Given _____ [Round to the nearest dollar]

8 Don't Know [Probe: "Is there someone else in the household who could tell me about your housing costs?" If no, terminate. If yes, read the introduction to the other respondent and go to Q14b]

9 Refused [Read the Refusal statement]

FMR_Q15 I figure that the total monthly rent for your residence for everyone who lives here including ALL assistance AND/OR subsidies is _____ [ADD Q13A+Q14 OR Q13B+Q14] Does that sound right to you?

1 Yes [Skip TO Q17]

8 No [Go back to Q13]

9 Don't know/Refused

FMR_Q16 How much is the total monthly rent for your residence? Please do not include any separate parking or utility costs?

1 Amount Given _____ [Round to the nearest dollar] [Skip to Q14]

8 Don't Know [Probe: "Is there someone else in the household who could tell me about your housing costs?" If no, terminate. If yes, read the introduction to the other respondent and go to Q14b]

9 Refused [Read the Refusal statement]

FMR_Q17a Is part of your rent, or anyone who lives with you, paid for by a federal, state, or local program?

1 Yes

2 No [Skip to Q18]

8 Don't Know [Skip to Q18]

9 Refused [Skip t Q18]

"In this question, we are trying to determine if the respondent's current rent is subsidized. Many renters receive assistance in the form of a subsidy payment through federal, state, or local programs. The amount of the assistance depends on income. In shared rental units, respond YES if one or more individuals in the unit are subsidized.

FMR_Q17b How much would the monthly rent be without the housing assistance?

[INTERVIEWER NOTE: This amount should include the housing assistance for the respondent plus anyone else living in the rental unit.]

1 Amount Given _____

8 Don't Know [Ask if anyone else would know]

9 Refused

“In this question we are trying to determine the total housing subsidy this rental unit receives from any sources. In shared rental units, make sure to add the subsidy amount for all subsidized individuals. A renter is more likely to know the market rent for the unit than the subsidy amount, which is why we are asking the question this way. Subsidies are often paid directly to the landlord.

FMR_Q18 Which of the following best describes the structure where you live:

[INTERVIEWER NOTE: PLEASE READ LIST]

- 1 Apartment building with 5 or more units
- 2 Single family dwelling (detached)
- 3 Duplex
- 4 Apartment building with 2 to 4 units
- 5 Townhouse or row house
- 6 Mobile home
- 7 Other (Specify _____) [Skip to Q18_o
- 8 Don't Know [Skip to Q20a]
- 9 Refused [Skip to Q20a]

FMR_Q19 Is this unit detached or is it attached to other units?

- 1 Detached
- 2 Attached
- 8 Don't know
- 9 Refused

FMR_Q20a Is this the only landline telephone number that rings at your residence? [We are asking about other residential landlines, not telephone extensions with the same number.]

- 1 Yes (Skip to Q21)
- 2 No

In this question we are trying to determine the number of different residential telephone numbers serving the residence. We are not asking about the number of phones (extensions). We are asking about the number of different residential telephone lines.

FMR_Q20b. How many different residential landline telephone numbers, not extension phones, ring into your household?

- 1 Amount Given
- 8 Don't Know
- 9 Refused

In this question we are trying to determine the number of different residential telephone numbers serving the residence. We are not asking about the number of phones.

FMR_Q21a Do you or anyone in your family have a working cell phone?

- 1 Yes
- 2 No (Skip to Q22)
- 8 Don't know
- 9 Refused

FMR_Q21b How many cell phones do you or people in your family have?

- 1 Amount Given [Range: 1-10]
- 98 Don't Know
- 99 Refused

FMR_Q21c Of all the telephone calls that you or your family receives are...

[READ LIST]

- 1 All or almost all calls are received on cell phones
- 2 Some are received on cell phones and some are regular calls
- 3 Very few or none are cell phones
- 8 Don't know
- 9 Refused

FMR_Q22 Do you pay separately for utilities such as heat, air conditioning, lights, water, cooking fuel, or trash collection? [If no, probe with "Do you pay any utility bills?]

- 1 Yes
- 2 No [Skip to Q35]
- 8 Don't know
- 9 Refused

FMR_Q23 Is the cost of heating included in your rent, or do you pay separately for heating fuel?

