

# Fair Market Rent Survey Design: A Literature Review and Study Design Plan

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## 1. INTRODUCTION

The mission of the Department of Housing and Urban Development (HUD) is “to create strong, sustainable, inclusive communities and quality affordable homes for all.” (HUD, “About HUD”). The Housing Choice Voucher (HCV) program is an extension of this mission and a response to the need for affordable rental housing. The program has changed several times since its inception as Section 8 of the U.S. Housing Act of 1937. Today, “through tenant-based vouchers, HUD provides rental subsidies for standard-quality units that are chosen by the tenant in the private market. The subsidy amount is based on a payment standard set by the Public Housing Authority (PHA) between 90 percent and 110 percent of the fair market rent (FMR).” (HUD, “Housing Choice”). The Code of Federal Regulations (CFR) defines an FMR as “the rent, including the cost of utilities (except telephone), as established by HUD... for units of varying sizes (by number of bedrooms), that must be paid in the market area to rent privately owned, existing, decent, safe, and sanitary rental housing of modest (non-luxury) nature with suitable amenities.” (24 CFR 888.111).

The U.S. Housing Act, as amended by the Housing and Community Development Act of 1974, requires HUD to establish and publish FMRs at least annually. Because rents vary considerably between localities, FMRs are area-specific. As noted by HUD in the Overview of Fair Market Rents:

The U.S. Department of Housing and Urban Development (HUD) annually estimates FMRs for 530 metropolitan areas and 2,045 non-metropolitan county FMR areas... HUD defines FMR areas as metropolitan areas and non-metropolitan counties. With a few exceptions, the most current Office of Management and Budget (OMB) definitions of metropolitan areas are used (HUD, “Fair Market Rents”).

HUD calculates FMRs to support public-subsidized housing programs. The FMRs are used for HUD programs, IRS programs, and local programs to help determine appropriate subsidy levels for families based on their income to ensure their ability to secure housing in the areas they want to live. FMRs include both cost of the rental along with utilities (but excluding internet, cable or satellite television, and telephone service). In the case of the HCV program, HUD allocates monies to local PHAs. PHAs in turn administer the HCV program and provide the rental assistance payment to the landlord on behalf of the voucher holder. These Congressionally appropriated funds originate as taxpayer dollars, and HUD is responsible for maintaining fiscal stewardship over the funds. Therefore, FMRs must be set at a value high enough to grant access to decent, safe, and sanitary housing of a modest nature with suitable amenities, but also low enough to ensure that the greatest number of eligible persons benefit from availability of the vouchers.

The process by which HUD estimates an FMR has been relatively consistent since it was introduced. Historically, HUD has used Decennial Census data (projected forward) to estimate FMRs. Since 2005, HUD has supplemented the Decennial Census data with data from the ACS. Ultimately, because ACS data are collected continuously, the ACS data will supplant Decennial Census data in the estimation.

In addition to Census data, HUD has used custom survey data to estimate FMRs in some areas. The surveys, the subject of the present review, have been RDD surveys to landline numbers of people who have moved in the past 24 months and were presently living in two-bedroom units in buildings at least two years old and not owned by a PHA (HUD, 2007). Overtime, the RDD surveys expanded the definition of an “eligible” survey participant to those meeting the above criteria and who did not live in a vacation or seasonal home and who did not do work for a landlord in exchange for a reduction in rent.

While the process for collecting the data to calculate an FMR has been relatively consistent, the affordable housing market and the American communications landscape have changed significantly.

Furthermore, best practices in survey research have also changed and continue to evolve. A quarter of American adults now rely exclusively on cell phones, and a further 18 percent use their cell phones for “most or all” calls (Blumberg & Luke, 2010). The numbers are higher for the renter population where 46 percent are cell-only. That means that almost half of American adults are now largely unreachable on conventional landlines.

The affordable rental housing market also offers more choices than it did 40 years ago. Tenants can access affordable rental housing by living in a subsidized building or using a voucher to rent a market-based apartment. Developers are provided incentives and loans to build rental housing where all or a portion of the rental units are “affordable.” Some of these projects are managed by local housing authorities; some are privately undertaken. It is more and more difficult to identify housing that is rented for the “market rate”.

To ensure that the FMR Surveys and the FMRs based on them accurately represent the cost of housing to families with vouchers, HUD is undertaking an evaluation of new survey methodologies to address the changes in telecommunications, affordable housing, and survey research best practices. In this report, we offer some background to the affordable rental housing market. It is necessary to understand the specific housing options in order to identify the precise set of rents eligible for the FMR survey. We review the literature relevant to the accurate collection of rental data using surveys and the accurate estimation of FMRs. Finally, we offer an evidence-based study design plan for an experiment to determine the optimal FMR survey design.

## 2. FEDERAL AFFORDABLE HOUSING PROGRAMS

The United States first acknowledged its role in protecting and providing affordable housing in U.S. Housing Act of 1937's Declaration of Policy which stated in part, "It is the policy of the United States to promote the general welfare of the Nation by employing its funds and credit, as provided in this Act, to assist the several states and their political subdivisions to remedy the unsafe and unsanitary housing conditions and the acute shortage of decent, safe, and sanitary dwellings for families of lower income..."<sup>1</sup> A report from the Joint Center for Housing Studies of Harvard University (JCHSHU) reiterates that need for affordable housing has risen and has seen a sharp increase in these first years of the new millennium (JCHSHU, 2001).

HUD's *Worst Case Housing Needs 2009 Report to Congress* found "dramatic increases in worst case housing needs...that cut across demographic groups, household types, and regions." (Steffen, Keith, Martin, Teresa, Vandenbroucke, & Yao, 2011). The report also found that, since 2003, vulnerable renters had faced the "tightest market" for affordable housing than at any time since 1985 (Steffen, et al., 2011). A 1999 HUD report on the rental-housing crisis indicated that at that time, there were approximately one million households on Section 8 waiting lists, with an average waiting time of 28 months (HUD, 1999). A preliminary assessment by the National Low Income Housing Coalition (NLIHC) notes the following regarding available, affordable rental units:

A preliminary analysis of the 2008 American Community Survey (ACS), with comparison to the 2007 ACS, shows that the shortage of housing affordable for extremely low-income households has increased. For every 100 extremely low income (ELI) renter households, in 2008 there were just 37 rental units that were both affordable and available to them. There were 39 such units in 2007 (Pelletier, 2001).

Clearly, no one disputes the need for affordable housing. Rather, the question is how to best address this shortage. Some of the many proposed (and existing) means include:

- Publicly funded public housing; government subsidies for new private housing (e.g., Low Income Housing Tax Credits (LIHTC); local tax incentives);
- Government funding of existing private housing (e.g., HCV);
- Subsidies for goods and services beyond housing (e.g., mental health services, food assistance, etc.); and
- Private funding of alternate solutions.

Since the 1930s, the Federal government has directly funded the development of new, affordable housing, originally as public housing owned and operated by public or quasi-public entities. When HUD first started using FMRs in the 1990s, housing assistance primarily came in one of two forms: (1) subsidized apartments in buildings owned and operated by local public housing authorities (project-based assistance), or (2) Section 8 vouchers that allowed individuals to rent elsewhere (tenant-based assistance). Today, a multitude of Federal programs exists to subsidize the development and construction of new,

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<sup>1</sup>United States Housing Act of 1937, Pub. L. 93-383, 88 Stat. 653 (codified as amended at 42 U.S.C. 1437 et. seq.)(hereinafter the 1937 Act) as it was amended by the Quality Housing and Work Responsibility Act of 1998, Pub. L. 105-276, 112 Stat. 2518(enacted October 21, 1998). This document also reflects amendments made to the 1937 Act by the Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1999, Pub. L. 105-276, 112 Stat. 2461 (enacted October 21, 1998)(hereinafter Appropriations Act, 1999) and the Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1999, Pub. L. 105-277 (enacted October 21, 1998)(hereinafter Omnibus Act, 1999). <http://www.hud.gov/offices/ogc/usha1937.pdf> (accessed May 2, 2011).

affordable housing—primarily by partnering with private developers. As one might expect, many of these programs are administered by HUD, though the Internal Revenue Service (IRS) and U.S. Department of Agriculture (USDA) also have roles in funding affordable rental housing (Table 1). The increase in number and variety of programs designed to provide affordable housing make it more difficult to accurately identify if rental units are market rate units or not.

*Table 1: Federal Programs Supporting New Affordable Housing*

<b>Administering Agency</b>	<b>Program</b>	<b>Description</b>	<b>Relies in Part on FMR?</b>
<b>HUD</b>	Public Housing	Funds to develop public housing units	Yes
	HOME	Formula grant, many eligible uses	Yes
	HTF	Formula grant, primarily for rental housing	
	SHP	Competitive grant to house homeless individuals and families	Yes
<b>IRS</b>	LIHTC	Tax credits for new affordable rental housing	Yes
<b>USDA</b>	Rural Rental Housing	Loans for low-income rental housing in rural areas	No
	Section 538 Guaranteed Loans	90% loan guarantee for low-income rental housing loans	No
	Farm Labor Housing	Loans and grants to develop housing for domestic farm laborers	No

According to the National Council of State Housing Finance Agencies, an estimated two million Federally subsidized apartments for low-income tenants were built between 1986 and 2006 (NCSHFA, 2008). In fact, “by 2008, there were nearly 33 percent more homes built under new government low-income housing programs (after 1986) than there were subsidized apartments built by all the HUD-sponsored programs dating back to the 1960s” (Erickson, 2009).

The proliferation of housing subsidy programs has made it increasingly difficult to identify and collect rent information from eligible housing units. In the past, when there were fewer programs and more straightforward financing of housing assistance, it was easier for survey researchers (and for respondents themselves) to reliably determine whether respondents' housing units were subsidized in whole or part. With the advent of programs that provide subsidies during the loan and building phase as well as in varying modes during occupancy, it is more difficult to determine whether the rental cost of the unit reflects a market rent or not.

## 2.1. HUD PROGRAMS

HUD administers a number of programs to support the development of new, affordable rental housing. HUD has four mission-oriented divisions: Housing, Community Planning and Development (CPD), Public and Indian Housing (PIH), and Fair Housing and Equal Opportunity (FHEO). Of these, only FHEO does not provide funds to support new, affordable housing. There are many more programs that may be used to support new housing units as well. For example, Community Development Block Grant

(CDBG) funds may be awarded by a grantee to a Community Based Development Organization (CBDO) to construct new housing units as a part of neighborhood revitalization, community economic development, or energy conservation, but Federal regulations prohibit the use of CDBG funds to construct housing in almost any other circumstance. Neighborhood Stabilization Program (NSP) funds may be used to construct new housing as part of an effort to redevelop demolished or vacant properties, but the primary purpose of NSP is to remove or return foreclosed and abandoned properties to the housing market. To effectively establish the FMR for a region, it is necessary to identify whether and through what program survey respondents' rents are subsidized. The following subsections discuss those programs for which the primary purpose is to support new, affordable housing.

### 2.1.1. Housing Choice Voucher Program

HUD describes the Housing Choice Voucher Program (HCV) as “the Federal government’s major program for assisting very low-income families, the elderly, and the disabled to afford decent, safe, and sanitary housing in the private market” (HUD, “Housing Choice Vouchers”). It is the largest of the various programs authorized by Section 8 of the United States Housing Act of 1937 for the payment of rental housing assistance to private landlords; it pays a large portion of the rents and utilities for about 2.1 million households annually. With the HCV program, people are free to choose any housing that meets program requirements. People do not have to live in subsidized housing projects; they can choose apartments, mobile homes, townhouses, and even single-family homes. HUD’s PIH allocates vouchers to local public housing authorities to administer.

According to HUD’s Website, local PHAs determine who is eligible for a housing voucher based on a family’s total annual gross income and number of family members. A family's income may not exceed 50 percent of the median income for the county or metropolitan area in which the family chooses to live. “By law, a PHA must provide 75 percent of its voucher to applicants whose incomes do not exceed 30 percent of the area median income” (HUD, “Housing Choice Vouchers”). The program is limited to U.S. citizens and specified categories of non-citizens who have eligible immigration status.

Once a family has received a voucher, it is their responsibility to identify and chose a place to live where the owner will agree to rent under the HCV program. If a landlord agrees to rent as part of the HCV program, the local PHA will determine if the rental unit meets HUD’s minimum standards for health and safety. If the unit meets these standards, then the PHA will pay the housing subsidy directly to the landlord for the voucher holder. The participating family then pays the difference between the actual rent charged by the landlord and the amount subsidized by the program.

### 2.1.2. Public Housing

In addition to administering the HCV program, which provides subsidies to low-income renters to allow them to rent existing housing units on the private market at affordable rates, PIH also provides funds to PHAs to develop new public housing units. PHAs may use HUD funds to develop public housing units in any generally accepted way, including (but not limited to) the following:

- *Conventional:* The PHA owns and designs the project and bids out development to a contractor.
- *Turnkey:* A developer prepares and develops the project, and the PHA purchases the completed project from the developer.
- *Acquisition:* The PHA purchases an existing property (with or without rehabilitation).
- *Mixed-finance entities:* Organizations other than the PHA may own part of the project.
- *Force account:* The PHA prepares and develops the project itself.



HUD imposes a limit on the number of public housing units that a PHA may develop. Each PHA may not develop units beyond the number of units that it had on August 21, 1996, or the number of units for which it was receiving operating subsidy on that date, whichever is less.

Residents of public housing—whose income must not exceed 80 percent of area median income (AMI)—pay rent based upon their income. Rent may be set to any of the following standards:

- Thirty percent of a resident’s monthly adjusted income;
- Ten percent of a resident’s monthly gross income;
- Welfare rent (not applicable in all states); or
- A fixed rent of \$25–50 set by the PHA.

### 2.1.3. HOME

The HOME program has created approximately one million new, affordable rental and homeownership units since 1992 (Federal Register, 2010). HUD’s Office of Community Planning and Development (CPD) administers the HOME program, a formula grant designed specifically to increase the supply of affordable housing. HUD awards HOME funds annually by formula to participating jurisdictions—cities, counties, states, and consortia of local governments. Participating jurisdictions may use HOME funds to carry out a number of eligible activities within four main categories:

- Rental housing (including acquisition, construction, and rehabilitation);
- Rehabilitation of owner-occupied housing;
- Homeownership assistance (including secondary mortgages, down-payment assistance, and assistance for new construction); or
- Tenant-based rental assistance.

Participating jurisdictions have broad discretion to fund new, affordable rental housing in a variety of ways (e.g., soft costs, hard costs, relocation costs, etc.). Restrictions are minimal, but a participating jurisdiction may not use HOME funds to assist public housing units. Projects receiving HOME funds must receive, on average, no less than \$1,000 per unit.<sup>2</sup> Additionally, within two years of receiving its annual HOME entitlement grant, a participating jurisdiction must commit the entire grant amount by entering into written agreements with developers, owners, subcontractors, or sub-recipients. Fifteen percent of the grant amount must be committed to Community Housing Development Organizations (CHDOs), which are private, non-profit organizations meeting special requirements within the HOME governing regulations (24 CFR 92.2).

