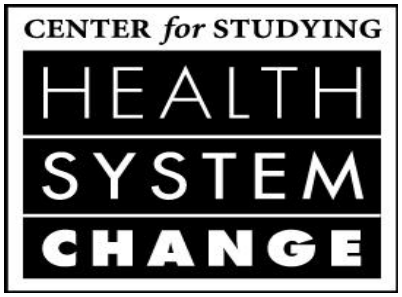
Community Tracking Study

Household Survey Methodology Report
2007 (Round Five)



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I. OVERVIEW

A. OBJECTIVES OF THE COMMUNITY TRACKING STUDY

The Community Tracking Study (CTS) has been the core research effort of the Center for Studying Health System Change (HSC), a nonpartisan policy research organization in Washington, D.C., that is funded in part by the Robert Wood Johnson Foundation (RWJF) and is affiliated with Mathematica Policy Research, Inc. HSC's mission is to inform health care decision makers about changes in the health care system at the local and national levels, as well as how such changes will affect people. Since 1995, HSC has conducted five rounds of household and physician surveys; an employer survey was conducted for the first round but discontinued for subsequent rounds. In addition, HSC conducted interviews with health care leaders in 12 communities for rounds one through four.

The first four rounds of CTS surveys were focused on 60 nationally representative communities stratified by region, community size, and whether metropolitan or nonmetropolitan. In addition, the CTS examined 12 of the 60 communities in depth by conducting site visits and using survey samples large enough to draw conclusions about health system change in each community. The 12 communities make up a randomly selected subset of sites that are metropolitan areas with more than 200,000 people (as of July 1992).

For the fifth round of the household and physician surveys the community-based design was replaced by a national-sample design, although site visits continue to focus on the 12 communities (6 rounds of site visits have been completed, with the latest occurring in 2007). To reflect the change from a community-based to national sample, the round five Household Survey

is referenced as the 2007 Health Tracking Household Survey in HSC publications and journal articles.

B. THE ROUND FIVE HOUSEHOLD SURVEY

The first three rounds of the Household Survey included about 60,000 people in 33,000 families. For round four (2003), the sample consisted of about 47,000 people in 25,000 families. With the shift from the clustered 60-site community-based to a national sample design for round five, the sample could be substantially reduced. Round five interviews were conducted between April 2007 and February 2008 with 17,797 people in 9,407 family insurance units (FIUs). The household-level response rate was 47.2 percent and the FIU-level response rate was 43.5 percent.

The fifth round of the Household Survey asks about health insurance, use of health services, medical costs and affordability of care, perceptions of care delivery and quality, satisfaction with care, consumer-directed health care, health status, factors affecting health care choices, and demographic information. After contacting selected households, we determined the composition of each household, grouped household members into FIUs, and obtained information about each adult and one randomly selected child in the FIU. The FIU is based on groupings of people typically used by insurance carriers. It includes an adult household member, spouse, and dependent children up to age 18 (or ages 18 to 22 if the child is in school). A family informant provided information on most topics for each adult in the FIU and one randomly selected child. In addition, each adult answered subjective questions that a proxy respondent could not answer reliably. A Spanish version of the instrument was used when appropriate. The survey was administered by computer-assisted telephone interview (CATI).

This report describes the design and conduct of the fifth round of the household survey. HSC provides technical direction and oversight, and Mathematica Policy Research, Inc. (MPR)

is responsible for sample design, data collection, sample weights, and variance estimation for the household surveys. Social and Scientific Systems, Inc. (SSS) converted the raw survey data into an analysis file. MPR and SSS collaborated with HSC to prepare the documentation for the public and restricted use files. Documentation of rounds one through four are available on HSC's Web site (Technical Publications 15, 34, 46, and 62, respectively, at www.hschange.org) as well as on the Interuniversity Consortium for Political and Social Research (ICPSR), at http://www.icpsr.umich.edu/.

Users of the round five Household Survey may also wish to review the Household Survey public use file or restricted use file user's guide for round five (forthcoming), which provides less detail than this document on the technical aspects of survey data collection and survey weight construction, but provides additional information of particular relevance to the data users, on topics such as data editing and imputation. In this report, we discuss the sample design of the round five survey (Chapter II), survey design and preparation (Chapter III), data collection (Chapter IV), and sample weighting (Chapter V). The appendixes present the survey instruments (Appendix A), advance materials mailed to surveyed households (Appendix B), and training manual (Appendix C).