- 1 Included in rent [Skip to Q25]
- 2 Pay separately
- 3 Unit does not have heating system [Skip to Q25]
- 8 Don't know [Skip to Q25]
- 9 Refused [Skip to Q25]

FMR_Q24 What primary type of fuel do you use for heating?

- 1 Electricity
- 2 Natural gas

- 3 Bottled gas (propane, butane, Petrolane)
- 4 Fuel oil
- 7 Other-specify
- 8 Don't Know
- 9 Refused

FMR_Q25 Is air conditioning included in your rent, or do you pay separately for air conditioning?

- 1 Included in rent (Skip to Q27)
- 2 Pay separately
- 3 Unit does not have air condition (Skip to Q27)
- 8 Don't Know
- 9 Refused

FMR_Q26 What primary type of utility do you use for air conditioning?

- 1 Electricity
- 2 Natural gas
- 7 Other (specify: _____)
- 8 Don't know
- 9 Refused

FMR_Q27 Is cooking fuel included in your rent, or do you pay separately for cooking fuel?

- 1 Included in rent (Skip to Q29)
- 2 Pay separately
- 3 Unit does not have a cooking facility (Skip to Q29)
- 8 Don't Know
- 9 Refused

FMR_Q28 What primary type of utility do you use for cooking?

- 1 Electricity
- 2 Natural gas
- 3 Bottled gas (Propane, butane, Petrolane)
- 7 Other (specify: _____)
- 8 Don't know
- 9 Refused

FMR_Q29 Is the cost of lighting and refrigeration included in your rent, or do you pay separately for lighting and refrigeration?

- 1 Included in rent (Skip to Q29)
- 2 Pay separately

- 3 Unit does not have a cooking facility (Skip to Q29)
- 8 Don't Know
- 9 Refused

“In this question we are trying to determine if the respondent pays separately for electricity to power the lights and refrigerator. We are not asking if they rent a refrigerator.”

FMR_Q30 Do you pay a separate monthly rental fee for a range or refrigerator?

- 1 Yes
- 2 No
- 8 Don't know
- 9 Refused

FMR_Q31 Is hot water included in your rent, or do you pay separately for hot water?

- 1 Included in rent (Skip to Q33)
- 2 Pay separately
- 3 Unit does not have a cooking facility (Skip to Q33)
- 8 Don't Know
- 9 Refused

FMR_Q32 What primary type of utility do you use for heating water?

- 1 Electricity
- 2 Natural gas
- 3 Bottled gas (Propane, butane, Petrolane)
- 4 Fuel oil
- 7 Other (specify: _____)
- 8 Don't know
- 9 Refused

FMR_Q33 Is a water or sewage fee included in your rent, or do you pay separately for water and sewage?

- 1 Included in rent
- 2 Pay separately
- 3 Unit does not have water and sewage
- 4 Water and sewage are supplied by city
- 8 Don't Know
- 9 Refused

FMR_Q34 Is trash collection included in your rent, or do you pay separately for trash collection?

- 1 Included in rent
- 2 Pay separately
- 3 Unit does not have trash collection

- 4 Trash collection supplied by city
- 8 Don't Know
- 9 Refused

FMR_Q35_Location: Would you please tell me the county were your housing unit is located?
Record Corresponding Code (programmed into CATI)

FMR_Q36 Would you please tell me the city or town where your housing unit is located?

- 1 Record city or town: _____
- 9 Refused

FMR_Q37 Could you please tell me your ZIP code?

Record ZIP code: _____

FMR_Q38 For verification purposes only, may I have your first name? [INTERVIEWER NOTE: If the respondent is reluctant to give his/her name, please ask for his/her initials.]

SPECIFY: _____

INTERVIEWER NOTE: If the respondent is reluctant to give his/her initials please indicate if the respondent was mail or female and that he/she refused.

FMR_THANKS Those are all the questions I have for you. Thank you very much for cooperating with the survey.