For each HOME entitlement grant it receives, a participating jurisdiction must make sure that 90 percent of the rental units it funds are occupied by households at no more than 60 percent of AMI. Additionally, if a rental housing project receives HOME funds and has at least five units, then at least 20 percent of the units must be occupied by households at no more than 50 percent of AMI. The latter requirement applies to each project for a minimum of 20 years. HOME program regulations require that all tenants recertify their income annually. HUD allows maximum HOME rents at the lesser of the following:

- Rent less than or equal to 30 percent of the adjusted income of a family at 65 percent of AMI; or
- Area FMR.

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<sup>2</sup> HUD also sets limits to the amount of HOME funds that a project may receive. These limits, known as Section 221(d)(3) program limits, vary by metropolitan area and fiscal year.

The rents are part of the universe of rents eligible for the FMR Survey. Furthermore, HUD's regulations for the HOME program require that "Owners [of HOME-funded rental housing] may not refuse to lease HOME-assisted units to a certificate or voucher holder under the Section 8 Program, or to a holder of a comparable document evidencing participation in a HOME tenant-based rental assistance (TBRA) program, because of the status of the prospective tenant as a holder of such certificate, voucher or comparable HOME TBRA document" (HUD, 2006).<sup>3</sup>

#### 2.1.4. Housing Trust Fund

Recently, HUD proposed a new subpart to the regulations governing the HOME program to codify the Housing Trust Fund (HTF), which was created by the Housing and Economic Recovery Act of 2008. The purpose of HTF is to increase and preserve the supply of rental housing for households earning up to 50 percent of AMI and also to increase homeownership for such households. HUD will award HTF grant funds to states on a formula basis. HTF, as proposed, will function similarly to HOME, and many of the same requirements will apply. For example, states must commit HTF funds within two years of receipt.

Though states may use HTF funds for both rental and owner-occupied housing, the program clearly prioritizes rental housing. States must use no less than 80 percent of their HTF funds to develop, rehabilitate, or preserve affordable rental housing, and no more than 10 percent for homeownership. Unlike HOME, HTF allows states to set per-unit subsidy limits, requires a 30-year period of affordability (though states are free to increase the affordability period), and mandates that assisted units meet energy and water efficiency standards.

#### 2.1.5. Supportive Housing Program

HUD offers a number of programs to support housing and services for homeless individuals and families. Established in 1987 under Title IV, Subtitle C, of the McKinney-Vento Homelessness Assistance Act of 1987 (HUD, "Supportive Housing Program"), the Supportive Housing Program (SHP) is a competitive grant that allows recipients to construct new housing units, among other eligible activities. Funds for new construction are limited to \$400,000. Recipients may use SHP funds to construct permanent housing (i.e., long-term housing for persons with disabilities) or transitional housing (i.e., housing that facilitates the movement of homeless individuals and families to permanent housing). SHP funds may not be used for emergency shelters. Residents of SHP-funded units must be homeless (HUD, 2008). SHP recipients may charge rent, though doing so is not required. If a recipient chooses to charge rent, then rent must be no more than 30 percent of the tenant's monthly-adjusted income or 10 percent of monthly gross income. Tenants of SHP-funded housing who pay rent must have their income reviewed at least annually by the SHP recipient.

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<sup>3</sup> See also 24 CFR 92.252(d). Note also that "In accordance with the Section 8 program rule at 24 CFR 982.352(c)(6), Section 8 rental assistance voucher and certificate holders cannot also receive TBRA under the HOME Program because the two programs would provide duplicative subsidies. HOME TBRA recipients who are offered a Section 8 voucher or certificate must relinquish HOME assistance, if they wish to accept the Section 8 assistance. Similarly, a family currently receiving Section 8 rental assistance may not accept HOME TBRA without relinquishing the Section 8 assistance. However, a Section 8 rental assistance recipient may receive HOME-funded security deposit and utility deposit assistance. Similarly, a family cannot receive HOME TBRA if they are receiving rental assistance under another Federal program (e.g., Section 521 of the Housing Act of 1949 provided through the Rural Housing Service) or a State or local rental assistance program, if the HOME subsidy would result in duplicative subsidies to the family" (HUD, 1996).

Recipients may also use SHP funds to lease buildings or units to provide supportive housing to homeless individuals and families. A recipient may lease a unit directly from a landlord and then place an eligible, homeless tenant in the unit. The recipient may charge an affordable rent to the homeless tenant. HUD requires that the recipient pay no more than FMR to the landlord.

## 2.2. LOW INCOME HOUSING TAX CREDITS

One of the most significant subsidies for affordable housing is the LIHTC program. HUD does not administer the LIHTC program. Rather, it is a tax credit authorized as part of the Federal income tax code (26 U.S.C. §42). The IRS allocates these tax credits to states. States then award tax credits to housing developers on a competitive, project-specific basis. Developers, in turn, sell the tax credits to raise funds for affordable housing projects.

The Joint Center for Housing Studies points out that:

Market-rate rentals accounted for little more than half of the 300,000 new multifamily units completed each year from 1995 through 2009. Of the remainder, 23 percent were assisted rentals produced through the Low Income Housing Tax Credit Program, and the other 24 percent were intended for sale as condominiums (JCHSHU, 2001).

To be eligible to receive LIHTC assistance, projects must be residential and developers must commit to an affordable rent ceiling as set by HUD. Rent ceilings reflect rents that are affordable (i.e., no more than 30 percent of a household's income) to households earning 60 percent of AMI. Developers commit to an affordability period of at least 30 years (more in some states), during which time rent ceilings apply to at least 20 percent of units. If a developer sets aside 20 percent of units as affordable, then they must be occupied by households at no more than 50 percent of AMI. If a developer sets aside 40 percent of units as affordable, then they must be occupied by households at no more than 60 percent of AMI. Of course, projects that are 100-percent affordable are also eligible. Tenants of LIHTC-funded housing must report and recertify their income annually.

The LIHTC program uses FMRs to identify Difficult Development Areas (DDA). By definition, DDAs have high construction, land, and utility costs relative to AMI. DDAs are limited in size and may contain no more than 20 percent of the Metropolitan Statistical Area (MSA) or non-metropolitan counties. DDAs are eligible for a greater share of LIHTCs than other areas (130 percent of qualified basis).

## 2.3. UNITED STATES DEPARTMENT OF AGRICULTURE

HUD is not the only department in the United States government that provides incentives for building or providing affordable housing or subsidies for individuals to access housing. The USDA also offers programs specifically aimed at supporting rural residents. These programs do not rely on the local FMR. USDA offers four main sources of funds in support of affordable rental housing:

- Section 515 Rural Rental Housing loans,
- Section 538 Guaranteed Loan program,
- The Farm Labor Housing program, and
- The USDA Rental Assistance Program.

Section 515 Rural Rental Housing loans are direct loans awarded to owners of affordable rental housing on a competitive basis. Loans are issued at terms of up to 50 years with a one percent interest rate. For-profit and non-profit developers are eligible to apply. To be eligible for Section 515 Rural Rental Housing loans, new housing must be in a rural area and 95 percent of units must be occupied by very-low-income

households (Housing Assistance Council, 2010). Generally, recipients of Section 515 Rural Rental Housing loans also utilize USDA Section Rental Assistance (Cowan, 2008).

The Section 538 Guaranteed Loan program allows USDA to guarantee market rate loans for new or existing housing in rural areas. To be eligible, average gross rent for all units must not exceed 30 percent of AMI, adjusted for family size. USDA guarantees up to 90 percent of a qualifying loan, with a repayment term between 25 and 40 years (Housing Assistance Council, 2008).

Tenants can use HCV to rent units built with Section 515 or 538 loan funds provided that the property owner agrees to accept them.

The Farm Labor Housing program provides loans and grants to develop housing for domestic farm laborers. Grant funds and loans are available to farm worker associations, non-profit organizations, Indian tribes, and public agencies. USDA issues Farm Labor Housing loans at 33-year terms with one percent interest. Grants may be used to fund up to 90 percent of development costs. Individual farmers, associations of farmers, and family farm corporations may apply for loans but are not eligible for grants. Tenants of Farm Labor Housing-funded units must be U.S. citizens or permanent residents and must earn more than 50 percent of their income from farm work.

The USDA rental housing assistance program is similar to HUD's Section 8 new construction project-based vouchers (Section 521), providing an additional subsidy for tenants in Section 515- or 514/516-financed rental housing with incomes too low to pay the U.S. Department of Agriculture's Rural Development Housing and Community Facilities Programs office (RD) subsidized rent from their own resources. RD pays the owner the difference between the tenant's contribution (30 percent of adjusted income) and the monthly rental rate, which is calculated based on the owner's project costs" (Housing Assistance Council, 2008).

USDA rental assistance housing rents would not be part of the universe of eligible rents for the FMR surveys, yet rural rent housing loan-funded housing would be.

### 3. THE EXISTING FMR SURVEY

Again, the FMR is “the rent, including the cost of utilities (except telephone), as established by HUD... for units of varying sizes (by number of bedrooms), that must be paid in the market area to rent privately owned, existing, decent, safe, and sanitary rental housing of modest (non-luxury) nature with suitable amenities.”( 24 CFR 888.111). In order to collect the data to calculate FMRs based on the RDD landline survey, HUD has used a questionnaire with three subsections that:

- Determine the eligibility of the household reached;
- Collect rent information; and
- Determine which utilities the respondent pays for if any.

For the FMR questionnaire, HUD has historically defined eligible survey participants as:

- Renters;
- Living within the targeted geography;
- Not living in public housing;
- Residing in a residential home such as an apartment, house, or mobile home ( not a barracks, dormitory, half-way home, hospital, prison, group home, etc.);
- Living in a home with two bedrooms;
- Having moved into the home within the last two years;
- Living in a building that had been built more than two years ago;
- Living in a permanent residence and not a seasonal or vacation property;
- Individuals who did not perform work for a landlord for a reduction in rent; and
- Individuals who could report the rent on their home including any and all subsidies.

The FMR questionnaire did not require participants to report the monthly costs of their utilities. Participants indicated only which utilities that they paid for, and then also reported the primary fuel type used to provide that utility.

Once the FMR survey data was collected, rent information was used in conjunction with utility cost schedules provided by HUD’s regional offices. The utility cost schedules provided information for the local area’s monthly average cost for all utilities for different fuel types. Rent and the appropriate utility cost information were added together to calculate a gross rents for the area. A distribution of these gross rents would then be calculated, and the FMR would be set at the 40<sup>th</sup> or 50<sup>th</sup> percentile. From this two-bedroom rent standard, HUD would then adjust the FMR for different sized units using based on CPI data.

#### 3.1. THE FMR PERCENTILE THRESHOLD

Originally, HUD set FMRs at the 45th percentile (i.e., the dollar value below which 45 percent of standard quality units were rented). In 1995, though, HUD changed the definition of FMRs to reflect rents at the 40th percentile. This was done primarily as a cost saving measure (Federal Register, 1995). In response, individuals voiced many concerns. One of the major concerns raised was that the change would limit the number of standard quality units available to Section 8 voucher holders and result in areas of concentrated poverty.

HUD responded with two points. First, HUD noted that it considers only recent movers for the purpose of calculating FMRs. Because tenants who remain in a unit for an extended time often pay less rent than a recent mover would pay for a comparable unit, considering only recent movers to some extent inflates

FMRs. Consequently, HUD argued, voucher holders would have access to more than 40 percent of the actual number of standard quality rental units on the market.

HUD's second point was that rent-eligible units were not, in fact, concentrated in high-poverty areas and that the change in percentile would not affect concentration. According to HUD's analysis, in approximately 85 percent of neighborhoods with 10 or more two-bedroom rental units, 30 percent or more of those units were rented below FMR. HUD concluded that reducing the FMR percentile to 40 percent would not affect the adequacy and choice of housing available to voucher holders.

HUD changed the definition of FMRs again in 2000. Though HUD kept FMRs at the 40th percentile in most areas, HUD allowed some PHAs to choose between the 40th and 50th percentiles. In other areas, HUD set FMRs at the 50th percentile.

HUD had two reasons for increasing the FMR to the 50th percentile in some areas. First, despite its earlier analysis that suggested that the 40th percentile was sufficient to maintain the adequacy and choice of housing available to voucher holders, HUD found that voucher holders in some areas were not able to find standard quality rental units at the 40th percentile. PHAs have flexibility to set payment standard amounts at 90–110 percent of the applicable FMR. In 2000, HUD allowed PHAs that set payment standards at 110 percent of FMR at the 40th percentile to change the FMR to the 50th percentile if less than 75 percent of families receiving vouchers within a six-month period were able to find housing. PHAs choosing apply the 50th percentile retain the ability to set payment standard amounts at 90–110 percent of FMR.

HUD also found that market conditions in some areas confined voucher holders to areas of concentrated poverty (Federal Register, 2000). In order to promote choice of neighborhood, HUD increased FMRs to the 50th percentile in areas meeting the following criteria:

- Evidence shows that low-income families live in concentrated areas.
- The FMR area has no less than 100 census tracts.
- In no more than 70 percent of census tracts with 10 or more two-bedroom rental units, 30 percent or more of those units have gross rents at or below the 40th-percentile FMR.
- At least 25 percent of voucher holders in the area live in the five percent of census tracts with the largest number of voucher holders.

If HUD determines that an area qualifies for 50th-percentile FMR, that area retains 50th-percentile FMR for a period of three years. At the end of the three-year period, HUD reevaluates for continued use of 50th-percentile FMR. HUD publishes a list of 50th-percentile FMR areas each year on the Federal Register.

### 3.2. BEDROOM SIZE

Because data on less-common unit sizes may be insufficient or unavailable, HUD generally calculates FMRs for two-bedroom units—nationally the most common rental unit type, comprising approximately 40 percent of the renter-occupied units in the United States. HUD then sets FMRs for other unit sizes based on the two-bedroom FMR. One-bedroom units represented approximately 27 percent of the responses, and three-bedroom units represented approximately 23 percent of the responses. Collectively, one-, two-, and three-bedroom units account for around 90 percent of renter occupied units according to the AHS.

As HUD's Office of Policy Development and Research points out regarding the two-bedroom unit size, "being the most common unit, they are the easiest units for which to obtain data. HUD estimates FMRs for efficiencies, one-bedroom units, three-bedroom units, and units of other sizes using the two-bedroom

estimate as a base.” However, this may be a changing phenomenon. The 2009 AHS revealed that 341 of the 941 new construction (four years old or less), renter occupied units were built with three bedrooms as opposed to 314 of the same type built with two bedrooms(US Census Bureau, 2009). In 2007, 379 of the 1,036 total same type of units were built with three bedrooms as compared to 322 two-bedroom units (US Census Bureau, 2007). In their July 10, 2010 press release regarding the 2009 AHS survey, HUD noted that “Most homes have three or more bedrooms (64 percent compared to just 48 percent in 1973). New homes generally have more bedrooms – 80 percent of them have three or more bedrooms”(HUD, 2010). A more detailed analysis is needed to determine whether this change represents a shift in the market and is expected to continue or is merely an anomaly, the effect on rental stock, and implications, if any, for the FMR calculation.