II. SAMPLE DESIGN

Several changes were made to the sample design of the fifth round of the Household Survey. The first three rounds of the Household Survey were administered to households in the 60 CTS communities, which were designed to be nationally representative, and to an independent national sample of households, referred to as the "national supplement." The purpose of the supplemental sample was to increase the precision of national estimates. The national supplement was dropped for round four after analyses indicated that dropping the supplement would not reduce the range of analytic questions that the survey could address. Each of the first three rounds of the Household Survey included about 60,000 people in 33,000 FIUs; round four consisted of 46,587 people in 25,419 FIUs. For round five, HSC replaced the 60-site community-based design with a design to produce only national estimates, which allowed for substantial reductions in sample size due to the elimination of clustering at the site level. Overall, 17,797 people in 9,407 FIUs were interviewed in round five. In addition, the overlap sample, which was used to increase the precision of estimates of change, was dropped in the absence of the community samples from the prior round; the field component was deleted to reduce cost, and unmarried *domestic* partners were included in the same FIU.

The Household Survey, like most other surveys based on RDD methods, has excluded households with only wireless telephones since round one, except for wireless households included in the in-person supplement in rounds one through four. As the fraction of the U.S. population living in wireless-only households increases, population coverage provided by the RDD sample frame is reduced.

In the following sections, we discuss changes in sample design between prior rounds and round five and the impact of the exclusion of cell-only households, procedures for selecting the round five RDD sample, and the process for forming households and families and selecting individuals.

A. CHANGES IN SAMPLE DESIGN AND COVERAGE FOR ROUND FIVE

1. National sample design. The sample design used in rounds one through four was designed to support both community level and national level analyses. However, selecting a sample of 60 communities resulted in considerable loss of precision due to clustering compared with a national sample. (Procedures for selecting the community based samples in rounds one through four are discussed in Technical Publications 15, 34, 46, and 62, respectively, at www.hschange.org). To reduce the cost of data collection in round five, we decided to drop the community-based design and only support national estimates. Since the sample was no longer clustered in 60 communities, we were able to reduce the nominal sample size from roughly 46,000 to 18,000 individuals and still have sufficient sample sizes to track changes between rounds at the national level.

2. Overlap Sample. For rounds two through four, part of the sample was selected from telephone numbers included in the prior round (overlap sample) and part from telephone numbers selected for the first time (new sample). This decision was made to increase the precision of estimates of change between rounds. In addition, the overlap sample slightly increased response rates and reduced data collection costs because individuals and families surveyed in prior rounds were much more likely to agree to participate in subsequent rounds than were those who had not been contacted before. On the other hand, the use of the overlap sample increased the complexity and cost of sample weighting and variance estimation. Since we

dropped the community-based sample design for round five, the overlap sample was not feasible for round five because there was a very small likelihood that telephone numbers sampled for the 60 communities would be selected in an independent national sample.

3. The field component. The purpose of the field component used in the first four rounds of the Household Survey was to represent households with no or intermittent landline telephone access. Representing individuals living in these households was important because they were lower income and were less likely to be insured or have access to health care services than the rest of the population. Although the field component was not designed to represent individuals who had cell phones but did not have landline service, such individuals were becoming more common during the third and fourth rounds of the Household Survey. The field interviews were conducted in 12 communities (the high intensity sites) that were randomly selected from the 48 CTS communities representing MSAs that in 1992 had a population of at least 200,000 persons.[1]

Since the field interviews were far more costly than RDD interviews, Touzani and Hall (2004) investigated whether the field component significantly reduced bias in key tracking variables by comparing weighted estimates for the RDD and field components. Data were compared for the first and third rounds of the Household Survey. Omitting the field component would have biased sample estimates for nearly all characteristics examined for both rounds one and three of the survey. The potential bias was largest in measures of health insurance coverage.

[1] Households included in the field component were selected using area probability methods. Individuals within sampled households were screened by interviewers during a personal visit to determine eligibility (reporting an interruption in telephone service of at least 2 weeks in the last 12 months). The field interviewers were provided with cellular telephones, which were used to contact a central interviewing facility, after which they handed the cell phone to the respondent who was interviewed by a trained interviewer.