APPENDIX F: BEDROOM DISTRIBUTIONS

Table F-1: Bedroom Distributions, ACS and Surveys

3-Year 2010 Acs Bedroom Distribution				
BEDROOMS	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
0	1,618	1,477	2,443	1,155
1	16,900	11,173	13,136	12,575
2	38,406	16,913	34,358	17,037
3	29,231	7,640	27,182	10,899
4 or more	6,407	2,687	6,199	2,918
Total	92,562	39,890	83,318	44,584
Survey bedroom distribution				
	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
0	3	2	8	14
1	34	46	115	208
2	76	58	269	266
3	66	23	192	155
4 or more	20	19	26	40
Total	199	148	610	683

Table F-2: Test of Difference in Means for Gross Rent, Surveys vs. ACS

	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
Survey mean	\$736.10	\$671.83	\$953.50	\$655.87
2010 3-yr ACS mean gross rent	\$805.19	\$688.57	\$948.86	\$656.32

	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
2010 ACS mean adjusted to mid-2011	\$834.17	\$713.36	\$983.02	\$679.95
Standard deviation of the survey mean	\$20.60	\$22.96	\$16.26	\$10.04
Estimated standard deviation of ACS survey mean	\$14.28	\$19.36	\$19.86	\$18.05
z- score	3.91	1.38	1.15	1.17

APPENDIX G: FMR ESTIMATES

Table G-1: Computation of FMRs using Techniques 1, 2, and 3

NON PROJECT TWO BEDROOM, RECENT MOVER, NOT NEW RENTAL UNITS	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
40th percentile from survey	\$605.10	\$618.63	\$796.00	\$622.30
Trended FMR	\$616.95	\$630.73	\$811.58	\$634.48
UNASSISTED TWO BEDROOM, RECENT MOVER, NOT NEW RENTAL UNITS	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
40th percentile from survey	\$603.23	\$618.63	\$805.80	\$622.40
Trended FMR	\$615.04	\$630.73	\$821.57	\$634.58
TWO BEDROOM, NOT NEW RENTAL UNITS ABOVE HUD LOW RENT	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
40th percentile from survey	\$622.56	\$643.07	\$776.72	\$630.80
Recent mover adjust per HUD	1.1063	1.0368	1.1024	1.0
Trended FMR	\$699.74	\$679.78	\$873.02	\$643.15

Table G-2: Computation of FMRs using Technique 4

	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
ACS2009 5-Year 2-Bedroom Adjusted Standard Quality Rent	\$668	\$629	\$762	\$600
Recent mover adjustment factor	1.1063	1.0368	1.1024	1
Survey calculated change June 30, 2009-August 4, 2011	0.92762118	0.9773888	1.06865748	0.9971446
Trending factor (at 3 percent annual)to April 1, 2012=	1.01957189	1.0195719	1.01957189	1.0195719
Survey-based 2012 FMR	\$698.94	\$649.88	\$915.27	\$610.00

Table G-3: Calculation of Change June 30, 2009-August 4, 2011 Using Technique 4

FROM 05 09 ACS TABLE 25065	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
Aggregate gross rent	\$59,173,600	\$25,419,100	\$65,919,200	\$27,566,700

Aggregate gross rent in 2011 using survey mean gross rents and using unit counts from 2009 ACS

UNITS WITH CASH RENTS	COLUMBIA	MEAN GROSS RENTS	PEORIA	MEAN GROSS RENTS	CHARLESTON	MEAN GROSS RENTS	FORT WAYNE	MEAN GROSS RENTS
0	1196	\$300.64	1110	\$1,170.33	1439	\$811.25	972	\$598.00
1	15926	\$519.12	11051	\$437.14	13385	\$680.53	13059	\$496.59
2	34306	\$666.65	16028	\$685.41	33168	\$871.55	17758	\$672.14
3 or more	26147	\$894.69	8799	\$878.36	25968	\$1,203.83	10506	\$807.71
Total/sumproduct	77575	\$54,890,685	36988	\$24,844,344	73960	\$70,445,046	42295	\$27,487,986
Ratio to above/mean	0.927621181	\$707.58	0.977388828	\$671.69	1.068657476	\$952.47	0.997144603	\$649.91

Table G-4: Testing Difference between HUD FMR and Technique 4 FMR¹

	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
Survey estimate of mean gross rent August 4, 2011	\$707.58	\$671.69	\$952.47	\$649.91
HUD estimate of mean gross rent August 4, 2011(product of next three rows)	\$778.28	\$712.56	\$909.37	\$675.80
2009 5-yr estimate as of July 1, 2009 (from ACS Tables)	\$762.79	\$687.23	\$891.28	\$651.77
CPI adjusted to Dec 2010	1.002607	1.018887	1.002607	1.018887
3.0% trend to August 4, 2011	1.01764622	1.0176462	1.01764622	1.0176462
Standard deviation of the survey mean	\$20.58	\$22.96	\$16.26	\$10.02
z-score	3.43	1.78	-2.65	2.58

¹ As noted in the text, the crux of Technique 4 is whether HUD's predicts mid-2011 well. Therefore, we take the 2009 ACS mean gross rent and update it to mid 2011 using HUD's methodology and compare this number to the mean gross rent from the surveys.