#### 4. REVISING THE FMR SURVEY DESIGN

The goal of the present research effort is to re-examine the FMR Survey in light of changes in the housing assistance market and the communications landscape. Broadly, HUD desires to create the questionnaire, sampling frame, and survey protocol that lead to the best data quality. Survey data quality is a complex concept, encompassing elements of the sample, the administration protocol, the cognitive tasks required of respondents, and respondents' reactions to the survey itself. Survey conclusions have high quality to the extent that "error" has been minimized at every survey stage. There are many sources of survey error, and a useful way of organizing them was introduced by Weisberg (2005):

- Respondent selection errors
- Coverage error
- Sampling error
- Unit non-response error
- Response accuracy errors
- Item non-response error
- Measurement error due to respondents
- Measurement error due to interviewers
- Survey analysis and interpretation errors<sup>4</sup>
- Post-survey errors
- Mode effects
- Compatibility effects

*Precision* reflects the degree to which the estimate might change due to natural variation if the study were done again. Sometimes, this is represented as a margin of error (e.g., "plus or minus three percentage points"). *Accuracy* reflects the degree to which the estimate is systematically different from the true value because something is leading to a bias in results (e.g., over-representation of women in the sample). These types of survey error may have an impact on precision, accuracy, or both.

##### 4.1. RESPONDENT SELECTION ERRORS

The population for an FMR Survey is the set of all rents of standard-quality units that Housing Choice Voucher recipients could rent. Note that this population is a population of *rental units* not a population of *people*. The final estimate should generalize to units that are currently rented as well as those that are currently unoccupied—all those units that voucher recipients could rent. To accurately represent this population, every market rent should have a known, non-zero chance of being represented in the survey, and HUD should be able to identify and remove responses from any person whose rent is not in the market (e.g., a person who lives in public housing). This section discusses the ways in which design choices affect the completeness of the sample coverage and the accuracy with which we identify people whose rents are in the target market.

###### 4.1.1. Coverage Error

*Coverage error* is error associated with incomplete coverage of the population. The goal is to achieve a probability sample in which every rental unit in the population has some known, non-zero chance of being included in the sample. Very often in practice, a perfect probability sample cannot be achieved.

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<sup>4</sup> Weisberg refers to this category as "administration issues", but its contents concern how data are treated, combined, and interpreted after collection.



There are two kinds of coverage errors that can happen: some units can have zero chance of being included and some units can have some chance but the actual probability is unknown.

In the current FMR methodology, the sources of under-coverage (some units in the population have zero chance of being included are):

- Unoccupied units.
- Units occupied by people with no telephones at all.
- Units occupied by people accessible exclusively or primarily by cell phone.
- Units that screen out of the survey based on questions that ask about housing subsidies.

The first three of these have to do with the source of sample—RDD telephone numbers. The last has to do with the structure and content of the questionnaire. We discuss coverage error associated with the sample frame first.

### Scope of Current Sample Frame Coverage Error

Coverage error introduces bias when the units we cannot reach differ from those we can reach. If unoccupied units have exactly the same rent as occupied units, then their absence from the survey sample does not bias the estimates. If their rent is much higher or lower, then the coverage error introduces bias in the estimates.

#### *Unoccupied Units*

Currently, the FMR Surveys only call people’s homes, so units that are available for rent but not occupied by someone with a telephone are not included in rent estimates. Especially in rent-controlled areas, rents on units that are currently rented may rise at a lower rate than rents on unoccupied units. That is, a family who rented a unit 24 months ago may have seen an increase of four percent per year on their initial rent, but a new family renting a unit in the building might find that the market rate had risen by 15 percent in 24 months.

This is a noteworthy limitation for FMR Surveys, but impractical to overcome. FMR Surveys must focus on collecting rent data for occupied units and develop appropriate estimation models to accommodate the unoccupied units.

#### *Units Occupied by People Without Telephones*

According to data from the Centers for Disease Control and Prevention (CDC), in 2009, an estimated 2.1 percent of families did not have a phone. Families without a phone were more likely to rent their homes, but the total proportion of all renters who did not have a phone was low at 3.9 percent (Table 2) (CDC, 2009).

*Table 2: Phone Status by Home Ownership Status for American Families 2009*

	<b>Total</b>	<b>Owns Home</b>	<b>Rents Home</b>
<b>No Phone</b>	2.1%	1.0%	3.9%
<b>Cell-only</b>	25.7%	14.4%	45.8%
<b>Landline Only</b>	15.2%	14.6%	15.8%
<b>Landline and Cell (Dual-User)</b>	57.1%	70.0%	34.5%

Most researchers seem to agree that coverage error attributable to people without any phones is not a major concern for most general population surveys. Although these people are especially likely to be

renters, they represent a very small proportion of all renters, so their absence from FMR samples may not be a major problem.

### *Units Occupied by People Accessible Exclusively or Primarily by Cell Phone*

As we noted above, a quarter of the adult population has only a cell phone, and more have a landline but primarily use cell phones for voice communication (Blumberg & Luke, 2010). In 2009, almost half (46 percent, Table 2) of people who rented their homes had only cell phones. That means that FMR Surveys are missing at least that much of the renting population nationally.

Most researchers agree that under-coverage of cell phone users could pose a substantial threat to survey estimates of all kinds. Where FMR Surveys are concerned, it is important to note that coverage bias can impact the means and proportions that are generally studied, but it can also impact variances and covariances (Peytchev, Carley-Baxter, & Black, 2011). Since the distribution of rents measured in FMR Surveys is as important as the mean or median (the critical measure is the 40th percentile), this is a particular concern for HUD.

### Sample-Frame Construction Approaches

Researchers have proposed several approaches to addressing the coverage error associated with wireless substitution:

- **Continue to conduct RDD surveys using landlines only.** (Blumberg & Luke, 2009) argue that landline-only RDD surveys are still an acceptable alternative to dual-frame surveys (containing both landline and cell phones) since bias is relatively low from their perspective.
- **Use white pages lists and a cell phone RDD frame.** This recently proposed alternative (Guterbock, Diop, Ellis, Holmes, & Le, 2011) makes use of the efficiency realized by switching from landline RDD to listed phone numbers to offset the increased cost of conducting cell phone interviews.
- **Conduct RDD surveys using both cell phone and landline numbers.** This increasingly popular approach has two subvariants: dual-frame RDD surveys where the cell phone component includes only users who rely exclusively on their cell phones and dual-frame RDD surveys where both frames contain dual-users.
- **Employ an Address-Based Sample.** Address-based sampling (ABS) is increasing in popularity because everyone, or nearly everyone, in the population has one address that is their primary residence.

The first of these options may have been feasible in 2009, but in 2011 there is a growing body of evidence that weighting adjustments alone cannot account for all the differences between landline and cell phone users (e.g., Blumberg & Luke, 2009; Peytchev, et al., 2011). Over time, this bias may decrease as wireless-only users become more like the general population. However, the rapid rate of wireless substitution suggests that landline users will ultimately be the minority and will differ in important ways from the general population. Continuing to conduct RDD surveys using landline phone numbers only is a short-term solution; another alternative is needed for the FMR Surveys in the long-term.

The approach assumes that cell phones are the base sample frame, and landlines are needed to “patch” a hole in the frame that will disappear over time. However, the frame coverage is still not complete. The authors found slight bias in their estimates, but note that the bias will decrease over time as more homes are covered by cell phones. There are two reasons that a full RDD dual-frame is preferable. First, it is not clear what proportion of recent renters would have listed their landline phone numbers. Second, FMR Surveys require substantial geographic precision, so the primary driver of cost is not the landline interviews but the effort and screening involved in completing the cell phone interviews. We have not

proposed to test this sampling approach in the 2011 experiment, but we do see it as a marked improvement over the landline-only RDD. Thus, it is one alternative to consider if, in future, HUD finds implementing the more rigorous sampling approaches cost-prohibitive.

Either a combined RDD frame or an ABS frame could provide complete or close-to-complete coverage.

### 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;
- 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.

### *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”<sup>5</sup> but not also at a street address (Data from (National Cancer Institute, 2007).

PO Boxes are 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.

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 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.

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<sup>5</sup> This estimate from a mail survey that used a DSF frame but included all PO Box and rural route addresses.

## Coverage Error in FMR Surveys

Modifying the sampling frame will go a long way toward addressing the coverage error currently associated with the FMR Surveys. However, there are some possible threats to coverage that can be addressed by special analyses of the 2011 test data:

- Coverage
  - **Unoccupied units.** If the challenge here is faster-rising rents for unoccupied than for occupied rents, then respondents who moved in one year prior should have higher rents than respondents who moved in two years prior. By comparing rents reported by renters with different tenures, we can estimate the rate of change of rents in unoccupied units and determine whether an adjustment to the FMR is needed.
  - **Households without a telephone.** The number of these units is small. Only if these rents are very different from the rents of other respondents, and these differences cannot be addressed through adjustment, is this coverage error a serious problem. The FMR Survey experiment can address this by collecting phone usage information from ABS sample respondents and comparing those without a phone to those with a phone.
  - **Cell-only households.** Both dual-frame and ABS designs cover the cell-only population, but the mode of data collection differs between the two designs. It is highly unlikely that we will have a phone number and an address for a cell-only household. Therefore, a mail/Web administration will be required for ABS, while a telephone/Web administration will be required for dual-frame.
  - **No address.** The DSF, the source of ABS sample, is maintained by the USPS and contains physical addresses as well as PO Boxes and central distribution boxes. We discuss the DSF and its strengths and weaknesses as a sample source further below in “Address-based Sampling Frame”. Here, it is useful to note that we can ask about how each household contacted in the RDD survey receives mail to evaluate the scope of coverage error associated with ABS sampling in this population.
- Efficiency
  - **Targeting small geographic areas.** FMR Surveys are conducted in a defined geographic area. Sometimes these areas are large, such as a metropolitan area, but may be as small as a tract or a group of tracts. The ability to target small geographic surveys with cell phone samples is limited. We will evaluate the geographic incidence of reaching a cell phone respondent in a small geographic unit, such as a group of tracts.
  - **Reaching renter-occupied units.** Over 50 percent of renters are cell-only. Albeit expensive, cell phone samples are an effective way to reach renters. ABS samples are more cost-effective in general, but the ability to reach renters may require more mail-based screening, and thus increased printing and postage costs. The survey experiment will determine cost efficiency in reaching renters.
  - **Field period.** ABS samples will generally require a longer field period than a dual-frame survey. The longer field period for ABS allows for multiple contacts via mail—a longer process than multiple contacts via telephone. The anticipated production rate for renters will be known within days of starting the telephone survey and the sample size is easily adjusted to meet the target number of respondents. It will take several weeks to realize the production rate for a mail survey and the number of completed interviews will be more variable.

## *Screening Households out of the FMR Survey*

As we mentioned above, housing assistance programs have proliferated since the inception of the FMR survey. It is now more difficult than ever for HUD and for respondents themselves to determine whether the rents they pay are “market rents”. To determine which rents are eligible, it is useful to recall that the FMR survey should produce an estimate of how much a new family receiving a voucher would have to pay to obtain housing. From this perspective, the programs themselves fall into three basic categories:

- Rents on units that are ineligible for the market rate survey. This group includes public housing because HCV recipients do not obtain housing in buildings owned by the PHA or by the USDA
- Rents on units that are eligible for the market rate survey. This group includes housing that was funded with special loans or other money from HUD or USDA. Families receiving HCV could rent these units.
- Rents on units that are eligible for the market rate survey whose residents do not pay the market rate. This, the most problematic group, includes units whose current residents already receive HCV or another subsidy. These units themselves probably *have* market rates that are paid by a combination of HUD and the resident. A new family with HCV could rent the unit for the total rent being paid. The problem is that the resident does not personally actually pay the market rate.

The survey currently includes several questions designed to identify residents of public housing. The internal consistency of these questions can be evaluated to determine whether a subset of these questions could be as effective as the full set. Rents reported by respondents who are identified as living in housing owned by the government should not be included in the FMR calculation.

The survey also asks whether the respondent receives a subsidy and how much the rent would be if the subsidy were not in place. *If* these questions are effective in eliciting the true total rent, then this is the best solution to covering rents paid by people who receive rental assistance. However, there is good reason to believe that many respondents will have difficulty answering the question about what their rent would be if they paid the whole thing.

This question calls for the respondent to construct a “counterfactual”, an imaginary alternative to reality. This is a special kind of cognitive process, and a counterfactual constructed in the service of answering a survey question requires special cognitive effort. There is evidence that this question would be easier to answer for people whose “true” rent is closer to the amount they actually pay than for people whose rent is more heavily subsidized (see Roese, Sanna, & Galinski, 2005 for a review), and the values that people give may be influenced by their actual rent paid through priming or context effects. In short, there is a significant possibility that asking respondents to report the market rent for a unit for which their own rent is subsidized produces biased results.

HUD can explore this issue in the experiment survey data by examining:

- Item non-response rates for the counterfactual question
- Variance of responses to the counterfactual compared to variance of responses made by individuals whose rent is unsubsidized
- Correlation of self-paid rent with reported subsidy amount

If there is evidence that the question is introducing bias, then the alternative is to exclude the responses of people whose rent is subsidized from the FMR calculation. This exclusion will likely bias estimated FMR upward since rents of subsidized units are almost certainly systematically lower than unsubsidized rents (so excluding them would leave more higher rents in the analysis). The scope of this bias can be evaluated

by examining what proportion of all rents are subsidized (as reported in the survey). If only a small proportion of rents is subsidized, then eliminating this difficult question from the survey could be warranted.

#### 4.1.2. Sampling Error

Sampling error is the error, or noise, associated with measuring a sample rather than the whole population. Sampling error is inherent in all probability-based samples (samples where everyone in the population has a known, non-zero probability of being included). Because the probabilities are known, the sampling error can be estimated and the magnitude of the error can be reported--as the sample size goes up, sampling error goes down (Weisberg, 2005), meaning the estimate is more precise.

Currently the value of interest is the 40<sup>th</sup> percentile (or another percentile in some cases) of rents. One valuable way to look at this information is as reflecting the *access* that families have to housing. A family with a voucher is supposed to have access to 40 percent of the local housing. Because of sampling error, the value that is calculated as the 40<sup>th</sup> percentile could really be the 35<sup>th</sup> percentile or the 45<sup>th</sup> percentile. We want a sample size large enough to ensure that we do not accidentally set the FMR substantially below the true 40<sup>th</sup> percentile.

There are several advanced variance estimation techniques for computing standard errors and confidence intervals for a median or other percentile. A complete review of approaches to variance estimation for estimates of 40<sup>th</sup> percentiles is beyond the scope of this review (but see Kovar, Rao, & Wu, 1988 for a summary). There is some evidence that different approaches perform similarly in the estimation of home sales prices from complex survey data (Thompson & Sigman, 2000).