The cost of the field component made it impractical for round five, which was not site-based. To represent households without landline telephone service, we asked telephone survey respondents whether they had a significant interruption in telephone service in the 12 months before the interview and used questions about the length of interruptions to adjust sample weights. We defined *significant interruption* to mean two weeks or more of interrupted service in the 12 months before the screening interview (or since the date the household moved, if the move occurred after we started data collection for the RDD sample) and used questions about the length of interruptions to adjust sample weights (discussed below in Chapter V). This method has been used in many RDD surveys to adjust for the absence of non-telephone households (Keeter, 1995; Brick et al., 1996).

4. Unmarried domestic partners. For the first four rounds of the household survey, domestic partners (same-sex partners and other unmarried partners) formed separate FIUs. Because more health insurance policies now cover domestic partners, they were put into the same FIU for round five. The impact of this change is that one domestic partner can report on another's health insurance, employment, and income, just as a married partner could report on a spouse. It is likely that domestic partner awareness of these issues is similar to that of spouses and will not affect tracking. Since subjective questions on health status and attitudes toward health and health care are asked of each individual, those questions are unaffected by the change.

5. Cell Phone Coverage. Various studies have shown that the fraction of the U.S. wireless-only population has been rapidly growing in recent years, increasing the risk of bias to the extent that individuals in wireless-only households differ from those in landline households. Estimates from the 2007 National Health Interview Survey (NHIS) (which overlaps the field period for the round five Household Survey) indicated that between 13 and 17 percent of the U.S. population

were excluded from the RDD sample frame because they lived in wireless-only households (Blumberg and Luke, 2007, 2008).[2] Based on data from the 2006 NHIS, individuals living in wireless-only households are more likely to be young, living in low-income households, renting rather than owning their homes, and living alone or with roommates. Since wireless-only adults are more likely to be young and poor, it is not surprising that the NHIS data showed that these adults are more likely to be uninsured and less likely to have a usual place for medical care. They also are more likely to be binge drinkers, smokers, and HIV positive and less likely to be obese or diabetic than adults in landline households (Blumberg, Luke, and Cynamon, 2006; Blumberg and Luke 2007).

A key question for health care surveys like the Household Survey is whether the exclusion of wireless-only households (as well as the roughly three percent of households with no telephone service of any kind) is likely to bias survey estimates. Research based on the NHIS suggests that the magnitude of potential biases for estimates of health care service use and health status for all adults is less than two percentage points, when data are weighted to control for demographic differences between respondents and nonrespondents. (Blumberg et al, 2007, Blumberg, Luke, and Cynamon, 2006).[3] Nevertheless, as the percentage of the population in

[2] See: http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200712.pdf and http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200805.pdf

[3] Even for 2006 NHIS analyses that are limited to subgroups that are more likely to live in wireless only households (young adults, poor adults, and young and poor adults), Blumberg and Luke (2007) indicated that measures of access to care that are based only on landline households are unbiased or differ by less than one percentage point from the total subgroup population after adjusting for demographic differences.[3] Blumberg and Luke (2007) conclude that with appropriate weighting and demographic controls landline surveys of health conditions, such as asthma, diabetes, and measures of psychological distress, and health insurance may be able to ignore biases resulting from the exclusion of wireless-only households, even when focusing on subgroups with high wireless penetration.

wireless-only households grows, as is expected, the threat of biased estimates for the types of health care measures included in Household Survey may increase over time.

B. RDD SAMPLE SELECTION

In this section, we describe the sampling frame used to select the RDD sample. We then discuss stratification, sample allocation, and generation and release of the RDD sample

1. Sampling Frame

We used the Genesys Sampling System to select the RDD household samples.[4] To develop a sampling frame for a county or group of counties, Genesys first assigns each area code/exchange combination to a unique county.[5] Assignment is based on the addresses of published telephone numbers; a published number is one that appears in a regular ("White Pages") telephone company directory. An exchange is assigned to the county by the plurality of such addresses. Each county is in turn part of a state. Because the round five sample was not site-based like previous rounds, we stratified the frame of U.S. telephone numbers by census region and metropolitan status. We first stratified the sample of telephone numbers by metro vs. non-metro status, and then among the metro numbers by the four census regions: northeast, south, Midwest, and west. We proportionally allocated the sample so that telephone numbers in each of the five strata had the same probability of selection. Within each set of area code/exchange combinations, Genesys selected telephone numbers from working banks. A

4 Marketing Systems Group, 565 Virginia Drive Fort Washington, PA 19034 (p)215-653-7100 (f)215-653-7114 , www.m-s-g.com. http://m-s-g.com/genesys/genesyshme.htm

[5]In the 10-digit telephone numbering system used in the United States (XXX-YYY-ZZZZ), the first three digits (XXX) are referred to as the area code, and the next three (YYY) as the exchange.

working bank is defined as a set of 100 consecutive telephone numbers (XXX-YYY-ZZ00 to XXX-YYY-ZZ99) in which one or more numbers is a published residential number.