Table G-5: Percentile Upper and Lower Bounds for Techniques 1, 2, and 3

NON PROJECT TWO BEDROOM, RECENT MOVER, NOT NEW RENTAL UNITS	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
$1.96*(pq/n)^{0.5} = 1.96* [(0.24)/n]^{0.5} = \sim 1.96*0.5/(n^{0.5})$	0.2095328	0.232883	0.0915515	0.104766
0.4-1.96*std dev	0.19	0.17	0.31	0.30
0.4+1.96*std dev	0.61	0.63	0.49	0.50
lower bound	\$506.15	\$494.51	\$757.30	\$559.82
upper bound	\$676.29	\$717.70	\$845.70	\$643.00
trended 95% confidence interval lower bound	\$516	\$504	\$772	\$571
trended 95% confidence interval upper bound	\$690	\$732	\$862	\$656
UNASSISTED TWO BEDROOM, RECENT MOVER, NOT NEW RENTAL UNITS	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
$1.96*(pq/n)^{0.5} = 1.96* [(0.24)/n]^{0.5} = \sim 1.96*0.5/(n^{0.5})$	0.2202850	0.232883	0.0932629	0.106036
0.4-1.96*std dev	0.18	0.17	0.31	0.29
0.4+1.96*std dev	0.62	0.63	0.49	0.51
lower bound	\$504.63	\$494.51	\$762.57	\$544.79
upper bound	\$637.55	\$717.70	\$857.62	\$644.64
trended 95% confidence interval lower bound	\$515	\$504	\$777	\$555
trended 95% confidence interval upper bound	\$650	\$732	\$874	\$657
TWO BEDROOM, NOT NEW RENTAL UNITS ABOVE HUD LOW RENT	COLUMBIA	PEORIA	CHARLESTON	FORT WAYNE
$1.96*(pq/n)^{0.5} = 1.96* [(0.24)/n]^{0.5} = \sim 1.96*0.5/(n^{0.5})$	0.1147659	0.130667	0.0593214	0.0609728
0.4-1.96*std dev	0.29	0.27	0.34	0.34
0.4+1.96*std dev	0.51	0.53	0.46	0.46

lower bound	\$594.61	\$619.86	\$749.08	\$605.65
upper bound	\$648.52	\$661.83	\$803.53	\$660.08
trended 95% confidence interval lower bound with recent mover adjustment	\$671	\$655	\$842	\$618
trended 95% confidence interval upper bound with recent mover adjustment	\$731	\$700	\$903	\$673

APPENDIX H: MODEL PARAMETERS

Dependent Variable

Y = 1 if rental status confirmed
0 otherwise

Independent variables and recodes for modeling:

PRENOTIFICATION LETTER TREATMENT	APRENOTE1	APRENOTE2
1 Prenote, web	1	0
2 Prenote, no web	0	1
3 No Prenote	-1	-1
Follow-up treatment	ANRMAIL1	
1 Mail and phone follow-up	1	
2 Mail or phone follow-up	-1	
Reminder postcard treatment	ANRPOST1	ANRPOST2
1 Postcard, web	1	0
2 Postcard, no web	0	1
3 No postcard	-1	-1
Phone match status	PHONE_MATCH	
1 Match	1	
2 No Match	0	

Parameter Estimates	Estimate	s.e.
Intercept	1.0371	0.0457
aprenote1	0.0275	0.0646
aprenote2	0.2258	0.0647
anrpost1	0.0371	0.0644
anrpost2	-0.0811	0.0644
anrmail1	0.2985	0.0457
phone_match	-1.1148	0.0316
phone_match*anrmail1	-0.1515	0.0315
aprenote1*anrpost1	0.00672	0.0303

aprenote1*anrpost2	0.0453	0.0303
aprenote2*anrpost1	-0.0722	0.0304
aprenote2*anrpost2	-0.0125	0.0303
phone_match*aprenote1	-0.0263	0.0447
phone_match*aprenote2	-0.1406	0.0448
phone_match*anrpost1	0.0264	0.0443
phone_match*anrpost2	0.0768	0.0443