It is important to have some sense of what the sampling error might be for FMR Surveys so that we can evaluate the ideal sample size. Historically, FMR Surveys have used the Woodruff (1952) method for calculating confidence intervals around the 40<sup>th</sup> percentile. The method uses the observed distribution of values from the sample and the fact that the percentile is a value that represents a position in the distribution—the 40<sup>th</sup> percentile is the value in which 40 percent of the values are less than or equal. An estimate of 40 percent of the population has variance that can be calculated for simple random samples as demonstrated below as well as for complex samples such as dual-frame RDD and ABS. Thus the 95 percent confidence interval is the  $40\% \pm 1.96 \times se(40\%)$ , or  $40\% \pm 1.96 \sqrt{(40\% \times 60\% / n)}$  for simple random samples. The confidence interval for the 40<sup>th</sup> percentile is bounded by the percentile for the lower confidence limit and the percentile for the upper confidence limit.

*Table 3: 95% Confidence Interval for the 40th Percentile*

n	95% CI for 40 Percent	95% CI for 40 <sup>th</sup> Percentile
100	[30%,50%]	[Y30,Y50]
150	[32%,48%]	[Y32,Y48]
200	[33%,47%]	[Y33,Y47]
250	[34%,46%]	[Y34,Y46]
400	[35%,45%]	[Y35,Y45]
1000	[37%,43%]	[Y37,Y43]

#### Sampling Error in FMR Surveys

Currently, the target sample size for FMR Surveys is 200 observations. The approximate intervals in Table 3 suggest that 200 observations will yield an estimate of the 40<sup>th</sup> percentile that is between the true



33<sup>rd</sup> and 47<sup>th</sup> percentiles. In other words, the estimate could set the FMR at a value that would give families access to 33 percent of housing in the area or 47 percent of housing in the area. If the sample size were increased to 400, the minimum access would be closer to 35 percent. If the sample size were 1,000, the minimum access would be near 37 percent.

The variability of the value of the FMR depends on the rent distribution. If the rents are highly dispersed, the difference between the 33<sup>rd</sup> and 40<sup>th</sup> percentile will be large. If the rent variability is small, the difference will be small.

#### 4.1.3. Unit Non-response Error

If the sample frame is complete, then coverage error is minimized. If the total sample size is large, then sampling error is minimized, and the precision of estimates is high. However, there is a third source of error in the sample—sample non-response. If the sampled people who fail to participate in the survey are systematically different from those who do participate, then the results will be biased.

There is a persistent and widespread belief in survey research that high response rates are both necessary and sufficient to the achievement of low non-response bias (Groves, 2006). One reason that this is such a persistent belief may be that the non-response rate is intuitively related to the possible range of error. Consider a survey with a 25 percent response rate that produces a rental rate estimate of 20 percent. What if all the 75 percent of the sample that did not respond to the survey were renters? The true rental rate would be 80 percent, and our estimate would grossly underestimate the true value. What if they were all owner occupied? The true rental rate would be just five percent.

It is clear that survey non-response and non-response bias are conceptually related, but, it is generally not practical to report a possible range of five to 80 percent based on the extreme possibilities. Instead we evaluate the respondents to the survey and report a rental rate of 20 percent plus or minus a margin of error. This is because we are using inferential models that assume that 100 percent of the selected probability sample responded. These models allow us to use the sample size and the prevalence estimate to produce a confidence interval.

*Any* violation of the assumption of 100 percent response introduces threat of non-response bias. Conventionally, researchers have assumed that the magnitude of the threat is directly related to the magnitude of non-response, but there is a growing body of evidence that this relationship, if it exists, is very weak. Groves (2006) reviewed 30 studies and found that the relationship between response rates and non-response bias was quite weak. Non-response rates accounted for only 11 percent of the variance observed in non-response bias as measured by sample deviations from population characteristics on a variety of measures. Another study that directly manipulated efforts to reach respondents found that the majority of estimates from a survey with a "rigorous" protocol were statistically indistinguishable from estimates from a survey that used less effort to conduct interviews (Keeter, Kennedy, Dimock, Best, & Craighill, 2006).

It would be rare for a survey to achieve 100 percent response so most surveys are subject to non-response error. This means that all surveys violate a key assumption of the inferential statistical models we apply to them and that to address this violation, survey researchers must posit specific models of the impact of non-response on their estimates. The response rate is not a good measure of the magnitude or direction of this impact.

In the best case, unit data are Missing Completely at Random (Rubin & Little, 2002), and the conventional models hold. In the example above, we could be confident that the true rental rate would fall in the range represented by the confidence interval. In the worst case, missing unit data are 100 percent

biased, and the range would be very large as presented above. If this latter case were true, the range of possible true values would be very wide even if a conventionally acceptable response rate were achieved. Of course, neither of these is typically true. There probably is non-response bias in most surveys, but what kind of non-response bias and how it impacts estimates varies.

Some kinds of non-response error threaten the validity of estimates more than others. As Groves and Peytcheva (2008) note, the case of non-response bias that is of most interest to researchers is the case where the non-response bias and the survey measure of interest share a cause. For instance, imagine a survey of patient satisfaction among people diagnosed with serious depression who were receiving mental health counseling. It is easy to imagine that people whose depression had not lessened would be less satisfied and that they would also be less likely to respond to the survey. When the measure of interest is related directly or indirectly to the cause of non-response, the result is "non-ignorable" non-response bias (Rubin & Little, 2002). Note that non-response bias is inherently specific to the survey measures of interest. That means that moving from a focus on response rates to a focus on non-response bias means moving from a general model of validity to a specific model where non-response bias must be conceptualized and estimated separately for every survey and population.

There have been some efforts to identify general features of studies that relate to the magnitude of observed non-response bias. Groves and Peytcheva (2008) meta-analyzed non-response bias in several studies as it related to study design characteristics. They found that the following study elements had no significant impact on non-response bias across studies:

- Pre-notification,
- Incentives,
- Survey topic (health vs. other),
- Urbanicity of the sample,
- Subculture (majority vs. other), and
- Topic saliency.

The authors note that the absence of a general effect is not evidence for the absence of all specific effects. For instance, incentives in general did not seem to introduce bias, but using incentives in a study designed to measure income could introduce non-response bias such that poorer people were more motivated to respond and receive the incentive.

The following study elements did affect non-response bias:

- Personal involvement with the sponsor led to less non-response bias,
- Government sponsorship led to more non-response bias,
- Interviewer-administered mode led to more non-response bias,
- General (vs. specific) populations had more non-response bias, and
- Attitude measures were associated with much greater non-response bias than were behavioral or demographic measures.

### Non-Response Error in FMR Surveys

FMR Survey response rates have been low, but the findings above suggest that these low response rates alone do not necessarily mean that the surveys suffer from non-response bias. The findings from a meta-analysis of non-response bias across studies suggest that general features of the FMR Surveys that might lead to non-response bias are government sponsorship, sampling the general population, a lack of personal involvement with the sponsor, and the interviewer-administered mode. Beyond these general possible sources of non-response bias, there are many possible sources of study-specific non-response

bias. The most important of these are those where the key measure (rent) and the non-response bias could share a common cause.

Characteristics of units that affect rent are the unit's:

- Quality and amenities,
- Size, and
- Location.

We are also interested in measurable characteristics of possible respondents that would be associated with how much rent they pay. The most direct of these might include income and family size. Other demographics are certainly associated with rent paid, but their relationships with rent may not be proximal causes.

We cannot minimize non-response bias by maximizing response rates. To control non-response bias, we must minimize the likelihood of differential response on the key variables. For instance, income is related to rent, so the survey should not be designed in any way that would lead people with higher or lower incomes to systematically respond more readily.

There is another reason to maximize response rates, however, which is that higher response rates can mean lower cost. Some low-cost study design choices can increase the yield on the initial sample. Table 4 shows the design elements that the new FMR Survey protocol might incorporate and their possible impacts on non-response bias and survey cost.

Table 4: Design Elements and their Impacts on Non-Response Bias and Survey Cost

Design Element	Possible Impact on Non-Response Bias	Possible Impact on Total Survey Cost	FMR Survey Experiment
<b>Mode</b>	<b>Moderate.</b> Although interviewer-administered modes act to "pull" respondents to surveys, so they might obtain a more representative sample, Groves and Peytcheva (2008) found that non-response bias was actually higher in interviewer-administered studies.	<b>Unknown.</b> The protocol and anticipated response rates can affect survey costs, so a complex mail protocol with incentives could be more expensive or an RDD telephone study that requires geographic screening could be more expensive.	Test both phone and mail surveys.
<b>Notification</b>	<b>Unknown.</b> It is widely believed that pre-notification letters work to increase response rates by establishing an implicit or explicit relationship with the respondent. There is no reason to believe that this would be differentially effective in families of different sizes or incomes, but it could promote response in other groups that are hard to reach.	<b>Negative.</b> While pre-notification letters consistently increase response (Edwards, et al., 2009), the increase usually does not offset the cost of the letters.	Test the impact of a pre-notification on non-response and on survey cost.
<b>Pre-incentive</b>	<b>Unknown.</b> Messer and Dillman (2010) found no significant demographic differences between people who did and did not receive a \$5 Pre-incentive to a mail survey. However, in a Web survey (with mail invitations), they found that a Pre-incentive less to more response among respondents with less education but the implications of the difference for sample representativeness varies across categories.	<b>Negative.</b> While Pre-incentives substantially increase survey response (Edwards, et al., 2009), the increase does not always offset the cost of the incentives (Dubray & Conrey, 2011). Several studies have found that the incentives are cost effective (see Singer, 2002 for a review), but the incidence in this study is fairly low. That is, most people who receive surveys will not be qualified renters. Many people who received the incentive would not be eligible for the survey.	Omit pre-incentive

<b>Conditional Incentive</b>	<b>Moderate.</b> There is good reason to believe that people with lower incomes would be more motivated to respond to the survey and receive the incentive (Singer, 2002). This could lead to FMR estimates that are too low, or it could lead to more appropriate representation of lower-income respondents who are conventionally hard to reach.	<b>Unknown.</b> The impact of conditional incentives on response is much lower than the impact of Pre-incentives (Edwards, et al., 2009), but only a fraction of the total sample must be paid a conditional incentive.	Omit conditional incentive.
<b>Physical Survey Appearance</b>	<b>Minimal.</b> Researchers have tested many different physical design elements in mail surveys including the use of color, hand-written signatures, and logos. There is no reason to believe that these kinds of design elements would drive differential non-response in FMR Surveys.	<b>Minimal.</b> While physical design choices are typically cheap to implement, a comprehensive meta-analysis showed that most had little effect on response rate (Edwards, et al., 2009).	Design a survey consistent with best practices for readability and cultural appropriateness (see next chapter).
<b>Stamps vs. Metered Postage</b>	<b>Minimal.</b> There is no evidence that real stamps increase response (Edwards, et al., 2009) and no reason to believe that metered postage would lead to differential non-response.	<b>Positive.</b> For very large surveys, using pre-sort postage can lead to substantial savings. FMR Surveys are small, but presort postage can still be used to save some cost.	Use presort, metered postage for samples of more than 500.
<b>Special Delivery Service</b>	<b>Unknown.</b> Chance of response increases with the use of special delivery service (Edwards, et al., 2009); impact on non-response bias unknown.	<b>Negative.</b> Odds of response increase substantially when special delivery service is used (Edwards, et al., 2009), but the cost is prohibitive, so the technique is usually used with populations that are particularly difficult to reach such as doctors (e.g., Del Valle, Morgenstern, Rogstad, Albright, & Vickrey, 1997).	Use first class postage.

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<b>Internet Response Option</b>	<b>Unknown.</b> Response rates in mixed-mode studies are lower when mail and internet are offered at the same time (Griffin, Fischer, & Morgan, 2001; Israel, 2009; Messer & Dillman, 2010). However, there is some evidence that the final sample in mixed-mode studies is more representative than the final sample in mail-only studies (Messer & Dillman, 2010).	<b>Probably negative.</b> Offering a Web response option in mixed-mode studies can lead to lower overall response (Griffin, et al., 2001), and programming and data processing costs increase with the number of modes.	Test the impact of a Web option on non-response bias.
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## 4.2. RESPONSE ACCURACY ERRORS

The first major class of errors concerned errors with the sample: problems getting a frame that covered the whole population, problems getting enough responses to be sure of the estimate, and problems getting a representative sample of people to participate. The second major class of errors is errors in the responses to the survey itself. In this section, we discuss error that comes from respondents' skipping questions (item-non-response), error that comes from respondents' unwillingness or inability to answer the questions correctly, and error that comes from interviewers' introducing bias into respondents' answers.

### 4.2.1. Item Non-response Error

Researchers (e.g., Kupek, 1998; Shoemaker, Eichholz, & Skewes, 2002) have distinguished between two sources of item non-response: ability and willingness. When respondents do not know the answer they may respond "don't know" in a phone survey or skip a mail survey question. This can happen because they do not have an opinion, cannot recall an episode, or are unmotivated to conduct the required cognitive operations.

#### Item Non-response on Mail vs. Phone Surveys

Non-response attributable to inability to answer the question is higher in mail than in telephone surveys. These kinds of errors can be addressed to a certain extent through good question and questionnaire design.

Unwillingness to respond, is perhaps less easy to combat. Sensitive questions about health behaviors such as drinking alcohol or breaking the law tend to be associated with more non-response than other questions. Non-response to questions about income, in particular, is high across surveys (Tourangeau, Rips, & Rasinski, 2000).

The contrast between the effects of ability and willingness could be the reason that non-response is not uniformly higher in mail than in phone surveys. While ability-related non-response is higher on self-administered surveys, income non-response is higher on interviewer-administered surveys. Indeed, when non-response to income questions is removed from the measure, non-response is clearly higher in mail surveys (de Leeuw, 1992).

#### Non-response on Expenditures Questions

Expenditures, like income, are personal financial data and subject to the same kind of sensitivity. However, asking about consumption on surveys is also difficult because total expenditures can be sums of expenditures in many small categories. One study found that a question about total expenditures had higher non-response than did a question about spending in the past month on food, a more concrete concept (Browning, Crossley, & Weber, 2003).

One common approach to addressing non-response to questions about complex household finances is to use "unfolding brackets" questions. When a respondent gives a "don't know" or a refusal, the next question is a yes/no question of the form "is it more than x?". By asking questions of 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 binned for analysis, the range can be used directly. Investment values imputed using unfolding brackets are substantially higher than those imputed using all values as possible donors (Juster & Smith, 1997). These authors found that unfolding brackets were somewhat more successful in cueing recall than was a full set of ranges, but the surveys they reviewed were interviewer-administered.

## Non-ignorable Item Non-response

Item non-response can pose two problems by introducing:

- Sampling error since the total number of observations for a question decreases as item non-response increases, or
- Bias when the people who respond to a question are systematically different from those who do not.

Thus far, we have discussed item non-response in the former context. Unwillingness and inability to respond to survey questions reduces the total number of observations so has a direct, practical impact on the researcher's ability to use the data. However, if non-response is driven by the observed variable itself or by another unobserved variable of interest, then the data are not missing at random (NMAR), and the bias cannot be ignored. For instance, if heavy drinkers refused to answer questions about alcohol use because they were embarrassed, then the total final estimate of drinking in the sample would be too low.