2. Sample Selection and Release

We obtained five list-assisted RDD samples during data collection, using Genesys software, from Marketing Systems Group (MSG). Each of the five samples was divided into random replicates to allow for staged releases, although all replicates were ultimately released. After each sample was drawn, we had MSG determine whether sampled telephone numbers were residential (published or non-published), nonresidential (business, fax, modem), cell phone, or nonworking. Only residential telephone numbers were retained. Each release was then checked against prior releases to remove any duplicate selections. We then had MSG attempt to match each phone number to an address. Those not matched to an address were sent to additional vendors (Accurint and Masterfile) for address matching. Among the 34,875 telephone numbers sampled, screened, and released for calling, we were able to match an address to 49 percent.

Each sample was then divided into subsamples of those with matched addresses (by vendor) and those without addresses. Those without addresses were then released to the automatic call scheduler (discussed in Chapter IV) which controlled the release of cases to interviewers. Those with addresses were sent advance mailings (also discussed below), and then released to the call scheduler about one week later.

The telephone numbers in each RDD sample release were randomly sorted before being released, as Genesys samples are ordered by area code and exchange. The initial sample was released during April of 2007 and subsequent samples were released to meet the data collection schedule, interviewer labor supply, and adjust to response rates. The round five sample release schedule and numbers of telephone numbers in each release is shown below:

1. April 2007- 7,394
2. May 2007- 7,326
3. June 2007- 7,353
4. August 2007-10,469
5. November 2007-2,153

Total- 34,875

The automatic scheduler and data collection reports (discussed in Chapter IV) were used to control and monitor production.

C. HOUSEHOLD, FIU, AND INDIVIDUAL SELECTION

1. Households

At the beginning of the interview, a household informant was identified and asked about the composition of the household. Typically, the household informant was the person who answered the telephone, if he or she was an adult age 18 or older. The person who owned or rented the house was identified as the head of the household, or the householder. People who usually lived in the household but who were temporarily living elsewhere, such as college students, were included in the household enumeration.

2. FIUs

The CATI program grouped people in the household into one or more FIUs. It did this to ensure that a knowledgeable informant would be able to answer questions about each family member's health insurance coverage, use of health resources in the 12 months preceding the interview, and usual source of health care. The FIU also provided information on family income and on the employment, earnings, health insurance plan, and race or ethnicity of each adult in the FIU. An FIU reflects family groupings typically used by insurance carriers and is similar to the

filing unit used by Medicaid and state-subsidized insurance programs. The FIU includes an adult household member, his or her spouse, if any, and any dependent children up to age 17, or 18 to 22 years of age if a full-time student (even if living outside the household).[6] For rounds one through four, domestic partners (same-sex partners and other unmarried partners) were assigned to separate FIUs. Because more health insurance policies now cover domestic partners, they were put into the same FIU.

All FIUs were selected to participate in the rest of the interview as long as the FIU contained at least one civilian adult.[7] In each FIU, one informant was responsible for providing much of the information about the family and its members. Figure II.1 shows how one household of seven people could be divided into three FIUs. In this example, the household head's spouse is the household informant because the spouse answered the telephone and is familiar with the composition of the household. The spouse is also familiar with the health care of the head of household and their children, so the spouse is also the informant for the first FIU (FIU1). The household head's father is the informant for the second FIU (FIU2), and the unrelated boarder responds for himself or herself (FIU3). The household head's daughter is the randomly selected child in FIU1, and the household head's son is not included in the survey. The use of separate FIU informants ensures that survey respondents provide information about the health experiences of family members usually covered under the same health insurance plan. The main

[6]The CTS's definition of FIU differs from the Census Bureau's definition of a family, which includes all people living in the dwelling who are related to the householder by blood or by marriage. The Census family often is larger than an FIU. Adult relatives living in one household would be included in a Census primary family but would be assigned to separate FIUs for the CTS Household Survey.