Sherman (2000) proposed a method of determining whether missing data from two questions are MCAR with respect to each other by comparing response odds ratios of the two questions. Among other factors, the tests seek to determine whether the people who refuse to respond to one of the questions also refuse to respond to the other. Wood (2005) found no evidence of non-ignorable bias when applying Sherman's (2000) tests to compare socioeconomic status and income as measured by two different questions on a telephone survey. In other words, the analysis suggested that propensity to refuse to respond to the income question was not related to propensity to respond to the socioeconomic status questions. Analyses of data from the Current Population Survey have differed regarding the presence of non-ignorable bias in income reporting (research reviewed in Paulin & Ferraro, 1994).

However, Browning, Crossley, and Weber (2003) found compelling evidence that that non-response on expenditure and consumption questions was much higher in households made up of individuals who did not share finances and was also higher when the respondent was not the head of household. They found that non-response on food expenditures but not total expenditures was higher when the respondent was male. Taken with the household composition results, this suggests that respondents fail to respond when they simply do not know an answer.

## Item Non-response in FMR Surveys

Existing research suggests that the key FMR measure—rent—may be particularly subject to item non-response. Some respondents may be unwilling to respond because the question solicits personal financial information, and some may have some difficulty responding. In general, the ideal form of an expenditures question appears to be the simplest form to which the respondent knows (and does not have to calculate) the answer.

There is a significant threat of non-response, especially in households where members do not share finances. The FMR Survey already addresses the issue of rents split among roommates. However, the simplest form of the question may be "what is the total monthly rent for this unit?" or even "how much do you pay for this unit?"

Where respondents do not know the exact amount of the rent, HUD may wish to consider adding follow-up questions to obtain a range. The research shows that unfolding brackets are ideal, but these may be inefficient to implement in a mail survey, so HUD may wish to consider using ranges (which also performed well) instead. Again, these clarifying questions allow for missing data to be imputed more accurately.



#### 4.2.2. Measurement Error Due to the Respondent

Some item non-response is experimenter or interviewer-driven, but most item non-response is a subclass of measurement error attributable to respondents. This type of error comes from respondents' intentionally or unintentionally giving wrong or incomplete answers to survey questions. Survey response biases are varied, and a complete review is beyond the scope of this paper. A useful framework for the process of responding to survey questions (and a guide to where the process can go wrong) consists of four stages (Tourangeau, et al., 2000):

- *Comprehension* means attending to the question and determining what it is asking.
- *Retrieval* means searching memory for the information or events needed to provide a response.
- *Judgment* means combining memories, drawing inferences, making estimates, and conducting other cognitive operations on the retrieved material.
- *Response* means editing the response to fit the provided response format.

#### Errors of Comprehension

People will answer almost any question they are asked whether they understand it or not (Ferber, 1956). This means that error added by respondents' random or semi-random responses to misunderstood questions is much more of a threat to the validity of data than is item non-response. Absent data can be imputed if we can assume that extant data are valid. That assumption only holds, however, if we can be sure that respondents understood what we were asking.

Researchers use the term 'fluency' to reflect the ease with which question content can be processed. From the psychology literature, here are some features of a survey question (or of any language) that can interfere with processing fluency:

- **The use of negatives.** There is evidence that comprehending language that uses negatives to modify nouns takes more cognitive effort than does processing positively-framed text ((Deutsch, Strack, & Gawronski, 2006); (Bassili & Scott, 1996)). For instance, "To what extent do you agree that no parties should be allowed on campus?" would be more difficult to process than "To what extent do you agree that parties should be banned?".
- **Longer questions.** Simply put, more verbally complex questions, those with more clauses or more words, are harder to understand (Yan & Tourangeau, 2008). This may be especially true on phone surveys where respondents need to be able to remember the entire question to produce their answer after listening.
- **Multiple questions in one.** To reduce survey length, researchers are sometimes tempted to put several questions together and have response options that combine them. However, unsurprisingly, requiring multiple cognitive tasks of respondents leads to longer response times (Bassili & Scott, 1996).
- **Changes in terminology.** Experts tend to have quite fine definitions of terminology that naive survey respondents do not share. While "weight" and "mass" may mean very different things to a doctor, asking respondents to provide both will induce confusion because the terms do not mean different things to laypeople.

#### *The Impacts of Disfluency*

Disfluency—difficulty with question comprehension—threatens the validity of survey data in several ways. Of course, questions with substantial disfluency could be subject to comprehension errors. The respondent might miss an important clause or a negative modifier, and give the wrong answer. More broadly, however, overcoming disfluency requires respondents to exert special cognitive effort. Exerting

cognitive effort requires both motivation and ability (Smith & DeCoster, 2000). Not all survey respondents are motivated to exert this kind of effort (Krosnick J. A., 1991).

Even if they are motivated, their ability to apply control may be constrained by time or by limits on their English fluency. The more complex the question, the less likely all respondents will be to respond accurately. Further, limitations on ability are quite likely to disproportionately affect respondents with less education or whose first language is not English.

In addition to interfering with the accuracy of responses provided, disfluency can lead to negative attitudes. We use the ease with which we process information as a cue to how much we like the objects it describes (Schwarz, Bless, F., Rittenauer-Schatka, & Simons, 1991). That means that unnecessarily complicated questions could lead respondents to like the survey less and to become even less motivated to respond.

### Errors of Retrieval and Processing

Factual questions require respondents to seek out information in memory and interpret that information to form a final judgment. Retrieval and processing are conceptually distinct, since memory and cognitive processing exist in different systems (Smith & DeCoster, 2000), but for our purposes here, they occur as a single phase.

#### *Retrieval and Summation*

Estimates of expenditures are higher for sums of responses to disaggregated items than they are for responses to questions asking for aggregated expenditures (Winter, 2004). In other words, people underestimate their spending, and the broader the category of expenditure, the greater the underestimation.

#### *Rounding*

There is evidence that some people round their earnings down in surveys and that certain groups—men, people in their prime working years, and people with high incomes—tend to do this more than other people (Schwabish, 2007). This effect points to a bias in how people think about and report numbers. When they are asked to report frequencies of events, people tend to estimate rather than thinking about each event and counting. This is only not the case when the number of occurrences is very small (Tourangeau, et al., 2000). When they are asked how many cigarettes they smoke a day, heavy smokers tend to round to a number ending in zero while lighter smokers tend to report numbers more precisely (Shiffman, 2009).

This phenomenon is called "digit preference", and it can threaten the validity of survey data in several ways. First, the lumpy distributions that emerge from this rounding can interfere with data analysis, especially in economic data. Analysts have taken different approaches to smoothing data subject to digit preference with various impacts on final estimates (e.g., (Baker, 1992) for unemployment duration data). One way to address the problem in economic expenditures data are to bin reported expenditures (e.g., Thompson & Sigman, 2000).

The second way in which digit preference can threaten the integrity of results is by introducing bias. It is commonly observed that digit preference is greater for people using an estimation strategy to respond to the question and that this strategy is most common when the frequency or amount of the item being estimated is greater. For instance, digit preference in cigarette smoking is greater among heavier smokers, and digit preference in income is greater among people with higher incomes. When rounding is more

likely for some kinds of people than others, the observed distribution and measures of central tendency can be affected.

### Errors of Response

At some point in the judgment process, people select and report a response. In general, the response options should be as close as possible to the responses that come spontaneously to mind. For instance, a question like "Do you brush your teeth in the morning" is easier to answer if the response categories are "yes" and "no" than if the categories are "yes-always", "yes-sometimes", and "no" since the latter case is actually a hidden extra question. As with double-barreled questions, two cognitive judgments are required to tell whether something happens and how often.

In categorical or numeric response options, the specific categories or numbers can influence the responses people give, especially in attitude and behavior judgments (Schwarz, Hippler, Deutsche, & Strack, 1985; Schwarz, Knäuper, Hippler, & Noelle-Neumann, 1991).

Offering an explicit "don't know" option can affect response. In general, offering this option leads to fewer "substantive" responses to the question, and this effect is especially pronounced for questions requiring explicit memory of durations, dates, or frequencies (Poe, Seeman, McLaughlin, Mehl, & Dietz, 1988). Some researchers have suggested that offering this option allows lazy respondents to avoid the cognitive effort of coming to a conclusion (Krosnick, et al., 2002) although it may also be possible that offering the option is allowing some respondents who would otherwise add error to estimates by guessing to opt out of the question.

The physical design of a mail survey can affect response rates (Dillman, Smyth, & Christian, 2009), but more specifically, the shape and size of response boxes can give the respondent cues about what should go there (Dillman, et al., 2009).

### Response Error in FMR Surveys

The FMR Survey questions currently have the following features that could interfere with fluent processing:

- Changes in terminology between "unit", "structure", "building", and other terms. These terms may have different meanings to the research team, which is highly familiar with housing systems, but the differences may not be clear to respondents.
- Some superfluous words and clarifying phrases that could make questions unnecessarily long.
- Questions requiring multiple judgments such as a question about whether the respondent pays for energy used for "refrigeration and lighting".
- Questions that respondents may not be able to answer because of their own housing situation and the variety of affordable housing programs - such as how much of a subsidy they receive, how much rent a roommate pays, or if their building is owned by a public housing authority.

It is particularly important that the text in the FMR Surveys be shortened and simplified because the current complexity could be leading respondents to:

- Skip questions because they do not understand them,
- Provide incorrect responses to questions because they misunderstand or guess, or
- Quit the survey.

Such effects might disproportionately impact the responses of people who have lower education or less English-fluency, which could lead to more error in estimation of low rents than in estimation of high rents.

Broadly, it seems ideal to base the FMR Survey instrument on the ACS instrument, since the FMR is meant to stand in for the ACS when ACS data are incomplete or inconsistent. More specifically, HUD can follow recommendations made in a report of testing for the AHS (Gordon, Chipungu, Bagley, & Zanakos, 2005):

- Avoid using the following terms, which are not well-understood by respondents:
  - Public housing authority
  - Certificate
  - Address
  - Renewal
  - HUD
  - Section 8
- Refer to “recertification” to identify housing subsidy recipients.
- Use “is your rent lower because you are in a government housing program” to identify benefit recipients.
- Use “housing authority” instead of “public housing authority”.

The literature also suggests that HUD should focus on the following in refining the questions:

- Asking about rent in the way that is easiest for the respondent to understand. For the majority of households, this would mean asking about total rent, since rent is a shared expense in most households. Follow-up or “unfolding” questions could collect more detail or information from people who cannot answer this question, especially those who do not share expenses with their roommates.
- Using similar language throughout the survey to refer to concepts that are similar in respondents’ minds.

#### 4.2.3. Measurement Error Due to Interviewers

Interviewers can introduce, or reduce, error by affecting survey non-response or by affecting survey responses themselves. While specific characteristics of interviewers are not strongly or particularly reliably related to non-response, different interviewers do achieve very different response rates. In particular, interviewer experience is positively related to non-response.

Interviewers can introduce bias into survey responses through tone, subtle wording changes, and other features of the delivery. Respondents can also bias their own responses based on characteristics they perceive in interviewers. While there are some systematic biases associated with systematic interviewer characteristics (e.g., race, gender, age), these are usually small and usually limited to biases on questions that are directly related to the interviewer characteristic.

While specific interviewer characteristics that bias responses are difficult to identify and control for, there can still be large differences between responses to interviewers. Researchers have generally sought to control for these biases by standardizing interviews, and maintaining and supervising very standardized surveys does reduce within-interviewer response clustering substantially (Schaeffer, Dykema, & Maynard, 2010).

While standardizing the survey is very effective, however, standardizing the conversational parts of the interview, especially the introduction can backfire. A more conversational screening component can reduce survey non-response by half (Houtkoop-Steenstra & Bergh, 2000).

## Measurement Error Due to FMR Survey Interviewers

Obviously, interviewers are no threat to the mail version of the FMR Survey, but the literature suggests that the threat on the telephone surveys is also minimal. The questions on this survey are not likely to be affected by interviewer characteristics such as race, and the survey is conducted on the phone where standardization can be supervised and implemented effectively. What the analysis does suggest, however, is that training in standardization and in refusal conversion techniques is particularly important for reducing error in survey response.

### 4.3. SURVEY ANALYSIS AND INTERPRETATION ERRORS

Weisberg (2005) puts three types of errors in this category:

- Errors in analysis,
- Mode effects, and
- Compatibility errors.

The latter is not relevant to FMR Surveys which do not combine survey data from multiple sources.<sup>6</sup> Bias introduced to responses by the survey mode is an important consideration and the possible mode effects here are discussed in detail in Section 4.2.1. Below, we discuss two possible sources of error in analysis or interpretation, although there are many.

In general, errors in analysis might be failures in execution—results can be biased or incorrect because analysis is conducted improperly—but are more likely to be failures in interpretation. The research in general is designed and analyzed to answer the following general question: How much do families need to pay to have access to adequate selection of standard quality rental units? In conducting the research, HUD must operationalize concepts such as “adequate selection”, “standard quality”, and even “rental unit”. Any time the specific, operational definition departs from the definition used by FMR stakeholders, there is potential for error in the survey conclusions. For instance, the survey defines a “rental unit” as a two bedroom unit, and HUD analysts estimate one- and three-bedroom unit costs from these units. This estimation relies on a series of assumptions about the relationship between the costs for two-bedroom and other units. If any of those assumptions is flawed, then there is error in the estimates of rental costs for all units.

All research efforts face these types of errors. As an example, we here discuss a few examples of possible errors and ways to evaluate their scope.

The definition of the FMR (“the rent, including the cost of utilities (except telephone), as established by HUD... for units of varying sizes (by number of bedrooms), that must be paid in the market area to rent privately owned, existing, decent, safe, and sanitary rental housing of modest (non-luxury) nature with suitable amenities.”( 24 CFR 888.111) is of a set of all rates paid in a community. In order to set a single payment standard, HUD must establish a threshold above which renters’ access to housing is considered adequate. From the pool of privately owned, existing, decent, safe, and sanitary rental housing, HUD examines the rents charged and sets FMRs at the 40th percentile; that is, the dollar value below which 40 percent of units have been rented.

Further, the statutory definition states that this is the set of market rates that *must* be paid, not the set of rates that *are being* paid. That is, the FMR is the set of rates that a family would have to pay to rent a unit

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<sup>6</sup> Although the compatibility of FMR survey data with the data obtained regarding utility costs is worthy of consideration.

starting tomorrow, not the set of rates that all families are currently paying. This distinction is important because tenants who remain in a unit for an extended time often pay less rent than a new mover would pay for a comparable unit. However, data on what market rates would be for families moving tomorrow are not available; HUD can only collect data on rates that are actually being paid.

In analyzing FMR Surveys, HUD assumes that the 40<sup>th</sup> percentile of rates collected in the FMR Surveys represents “adequate access” for families to units in their local vicinities. For the most part, this has proven true. In some communities it has not.

For the 40<sup>th</sup> percentile of rates collected in the FMR to accurately reflect the 40<sup>th</sup> percentile of rates that an eligible family would pay, the following must be true:

- The 40<sup>th</sup> percentile of the rates that recent movers (within 24 months) are paying is the same as the 40<sup>th</sup> percentile of the rates that new renters would have to pay, and
- The rates paid for two-bedroom units must be convertible to rents for one- and three-bedroom units.

There are other necessary conditions, but these two are important assumptions that HUD makes in analysis that are testable in the current context.