[7]People who were not on active military duty at the time of the interview were considered to be civilians.

exception is families in which spouses are covered under separate plans. Here, we allowed the FIU informant to answer for his or her spouse's plan.

FIGURE II.1

EXAMPLE OF FAMILY INSURANCE UNITS IN A HYPOTHETICAL HOUSEHOLD

Members of Household	FIU
Head of Household Head of Household's Spouse (Informant for HH and FIU1) Head of Household's Daughter (Selected) Head of Household's Son (Not Selected)	FIU 1
Head of Household's Father (Informant for FIU2) Head of Household's Mother	FIU 2
Unrelated Boarder	FIU 3

3. Individuals

The FIU informant answers questions about the FIU and about the health care situation and experiences of each adult FIU member and about one child (if the FIU included children). For FIUs containing more than one child, one was randomly selected.[8] (A "child" was defined as an unmarried individual younger than 18.) Full-time students age 18 or older were treated as adults in the survey; that is, they were asked all the questions asked of adults and could not be the randomly selected child.

Each adult in the FIU (not just the informant) was also asked to self-respond to questions that could not be reliably answered by another member of the family; these questions are described below in Chapter III.

4. Individuals Excluded from the Survey

The CATI survey instrument imposed a maximum of eight people per household for inclusion in the survey. The household informant identified all members of the household; in the rare instance of a household with more than eight people, interviewers were instructed to first list all the adults in the household, and then list as many children as possible up to the maximum.

Some household members were classified as ineligible and were not included on the file. To avoid giving unmarried full-time college students multiple chances of selection, they were excluded from sampled dwellings in which their parents did not reside. Unmarried children younger than age 18 with no parent or guardian in the household also were excluded. Adults on active military duty were classified as ineligible; however, they could have acted as an FIU informant if there was at least one civilian adult in the family. FIUs in which all adults were active-duty military personnel were considered ineligible for the survey.

Some FIUs (those listed by, but not including, the household informant) did not respond to the interview. Nonresponding FIUs were excluded from the file but were statistically represented by responding FIUs in the weighting process. Adult family members who did not respond to the self-response module were included on the file if the core interview contained responses for them; however, a separate weight was constructed for the self-response module that accounts for these types of nonrespondents.

III. SURVEY DESIGN AND PREPARATION

A. OVERVIEW

The Household Survey is the primary instrument for tracking changes in health insurance coverage, access to care, affordability of medical care, use of health services, perceptions of care delivery and quality of care, and consumerism in health care. . As described in Chapter II, the FIU is the primary interviewing unit for the survey, with selected subjective questions also asked of each adult FIU member. Within each FIU, questions are asked about all adults and about one randomly selected child. An adult familiar with the health care experiences of the people in the FIU is the informant for other adults on questions about health insurance, employment, demographics, and health services use during the 12 months preceding the survey. Each adult in the FIU (including the informant) also is asked to self-respond to questions that the FIU informant would not be able to answer, for example, questions on health status, chronic diseases, risk behavior, health care quality, and opinions. The adult who knows the most about the health care of the randomly selected child was asked questions about the child's health and health care.

The length of the interview varied with the number of people in the FIU and the complexity of their experiences with health care. The round five core interview, which is asked of the family informant, averaged 31 minutes, and the self-response module averaged 20 minutes, a level of burden that is comparable to round four.

B. INSTRUMENTATION

1. Household Survey

The survey instruments for all four rounds were developed by staff at HSC and MPR, with consultation and review by several experts.[9] Respondents to the round five survey were questioned about the following topics:

- Household composition
- Health insurance coverage
- Use of health services
- Access to health care
- Medical costs and affordability
- Perceptions of care delivery and quality
- Consumerism and health care
- Health Status, including chronic conditions, risk behaviors, and body mass index
- Employment, earnings, and income
- Demographic characteristics

The content of the round five survey is shown in Table III.1 and an English version of the entire questionnaire is shown in Appendix A; a Spanish version is available upon request to HSC. We made substantial additions to the questionnaire, including enhanced information on medical debt, use of retail clinics, coordination of care, perceptions of quality for persons with chronic conditions, consumer engagement, information seeking behavior, consumer use of information technology, and consumer shopping for health care (new questions are shown in italics in Table III.1). We dropped a number of questions that had been included on prior rounds because they were rarely used, had been superseded by other variables, had small samples, or no

[9]See Chapter III in Technical Publications 15, 34, 46 and 62 respectively, for a discussion of the initial instrument design and changes made for prior rounds.

longer had a high analytic priority. (These questions are shown in Table III.2.) New questions were cognitively tested and the instrument was pretested to evaluate skip patterns, interviewer comprehension, and respondent burden.