In 4.1.1 above, we mentioned that rents paid by people who moved up to two years ago might be lower than rents families would have to pay to rent now. Historically, this has been HUD’s reason for restricting survey responses to recent movers. However, even the rent of someone who moved in two years ago might be compressed relative to current market rates. To test this, the experiment analysis team can relate reported rates to unit tenure. If there is a substantial positive relationship, HUD may wish to apply a weighting correction to project older rents forward.

The exact relationship between rents on one, two, and three-bedroom units can be and has been evaluated by HUD using ACS data and is outside the scope of this experiment. However, while two-bedroom units are the most common, screening out units of other sizes is very costly in survey administration. The ideal modeling solution would be able to make use of data from all these unit types to create FMR estimates. If it is possible to use direct self-report data to create estimates for all unit sizes, then the FMR Surveys could be conducted more affordably and yield equally valid results.

## 5. FMR STUDY DESIGN PLAN

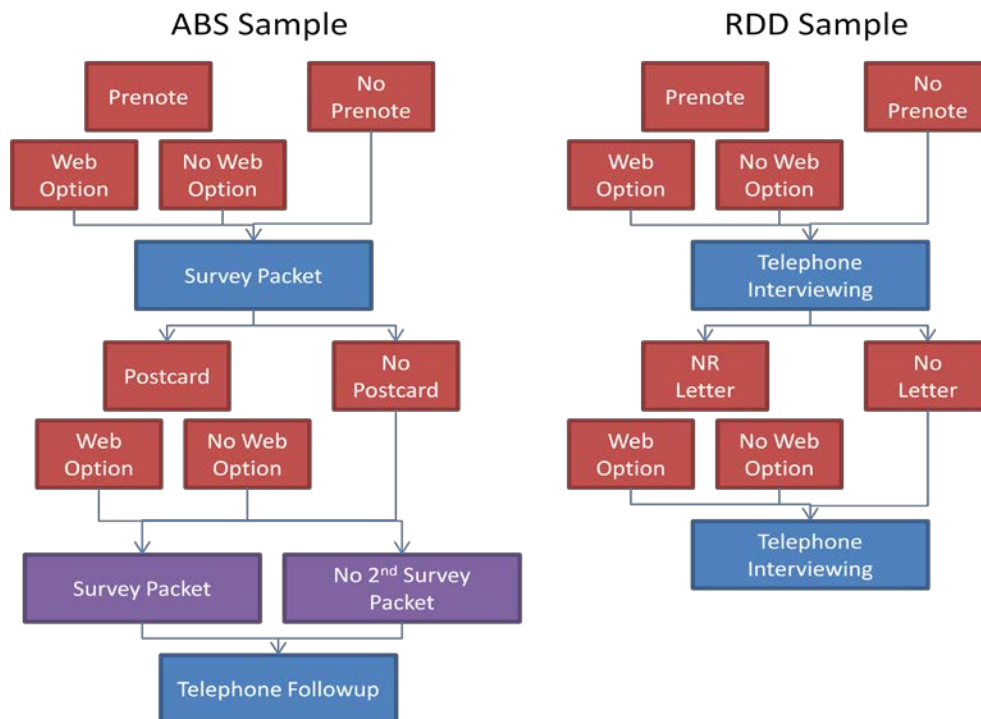
Based on HUD's goals and the literature review above, we here propose an experiment that will determine the optimal FMR survey design. HUD's priorities for this research endeavor are quality, cost, and speed. In other words, the overarching goal is to create a design with the survey sample and contact protocol that produces the best possible data as quickly as possible for as little cost as possible.

### 5.1. EXPERIMENT STRUCTURE

The core of the study design is an experiment to test the marginal utility of various protocol elements (Figure 1). Marginal utility refers to the value (in terms of data quality) that HUD gets in return for the additional cost and time invested in each element. We will test:

- *Pre-notification letters.* Although, these are known to increase response rates (See Section 4.1.3), they add a week to the data collection schedule and cost to the project budget.
- *Web response options.* These are known to decrease response rates (See Section 4.1.3), but the cost of a Web option is low, and it could decrease non-response bias.
- *Second survey mailings.* These are known to increase response rates (See Section 4.1.3), but they have a significant impact on the data collection schedule. HUD can test whether the second survey mailing is more cost effective than early telephone follow-up.
- *Non-response letters to RDD respondents.* These could help drive response on the phone or the Web.

Figure 1: *FMR Survey Experiment Structure*



## 5.2. DATA COLLECTION PLAN

### 5.2.1. Locations

Initially, there were two options for the experimental design:

- *Option 1.* Conducting Design 1 and Design 2 in the same area concurrently; and
- *Option 2.* Conducting Design 1 and Design 2 concurrently in two separate areas.

The first option has the advantage of complete control (same place, same time) over external factors that may influence outcomes of the surveys. However, the disadvantage was that the area would be overburdened, and there was a risk that one method could contaminate the results of the other—specifically, that the samples could overlap.

Therefore, we decided that option two was appropriate and that the two sites should be as similar as possible. One site in the matched pair would receive Design 1 while the other would receive Design 2.

To ensure that the results of the study were generalizable across locations, we selected two matched pairs of study locations:

- Columbia, SC (RDD) and Charleston, SC (ABS).
- Peoria, IL (RDD) and Fort Wayne, IN (ABS).

To select the pairs, 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.<sup>7</sup>
- *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.

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<sup>7</sup>ACS-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.



- 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,
- 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 5: Characteristics of Ideal Location Pairs*

	<b>First pair characteristics</b>	<b>Search for 2<sup>nd</sup> pair limited to:</b>
<b>Geographic location</b>	South	Northeast, Midwest and West
<b>Race distribution</b>	High minority	Low Minority
<b>Rent-to-income</b>	High	Low
<b>Rental housing age</b>	Young	Old

Based on these limitations, we selected Peoria, IL and Fort Wayne, IN because they met the criteria in Table 5 and were similar to each other on the criteria we used to match the two locations in South Carolina.

### 5.2.2. RDD Data Collection

#### Sample

In each location, the final sample for the RDD data collection will be 100 landline interviews and 50 cell phone interviews with renters of two-bedroom units who are recent movers. The data will include interviews with many more respondents who do not meet these criteria. We will use all the data in the analysis of the experiment.

#### Questionnaire

The questions and response options in the CATI questionnaire were changed to match those in the mail questionnaire. For the experiment, termination points were also removed in this survey, so that the data

available for analysis of the two instruments would be exactly equivalent. Should the RDD approach be used in future FMR surveys, the screening points would likely be reintroduced.

For non-respondents to the rent questions, we added unfolding brackets that ask respondents to tell us whether their rent is over or under \$1,000, \$750, and so on. These questions can be used to narrow the ranges of allowable imputed values (see Section 4.2.1). The unfolding brackets were also added to the Web survey.

### Data Collection

Table 6 shows the schedule of events for RDD data collection. Only some phone numbers will be matched to addresses. Two-thirds of matched addresses will be assigned to a pre-notification condition (half to the Web address condition, and half to the no-Web condition).

*Table 6: RDD Data Collection Schedule*

<b>Schedule</b>	<b>Event</b>
<b>Day 1</b>	Pre-notifications
<b>Day 1</b>	Web survey available
<b>Day 7</b>	Dialing begins
<b>Day 14</b>	Non-response letter
<b>Day 20</b>	Dialing resumes for non-responding letter recipients
<b>Day 27</b>	Dialing complete

Half of the matched records will be assigned to the non-response follow-up condition. We will attempt to contact landline numbers up to 10 times and cell phones up to six times. The records without matched addresses will be dialed continuously until the maximum attempts are completed.

After three attempts, matched records will be retired from the telephone sample. That is, they will not be called while the letter is on its way. These records will be dialed again beginning seven days after the non-response letter is mailed. Note that all matched records will be retired including those that do not receive the letter; this is so that the two conditions are exactly equivalent.

### 5.2.3. ABS Data Collection

#### Sample

In each location, some of the ABS sample will be specifically targeted at locations with a high density of renters. ACS data will be used to stratify Census tracts into high- and low-renter density tracts. MSG (Genesys) will pull a random sample of households from each tract. The sampling statistician will determine the optimal distribution of surveys across these strata to minimize both design effect and survey cost.<sup>8</sup>

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<sup>8</sup> Design effect refers to the effect that oversampling has on the final “effective” N. When the survey data are weighted, responses from renters in the high density areas will be weighted down because these areas are oversampled in the initial survey. The final “effective” sample size for a sample like this is lower than the total number of completed surveys. The goal here is to realize as much cost savings as possible by oversampling while ensuring that the final survey sample is large enough for analysis.

The total sample size needed for the ABS design is not as clear as it is for the RDD design since HUD has less experience with ABS. A total of 20,000 sample records for the two locations will be drawn. Response and cooperation rates for the mail survey are a key measure of the value of the ABS approach.

### Questionnaire

The FMR survey has never existed in a self-administered form. We modified some language to add explanatory notes, and we modified other language to lower the overall reading level of the questions and answer choices.

We eliminated most of the survey’s termination points; only respondents who owned their homes were told to skip the remaining questions and return the questionnaire. Thus, we collected rent data from renters of units of all sizes and from renters who might live in public housing. We did this for two reasons. First, skip patterns and termination points in surveys are possible source of item non-response or respondent error. Simply put, it is difficult for respondents to follow complex surveys. Second, having all the data from all potential respondents for this experiment will help the analysis team determine which screening criteria are most important.

To create the mail survey, we employed best practices in mail survey design (see Dillman, et al., 2009). We used a color (blue), lines, indents, and other visual cues to help respondents follow skip patterns. The mail survey appears in *Appendix A*.

To create the Web survey, we again employed best practices, including those for the design of internet products for use by people with disabilities. For example, we minimized scrolling by presenting one question per page; did not use color to convey instructions (though we did use it for emphasis in some places in the survey); and did not use grids for survey response (to make the survey readable on smartphones with portrait-orientation screens). The Web survey also included the “unfolding brackets” we used to narrow down rent amounts for some respondents in the CATI instrument (see Section 5.2.2).

### Data Collection

The schedule in Table 7 shows the planned dates for the phases. It is HUD’s goal to conduct the study as quickly as possible. One way this might be achieved is by eliminating the second survey mailing and conducting follow-up calls. In this condition, the total time in data collection will be less than 45 days. For respondents who receive a second survey mailing, the total data collection time will be 60 days.

*Table 7: ABS Data Collection Schedule*

<b>Schedule</b>	<b>Event</b>
<b>Day 1</b>	Pre-notifications
<b>Day 1</b>	Web survey available
<b>Day 7</b>	First survey packet
<b>Day 14</b>	Reminder Postcard
<b>Day 28</b>	Follow-up calls with respondents not receiving second survey packet
<b>Day 31</b>	Second survey packet
<b>Day 45</b>	Follow-up calls with remaining respondents
<b>Day 60</b>	Data collection ends

We will examine the response by date to determine whether the time between mailings can be reduced. In our experience, however, a three-week delay between first and second survey mailings is optimal. A

shorter delay results in a large proportion of first survey returns' arriving after the second survey is already mailed.

All addresses will be assigned to a pre-notification condition and a reminder postcard condition. Only some addresses will be matched with phone numbers. Half of matched addresses will be assigned to the second survey packet condition. All unmatched addresses will be assigned to the second survey packet condition. All records whose matched phone numbers are found to be non-working will also be sent the second survey packet.

### 5.3. ANALYSIS PLAN

The analysis will have four components:

- Utility of elements within the RDD design,
- Utility of elements within the ABS design,
- RDD compared to ABS as a sample source, and
- Questionnaire content analysis.

In each sub-analysis, we will want to answer the questions:

- What impact does this have on error?
- What impact does this have on cost?
- What impact does this have on time to complete the data collection?

The specific measures and approaches used in the different sections have a good deal in common. We first discuss the measures themselves and then outline the exact structure of the planned comparisons.

#### 5.3.1. Key Measures

##### Non-response Bias

Non-response bias is measure-specific. For instance, there might be bias on respondent race but not on respondent sex. The key measure on the FMR survey is obviously rent. To evaluate bias, one compares the value estimated in the survey to some gold standard. In this case, the ACS is the gold standard. We intentionally selected sites for which ACS 2009 (the most recent release) data were available.

The ACS reports contract rent, asked rent, and gross rent. Our goal is to evaluate bias in answers to the survey questions about how much people pay for rent. HUD uses this question, along with utility information, to create an estimate of gross rent; however, for the non-response bias analysis, we will compare the "raw" answers to this question to the ACS-reported *contract rent*. Since ACS-1 regions do not have precise estimates for recent movers, we will compare all the survey responses (including movers and non-movers) to the ACS data to evaluate non-response bias.

In the analysis, we will compare:

- 25<sup>th</sup>, 50<sup>th</sup>, and 75<sup>th</sup> percentile estimates of contract rent, and
- Proportions of responses in each bedroom size category.

In all cases, the data will be weighted for the survey design (the stratification by landline/cell or low- and high-density rent region) but not for non-response. After weighting for non-response, we may conduct a second non-response bias analysis to determine how much bias remains.

## Response and Cooperation Rates

Historically, response rates have been considered a measure of non-response bias. As we discussed, they are not an accurate predictor of the scope of non-response bias (Section 4.1.3). However, they are a useful measure of a survey protocol's efficiency, or the extent to which the protocol makes it easy to obtain completed interviews. To compare protocols, we will use:

- *Response rate*: a measure of the proportion of the eligible sample that participated.
- *Cooperation rate*: a measure of the proportion of people contacted and asked to complete the survey who participated. This is most useful for telephone surveys.
- *Yield rate*: the proportion of the whole sample that participated. This is useful for evaluating whether different approaches provide better access to recent movers or two-bedroom renters specifically.
- *Resolution rate*: a measure of the proportion of the sample whose eligibility is determined whether they complete the survey or not.

This last rate is often not used by researchers, but it is an important measure of survey quality. Conventional, adjusted response rates are higher when the proportion of the sample whose status is unknown is higher. However, a better survey is one that accurately establishes the eligibility of sample members whether they complete the interview or not. In other words, better surveys make more contact with, and find out more about, potential respondents.

## Cost

Survey costs consist of fixed costs for set-up and variable costs for each piece or element. For instance, there is a fixed cost of programming a Web survey and an incremental cost for each postcard invitation mailed. There is also some cost of management during data collection, which tends to scale less with volume than with time in data collection. That is, a data manager might spend two hours for every day the project is underway.

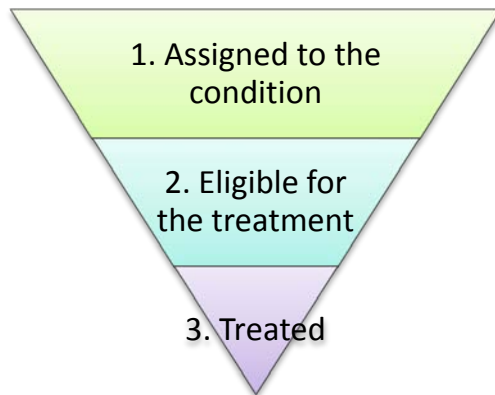
The incremental costs by piece and time are of most interest in determining the cost effectiveness of individual protocol elements. In comparing the RDD to the ABS approach overall, we can include set-up in the cost assessment, but this analysis is imperfect, since the set-up of a complex experiment takes more effort than the set-up of an individual FMR survey would. In addition to presenting the relative cost (including set-up) of the two approaches, we will consider their efficiency (see the next section). To compare individual conditions to each other (e.g., postcard vs. no postcard), we will just use the incremental cost of the pieces for the sake of simplicity.

### 5.3.2. Analytic Approach

The ABS experimental design has 18 cells: three (pre-notification: Web invite, pre-notification with no invitation, and no pre-notification) multiplied by three (postcard: Web invite, postcard with no invitation, and no postcard) multiplied by two (second survey vs. no second survey). The RDD experimental design has nine cells: 18 cells: three (pre-notification: Web invite, pre-notification with no invitation, and no pre-notification) multiplied by three (non-response letter: Web invite, letter with no invitation, and no letter).

Only some records will be exposed to the experimental treatments. Within each of the 18 experimental cells, only some records will be eligible for the treatment. For instance, only some records will be matched to addresses in the RDD study. Further, only some records within each eligible group will actually receive the treatment. For instance, some eligible records will have already completed the study by the time the non-response letters are sent.

Figure 2: Levels of Analysis



The analysis can focus on any of these three levels of analysis. They provide answers to different kinds of questions. If the question is “how much does pre-notification promote survey cooperation?”, then the most direct estimate comes from Level 3, a comparison of those treated to those not treated. If the question is “what would the survey cooperation rate be if HUD used pre-notification?”, then the best estimate comes from Level 1, which represent a mini-sample with the same characteristics as a new sample with the same protocol would have. We will use all three levels of analysis to understand the FMR survey experiment.

The specific approach to conducting the comparisons is important. The best comparisons will use all the record-level data in logistic or OLS regression. This will isolate the unique contributions of each treatment and provide more power to evaluate the main effects of individual treatments. Measures that can be estimated at the individual level include the following:

- *Response, cooperation, and resolution rates.* The dependent measure in each of these cases is a categorical (1/0) measure reflecting whether the record met the criterion. The denominator of each of these measures is a subset of all sample records. For instance, only people who are contacted are included in the cooperation rate. For the record-level analysis of cooperation, people who cooperated would be “1”, and people who were contacted but did not cooperate would be “0”. People who were not contacted would be excluded.
- *Cost.* The cost of a record can be calculated in a straightforward manner if only the incremental costs are considered. The cost of a record receiving a letter would be the cost of the paper, envelopes, and postage, for instance.

A remaining measure, **non-response bias**, must be evaluated at the aggregate level because this type of bias only exists in the aggregate. This aggregate-level analysis should be conducted for each site individually as well as the combined sites. The aggregate-level analyses are most valid for comparisons that separate each of the 18 experiment cells, but we will combine some cells for some analyses.

In conducting the record-level modeling, it will be necessary to explore main effects and interactions as well as planned comparisons. In particular, planned comparisons will be needed to isolate the impacts of the Web invitations at each stage from the impacts of the mailings themselves. The specific site may impact the results. While site can be included in the model, a more tractable approach to the analysis is to conduct the analysis for each site separately and evaluate the similarity of the results before combining sites for analysis.

### 5.3.3. Research Questions

The final analysis will address the following research questions using the measures described above and some additional measures addressed here. Where appropriate, we indicate which subsample or level of analysis we will use (Figure 2).

#### RDD Design

##### *Utility and Value of Pre-notification*

We will compare the pre-notification and no pre-notification conditions for:

- Non-response bias on contract rent and bedroom size distribution (Level 1);
- Response and cooperation rates up to the sending of the non-response letter and for the entire study period (Level 1, Level 2, Level 3); and
- Cost and cost-per-completed-interview (Level 1, Level 3).

##### *Utility and Value of Non-response Letter*

We will compare the non-response letter and no letter conditions for:

- Non-response bias on contract rent and bedroom size distribution (Level 1);
- Response and cooperation rates for the entire study period and for the period after the letters are sent (Level 1, Level 2, Level 3); and
- Cost and cost-per-completed-interview (Level 1, Level 3).

##### *Utility and Value of Web Invitation*

We will compare the Web invitation and no invitation conditions for:

- Non-response bias on contract rent and bedroom size distribution (Level 1);
- Response and cooperation rates for the entire study period (Level 1, Level 2, Level 3); and
- Cost and cost-per-completed-interview (Level 1, Level 3).

We will also determine whether the timing of the Web invitation makes a difference in these three variables.

##### *Utility and Value of Each Unique Protocol*

As we mentioned above, the non-response bias analysis and other analyses at the aggregate level are most valid when they are conducted for each experiment cell separately. We will present these analyses for all nine cells.

#### ABS Design

##### *Utility and Value of Pre-notification*

We will compare the pre-notification and no pre-notification conditions for:

- Non-response bias on contract rent and bedroom size distribution (Level 1);
- Response and cooperation rates up to the sending of the non-response letter and for the entire study period (Level 1, Level 3); and
- Cost and cost-per-completed-interview (Level 1, Level 3).

### *Utility and Value of Postcard Reminders*

We will compare the postcard and no postcard conditions for:

- Non-response bias on contract rent and bedroom size distribution (Level 1);
- Response and cooperation rates for the entire study period and for the period after the postcards are sent (Level 1, Level 3); and
- Cost and cost-per-completed-interview (Level 1, Level 3).

The postcard used to send the Web option may be more eye-catching than the conventional postcard, so we will compare these two conditions as well.

### *Utility and Value of Web Option*

We will compare the Web invitation and no invitation conditions for:

- Non-response bias on contract rent and bedroom size distribution (Level 1);
- Response and cooperation rates for the entire study period (Level 1, Level 3); and
- Cost and cost-per-completed-interview (Level 1, Level 3).

We will also determine whether the timing of the Web invitation makes a difference in these three variables.

### *Utility and Value of Second Survey Packet*

We will compare the second survey packet and no second packet conditions for:

- Non-response bias on contract rent and bedroom size distribution (Level 1);
- Response and cooperation rates for the entire study period (Level 1, Level 2, Level 3); and
- Cost and cost-per-completed-interview (Level 1, Level 3).

Records not matched to a telephone number will all be sent a second packet, but we will only conduct Level 2 and Level 3 analyses for records that are actually assigned to the packet and no-packet conditions. This is because records not matched to a telephone number might be different from records randomly assigned to the packet condition.

### *Utility and Value of Each Unique Protocol*

We will present aggregate-level analyses for all 18 cells.

### *Utility and Value of Telephone Follow-up*

All records will receive telephone follow-up, but the value of this step can still be evaluated. We can compare (a) response and cooperation rates and (b) survey cost for the study up until telephone follow-up begins to the study as a whole. We can also compare response and cooperation rates and non-response bias for mail responses only to those measures for the study as a whole.

### RDD Compared to ABS

The analyses discussed thus far have focused on determining the best protocol within each sample type. To determine which sample type overall is better, we will compare each site to its paired site on the following measures:

- Non-response bias calculated for the study overall;
- Non-response bias calculated for the condition with the lowest non-response bias; and



- Non-response bias calculated for the condition that has the lowest cost-per –interview..

If the conditions with the lowest non-response bias or cost-per –interview are different for different sites, we will evaluate all the candidate conditions. If the analysis in the first two sections reveals that a particular treatment had no impact on non-response bias, we will collapse the analysis with respect to that treatment to increase analytic power.

### Questionnaire Content Analysis

#### *Mail- vs. Phone-Based Surveys*

To compare the quality of the data we collect, we will determine whether:

- Item non-response is higher on mail or phone, especially on the rent question.
- Results from unfolding brackets substantially improve the final estimates by improving imputation of rents.
- Respondents tend to round their rent amounts and whether this effect appears higher among respondents with higher rents. To the extent that rent is a socially sensitive topic, evidence suggests that rounding should be less in the self-report rather than the interviewer-administered context (Tourangeau & Smith, 1996).

#### *Sampling Error*

The analysis presented in Section 4.1.2 suggests that the percentile calculated from a sample of 200 two-bedroom recent movers could be as low as the 33<sup>rd</sup> percentile of the true population. The ACS provides the optimal dataset for exploring this issue, but we will calculate the margins of error around the estimated 40<sup>th</sup> and 50<sup>th</sup> percentiles for HUD’s reference in interpreting other analytic conclusions.

#### *Eligible Population: Bedrooms*

Restricting the eligible population to recent movers who rent two-bedroom units substantially decreases the survey incidence. We will evaluate:

- Comparability of rents estimated from all one-, two-, and three-bedroom respondents to rents estimated using the conventional conversion models;
- Potential cost savings of including all of these respondents in the eligible survey population; and
- Potential increase in precision of including all of these respondents in the eligible survey population.

#### *Eligible Population: Public Housing*

There are several survey questions concerned with determining whether respondents live in public housing. We will evaluate:

- Item non-response on each question;
- Correspondence among questions;
- Self-reported “you pay” and total rents for question respondents; and
- Self-reported subsidy or vouchers for public housing respondents.

The ideal set of questions will have low non-response, relatively low redundancy, and show a markedly lower reported rent than the population in general. People living in public housing should also not report receiving vouchers or subsidies.

### *Eligible Population: Subsidies*

Units occupied by people receiving subsidies are eligible for the survey, but families receiving subsidies may not be able to accurately report total rents. We will evaluate:

- Item non-response on the counterfactual question;
- Correspondence between the “what if” rent, “you pay” rent, and total rent;
- Variance and apparent rounding in “what if” rents; and
- Total estimated FMR including and excluding subsidized renters.

If item non-response is high or the response to the “what if” question corresponds closely to the “you pay” rent, then respondents may not understand the question. If responses are variable or subject to rounding or digit preference, then respondents may be guessing at the total rent they would pay if they did not receive subsidy. If the question does prove problematic, then, ideally, the estimated FMR including and excluding these people would be about the same, and subsidy-receivers could be excluded from FMR analysis.

## REFERENCES

- Baker, M. (1992). Digit preference in CPS unemployment data. *Economics Letters* , 117-121.
- Barron, M., Kelly, J., Montgomery, R., Singleton, J., Shin, H.-C., Skalland, B., et al. (April, 2010). More on the extent of undercoverage in RDD telephone surveys due to the omission of 0-banks. *Survey Practice* , <http://www.surveypractice.org>.
- Bassili, J., & Scott, B. (1996). Response latency as a signal to question problems in survey research. *Public Opinion Quarterly* , 390-399.
- Blumberg, S. J., & Luke, J. V. (2009). Reevaluating the need for concern regarding noncoverage bias in landline surveys. *American Journal of Public Health* , 1806-1810.
- Blumberg, S., & Luke, J. (2010, December). *Wireless substitution: Early release of estimates from the National Health Interview Survey, January - June 2010*. Retrieved January 2011, from Centers for Disease Control and Prevention: <http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201012.htm>
- Boyle, J., Bucuvalas, M., Piekarski, L., & Weiss, A. (2009). Zero banks: Coverage error in list assisted RDD samples. *Survey Practice* , <http://surveypractice.files.wordpress.com/2009/02/survey-practice-january-2009.pdf>.
- Browning, M., Crossley, T. F., & Weber, G. (2003). Asking consumption questions in general purpose surveys. *Economic Journal* , F540-567.
- CDC. (2009). *National Health Interview Survey*. Retrieved 5 2, 2011, from data release: [http://www.cdc.gov/nchs/nhis/nhis\\_2009\\_data\\_release.htm](http://www.cdc.gov/nchs/nhis/nhis_2009_data_release.htm)
- Cowan, T. (2008). *An overview of USDA rural development programs in rural development issues*. (A. V. Burlingham, & W. N. Townsend, Eds.) New York: Nova Science Publishers, Inc.
- de Leeuw, E. D. (1992). *Data quality in mail, telephone, and face-to-face surveys*. Amsterdam: TT Publications.
- Del Valle, M., Morgenstern, H., Rogstad, T., Albright, C., & Vickrey, B. (1997). A randomised trial of the impact of certified mail on response rate to a physician survey, and a cost-effectiveness analysis. *Evaluation & the Health Professions* , 389-406.
- Deutsch, R., Strack, F., & Gawronski, B. (2006). At the boundaries of automaticity: negation as reflective operation. *Journal of Personality & Social Psychology* , 385-405.
- 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.
- Dohrmann, S., Han, D., & Mohadjer, L. (2006). Residential address lists vs. traditional listing: Enumerating households and group quarters. *Proceedings of the Survey Research Methods Section of the American Statistical Association*, (pp. 2959-2964).
- Dubray, P., & Conrey, F. R. (2011). Advance letter and pre-incentive effect on BRFSS survey response. *Poster Presented at the Annual Conference for the Behavioral Risk Factor Surveillance Survey* .
- 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*. JohnWiley & Sons, Lt.
- Erickson, D. (2009). *The housing policy revolution: Networks and neighborhoods*. Washington DC: The Urban Institute Press.

- Fahimi, M., Kulp, D., & Brick, M. (2009). A reassessment of list-assisted RDD methodology. *Public Opinion Quarterly* , 751-760.
- Federal Register. (1995). 60 (157), 42222.
- Federal Register. (2000). 65 (191), 58871.
- Federal Register. (2010). 75 (209), 66979.
- Ferber, R. (1956). The effect of respondent ignorance on survey results. *Journal of the American Statistical Association* , 576-586.
- Gordon, E. L., Chipungu, S., Bagley, L. M., & Zanakos, S. I. (2005). *Improving housing subsidy surveys: Data collection techniques for identifying the housing subsidy status of survey respondents*. Washington DC: U.S. Department of Housing and Urban Development Office of Policy Development and Research.
- Griffin, D. H., Fischer, D. P., & Morgan, M. (2001, May 17-20). 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. (2006). Non-response rates and non-response bias in household surveys. *Public Opinion Quarterly* , 646-675.
- Groves, R. M., & Peytcheva, E. (2008). The impact of non-response rates on non-response bias: A meta-analysis. *Public Opinion Quarterly* , 167-189.
- Guterbock, T. M., Diop, A., Ellis, J. M., Holmes, J. L., & Le, K. T. (2011). Who needs RDD? Combining directory listings with cell phone exchanges for an alternative telephone sampling frame. *Social Science Research* , 860-872.
- Housing Assistance Council. (2008, June). *USDA guaranteed rural rental housing program*. Retrieved June 13, 2011, from <http://www.ruralhome.org/storage/documents/rd538guaranteed.pdf>
- Housing Assistance Council. (2010, April). *USDA rural rental housing loans (Section 515)*. Retrieved June 13, 2011, from <http://www.ruralhome.org/information-and-publications/information-sheets/27-rd-programs/115-rural-rental-housing-section-515>
- Houtkoop-Steenstra, H., & Bergh, H. V. (2000). Effects of introductions in large-scale telephone survey interviews. *Sociological Methods and Research* , 281-300.
- HUD. (n.d.). *About HUD: Mission*. Retrieved May 25, 2011, from <http://portal.hud.gov/hudportal/HUD?src=/about/mission>
- HUD. (n.d.). *Fair market rents: Overview*. Retrieved May 27, 2011, from <http://www.huduser.org/portal/datasets/fmr.html>
- HUD. (n.d.). *Housing choice vouchers fact sheet*. Retrieved June 13, 2011, from HUD.gov: [http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/public\\_indian\\_housing/programs/hcv/about/fact\\_sheet](http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/hcv/about/fact_sheet)
- HUD. (n.d.). *Housing choice voucher program*. Retrieved May 25, 2011, from <http://portal.hud.gov/hudportal/HUD?src=/hudprograms/hcvp>
- HUD. (n.d.). *Supportive housing program*. Retrieved June 13, 2011, from HUD.gov: [http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/comm\\_planning/homeless/programs/shp](http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/homeless/programs/shp)
- HUD. (1996, November 1). *CPD Notice 96-07*. Retrieved June 3, 2011, from <http://www.hud.gov/offices/cpd/lawsregs/notices/1996/96-7.pdf>

- HUD. (2006). *Building HOME: A HOME program primer*. Retrieved June 13, 2001, from Homes & Communities: <http://www.hud.gov/offices/cpd/affordablehousing/training/materials/building/>
- HUD. (1999). *Waiting in vain: An update on America's rental housing crisis*. Washington DC: Department of Housing and Urban Development.
- HUD. (2007, July). *Fair market rents for the Section 8 housing assistance payments program*. Retrieved 5 2, 2011, from Hud.Gov: [www.huduser.org/datasets/fmr/fmrover\\_071707R2.doc](http://www.huduser.org/datasets/fmr/fmrover_071707R2.doc)
- HUD. (2008). *Homelessness Resource Exchange*. Retrieved June 13, 2011, from Supportive housing program desk guide: <http://www.hudhre.info/index.cfm?do=viewShpDeskguide>
- HUD. (2010, July 10). *HUD.gov*. Retrieved June 13, 2011, from Press release: HUD releases 2009 American Housing Survey: [http://portal.hud.gov/hudportal/HUD?src=/press/press\\_releases\\_media\\_advisories/2010/HUDNo.10-138](http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2010/HUDNo.10-138)
- Iannacchione, V. G., Staab, J. M., & Redden, D. T. (2003). Evaluating the use of residential mailing addresses in a metropolitan household survey. *Public Opinion Quarterly*, 202-210.
- 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.
- JCHSHU. (2001). *America's rental housing: Meeting challenges, building on opportunities*.
- Juster, F., & Smith, J. P. (1997). Improving the quality of economic data: Lessons from the HRS and AHEAD. *Journal of the American Statistical Association*, 1268-1278.
- Keeter, S., Kennedy, C., Dimock, M., Best, J., & Craighill, P. (2006). Gauging the impact of growing non-response on estimates from a national RDD telephone survey. *Public Opinion Quarterly*, 759-779.
- Kovar, J. G., Rao, J. N., & Wu, C. F. (1988). Bootstrap and other methods to measure errors in survey estimates. *The Canadian Journal of Statistics*, 25-45.
- Krosnick, J. A. (1991). Response strategies for coping with the cognitive demands of attitude measures in surveys. *Applied Cognitive Psychology*, 213-236.
- Krosnick, J. A., Holbrook, A. L., Berent, M. K., Carson, R. T., Hanemann, W. M., Kopp, R. J., et al. (2002). The impact of 'no opinion' response options on data quality: Non-attitude reduction or an invitation to satisfice? *Public Opinion Quarterly*, 371-403.
- Kupek, E. (1998). Determinants of item non-response in a large national sex survey. *Archives of Sexual Behavior*, 581-594.
- Link, M., Battaglia, M., Giambo, P., Frankel, M., Mokhad, A., & Rao, S. (2005). Assessment of address frame replacements for RDD sampling frames. *Paper presented at the 2005 American Association for Public Opinion Research Annual Conference*. Miami, FL.
- 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.
- National Cancer Institute. (2007). *Health information national trends survey*. Retrieved 2011 йил 5-May from <http://hints.cancer.gov/>
- NCSHFA. (2008). *State HFA factbook: 2006 NCSHA annual survey results*. Washington DC: National Council of State Housing Finance Agencies.

- Norman, G., & Sigman, R. (2009). Using addresses as sampling units in the 2007 Health Information National Trends Survey. *Proceedings of the Joint Statistical Meetings*, (pp. 4741-4752). Washington DC.
- Paulin, G. D., & Ferraro, D. L. (1994). Imputing income in the Consumer Expenditure Survey. *Monthly Labor Review*, 23-31.
- Pelletier, D. (2001). *Preliminary assessment of American Community Survey data shows housing affordability gap worsened for lowest income households from 2007 to 2008*. Retrieved May 11, 2011, from <http://www.nlihc.org/doc/Prelim-Assess-Rental-Affordability-Gap-State-Level-ACS-12-01.pdf>
- Peytchev, A., Carley-Baxter, L. R., & Black, M. C. (2011). Multiple sources of nonobservation error in telephone surveys: Coverage and non-response. *Sociological Methods & Research*, 138-168.
- Poe, G. S., Seeman, I., McLaughlin, J., Mehl, E., & Dietz, M. (1988). "Don't know" boxes in factual questions in a mail questionnaire. *Public Opinion Quarterly*, 212.
- Roese, N., Sanna, L., & Galinsky, A. (2005). The mechanics of imagination: Automaticity and control in counterfactual thinking. In U. J. Hassin RR (Ed.), *The new unconscious* (pp. 138–170). New York: Oxford University Press.
- Rubin, D. B., & Little, R. J. (2002). *Statistical analysis with missing data (2nd ed.)*. New York: Wiley.
- Schaeffer, N., Dykema, J., & Maynard, D. (2010). Interviewers and interviewing. In J. Wright, & P. Marsden (Eds.). Emerald Group Publishing.
- Schwabish, J. (2007). Take a penny, leave a penny: The propensity to round earnings in survey data. *Journal of Economic and Social Measurement*, 93-111.
- Schwarz, N., Bless, H. S., F., K. 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.
- Schwarz, N., Hippler, H. J., Deutsche, B., & Strack, F. (1985). Response scales: Effects of category range on reported behavior and comparative judgments. *Public Opinion Quarterly*, 388-395.
- Schwarz, N., Knäuper, B., Hippler, H. J., & Noelle-Neumann, E. (1991). Rating scales: Numeric values may change the meaning of scale labels. *Public Opinion Quarterly*, 570-582.
- Sherman, R. P. (2000). Tests of certain types of ignorable non-response in surveys subject to item non-response or attrition. *American Journal of Political Science*, 362.
- Shiffman, S. (2009). How many cigarettes did you smoke? Assessing cigarette consumption by global report, time-line follow-back, and ecological momentary assessment. *Health Psychology*, 519-526.
- Shoemaker, P. J., Eichholz, M., & Skewes, E. A. (2002). Item non-response: Distinguishing between don't know and refuse. *International Journal of Public Opinion Research*, 193-201.
- Singer, E. (2002). The use of incentives to reduce non-response in household surveys. In D. A. In R. M. Groves, *Survey Non-response* (pp. 163-177). New York: Wiley.
- 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.
- Staab, J. M., & Iannacchione, V. G. (2003). Evaluating the use of residential mailing addresses in a national household survey. *Proceedings of the Joint Statistical Meetings*, (pp. 4028-4033).

- Steffen, B. L., Keith, F., Martin, M., Teresa, S. M., Vandenbroucke, D. A., & Yao, Y. G. (2011, February). *Congress, worst case housing needs 2009: Report to Congress*. Retrieved May 10, 2011, from <http://www.huduser.org/portal/Publications/pdf/WorstCaseNeeds2009Summary.pdf>
- Thompson, K., & Sigman, R. (2000). Estimation and replicate variance estimation of median sales prices of sold houses. *Survey Methodology* , 153-162.
- Tourangeau, R., & Smith, T. W. (1996). Asking sensitive questions: The impact of data collection mode, question format, and question context. *Public Opinion Quarterly* , 275-304.
- Tourangeau, R., Rips, L., & Rasinski, K. (2000). *The Psychology of Survey Response*. Cambridge University Press.
- US Census Bureau. (2007). *American housing survey for the United States*. Retrieved June 13, 2011, from Table 4-3: Size of Unit and Lot in Renter Occupied Units: <http://www.census.gov/hhes/www/housing/ahs/ahs07/ahs07.html>
- US Census Bureau. (2009). *Table 4-3: Size of unit and lot in renter occupied units*. Retrieved June 13, 2011, from American Housing Survey for the United States: <http://www.census.gov/hhes/www/housing/ahs/ahs09/ahs09.html>
- Weisberg, H. F. (2005). *The Total Survey Error Approach: A Guide to the New Science of Survey Research*. Chicago, IL: University of Chicago Press.
- Winter, J. (2004). Response Bias in Survey-Based Measures of Household Consumption. *Economics Bulletin* , 1-12.
- Wood, M. (2005). Application of a test for evaluating ignorability of missing survey income data. *Conference Papers -- American Sociological Association*, (pp. 1-16).
- Yan, T., & Tourangeau, R. (2008). Fast times and easy questions: The effects of age, experience and question complexity on Web survey response times. *Applied Cognitive Psychology* , 51-68.

APPENDIX A: MAIL SURVEY INSTRUMENT

<p><b>1. Is this house, apartment, or mobile home –</b></p>	<p><input type="checkbox"/> Rented  <input type="checkbox"/> Occupied without payment of rent  <input type="checkbox"/> Owned by you or someone in this household with a mortgage or loan  <input type="checkbox"/> Owned by you or someone in this household free and clear (without a mortgage or loan)  <input type="checkbox"/> This is <b>NOT</b> a residential house, apartment, or mobile home.</p>
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**If you checked “Rented” please continue to QUESTION 2.**

**If you checked any other box, you’re done! Please return the survey in the envelope provided.**

<p><b>2. How long have you lived at this house, apartment or mobile home?</b></p>	<p><input type="checkbox"/> Less than 2 years  <input type="checkbox"/> 2 years or more</p>
<p><b>3. If this house, apartment, or mobile home were on the market for sale or rent, how many bedrooms would you say it has?</b></p>	<p><input type="checkbox"/> No bedrooms; it is an efficiency or studio  <input type="checkbox"/> 1 bedroom  <input type="checkbox"/> 2 bedrooms  <input type="checkbox"/> 3 bedrooms  <input type="checkbox"/> 4 or more bedrooms</p>
<p><b>4 Which best describes this building?</b></p>	<p><input type="checkbox"/> A mobile home  <input type="checkbox"/> A one-family house detached from any other house  <input type="checkbox"/> A one-family house attached to one or more houses – for example, a townhouse or rowhouse  <input type="checkbox"/> A building with 2 to 4 apartments  <input type="checkbox"/> A building with more than 5 apartments  <input type="checkbox"/> Other (<i>please specify</i>)</p> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p><i>Other (please specify)</i></p> </div>
<p><b>5. Was this house, apartment or mobile home built within the last two years?</b></p>	<p><input type="checkbox"/> Yes, it was built within the last two years  <input type="checkbox"/> No, it is more than two years old</p>
<p><b>6. Do you or does any member of this household live or stay at this address year round?</b></p> <p><i>If this is your vacation or seasonal home, apartment, or mobile home where you do not live year round, please select “No”.</i></p>	<p><input type="checkbox"/> Yes  <input type="checkbox"/> No</p>
<p><b>7. Is this house, apartment, or mobile home owned by a relative?</b></p> <p><i>If this home, apartment, or mobile home is owned by your spouse or another individual living at this address then please select “No.”</i></p>	<p><input type="checkbox"/> Yes  <input type="checkbox"/> No</p>
<p><b>8. Do you do any work for your landlord so you can pay less rent?</b></p>	<p><input type="checkbox"/> Yes  <input type="checkbox"/> No</p>

\*\*\*BARCODE\*\*\*\*





**If you checked “Yes, utilities are included in the rent,” skip to QUESTION 28.**

**If you checked “No”, please continue to QUESTION 18.**

<p><b>18.</b> Is the cost of <u>heating</u> included in the rent, or do you pay separately for heat?</p>	<p><input type="checkbox"/> Heat is included in the rent  <input type="checkbox"/> Pay separately for heat  <input type="checkbox"/> Your home does not have heat</p>
<p><b>18a.</b> Which FUEL is used MOST for heating this house, apartment, or mobile home? (<i>check one</i>)</p>	<p><input type="checkbox"/> Gas: from underground pipes serving the neighborhood  <input type="checkbox"/> Gas: bottled, tank, or LP  <input type="checkbox"/> Electricity  <input type="checkbox"/> Fuel, oil, kerosene, etc.  <input type="checkbox"/> No fuel used  <input type="checkbox"/> Other fuel (<i>please specify</i>)</p> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p><i>Other (please specify)</i></p> </div>
<p><b>19.</b> Is <u>air conditioning</u> included in the rent, or do you pay separately for air conditioning?</p>	<p><input type="checkbox"/> Air conditioning is included in the rent  <input type="checkbox"/> Pay separately for air conditioning  <input type="checkbox"/> Your home does not have air conditioning</p>
<p><b>19a.</b> Which FUEL is used MOST for <u>air conditioning</u> this house, apartment, or mobile home? (<i>check one</i>)</p>	<p><input type="checkbox"/> Gas: from underground pipes serving the neighborhood  <input type="checkbox"/> Gas: bottled, tank, or LP  <input type="checkbox"/> Electricity  <input type="checkbox"/> No fuel used  <input type="checkbox"/> Other fuel (<i>please specify</i>)</p> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p><i>Other (please specify)</i></p> </div>
<p><b>20.</b> Is <u>cooking fuel</u> included in the rent, or do you pay separately for cooking fuel?</p>	<p><input type="checkbox"/> Cooking fuel is included in the rent  <input type="checkbox"/> Pay separately for cooking fuel  <input type="checkbox"/> Your home does not have cooking facilities</p>
<p><b>20a.</b> Which FUEL is used MOST for <u>cooking fuel</u> in this house, apartment, or mobile home? (<i>check one</i>)</p>	<p><input type="checkbox"/> Gas: from underground pipes serving the neighborhood  <input type="checkbox"/> Gas: bottled, tank, or LP  <input type="checkbox"/> Electricity  <input type="checkbox"/> No fuel used  <input type="checkbox"/> Other fuel (<i>please specify</i>)</p> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p><i>Other (please specify)</i></p> </div>
<p><b>21.</b> Is <u>hot water</u> included in the rent, or do you pay separately for cooking fuel?</p>	<p><input type="checkbox"/> Hot water is included in the rent  <input type="checkbox"/> Pay separately for hot water  <input type="checkbox"/> Your home does not have hot water</p>
<p><b>21a.</b> Which FUEL is used MOST for <u>cooking</u> in this house, apartment, or mobile home? (<i>check one</i>)</p>	<p><input type="checkbox"/> Gas: from underground pipes serving the neighborhood  <input type="checkbox"/> Gas: bottled, tank, or LP  <input type="checkbox"/> Electricity  <input type="checkbox"/> No fuel used  <input type="checkbox"/> Other fuel (<i>please specify</i>)</p> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> <p><i>Other (please specify)</i></p> </div>