Different respondents were asked different questions, and not all questions were asked of all respondents (see Table III.3). For example, only the household informant was asked about household composition. Family informants were asked to answer questions about the family and individual family members. Each adult also provided information on topics that the informant could not provide, such as unmet need for medical care, health status, chronic diseases, risk behaviors, and opinions. If the family had children younger than age 18, the adult who knew the most about the sampled child's health care answered questions for him or her.

TABLE III.1
CONTENT OF THE ROUND FIVE HOUSEHOLD SURVEY
(New questions are in italics)

Health Insurance	
Private insurance coverage (Section B)	Covered by employer- or union-related private insurance Premium contribution for employer-sponsored insurance Covered by other private insurance: Purchased directly Premium for directly purchased private insurance *Covered by non-group insurance* *Duration of coverage under non-group plan* Prescription drug coverage *Whether enrolled in a consumer directed health plan (CDHP)* *Deductible amount* *Participation in a flexible spending account for health expenses* *Participation in a health reimbursement account* Whether plan is an HMO Provided by someone not in household
Public insurance coverage (Section B)	Covered by Medicare *Enrolled in Medicare Advantage HMO or non-HMO plan* *Prescription drug coverage through Medicare Part D* Covered by both Medicare and supplemental private insurance Premium for supplemental private insurance Covered by both Medicare and Medicaid Covered by Medicaid *Premium for Medicaid and/or SCHIP coverage* Enrolled in Medicaid HMO plan Covered by other public insurance (military, Indian Health Service, other state and local)
Uninsured (Section B)	Not covered by public or private insurance
Continuity of coverage/ changes in coverage (Section B)	Currently insured; lost coverage in past 12 months Currently uninsured; obtained coverage during previous 12 months Uninsured during all of past 12 months Uninsured at some point during the previous 12 months Reasons for losing health insurance coverage Any type of change in health coverage: Changed private insurance plans Reasons for changing private plans Changed from public or private plans Obtained or lost coverage

Access to Health Care	
Usual source of care (Section D)	Currently has/does not have a usual source of care Type of place of usual source of care Type of professional seen at usual source of care
Knowledge and Use of the Safety Net (Uninsured only) (Section D)	Whether usual source of care offers reduced fees Whether a safety net provider practices in the area Safety net provider's practice setting Travel time to safety net Safety net provider visit in the last 12 months
Difficulty getting needed services in past year (Section C)	Did not get needed services [a] Delayed getting needed medical services or prescription medicines [a] Reasons for delaying or not getting needed services [a]
Language barriers to care	Frequency with which person had difficulty understanding/communicating with physician because of language
Medical Costs and Problems paying medical bills (Section C)	Total family out-of-pocket expenses for health care during previous 12 months Problems paying for medical bills during the previous 12 months • Impact of medical bill problems on family finances (Contacted by collection agency; problems paying for necessities; put off purchases; used savings; had to borrow; filed for bankruptcy; been denied medical care *Amount of medical debt* *Cause of medical debt/ problems paying bills* *Insurance status at time debt-related expenses incurred* *Assistance from health care provider for paying medical bills* *Anticipated duration to pay off all current medical debt*
Resource Use	
Use of ambulatory services in past 12 months (Section C)	Number of physician visits Number of emergency room visits Number of visits to nonphysician providers (nurse practitioner, physician assistant, midwife) *Visit to a retail clinic* *Purpose of visit* *Factors in choosing retail clinic* *Health insurance coverage for visit* Waiting time between making appointment and seeing doctor [a]
Use of inpatient services in past 12 months (Section C)	Number of overnight hospital stays Number of overnight hospital stays excluding delivery/birth Number of inpatient medical treatment Total number of nights spent in hospital

Health Care Quality	
Coordination of Care (asked only of persons with chronic conditions) (Section C)	*How well do doctors work together to manage patients health care* [a] *Does PCP seem informed about care received from specialists* [a] *After seeing specialist, does PCP talk to you about your visit with specialist* [a]
Perceptions of Quality (asked of persons with chronic conditions) (Section C)	*In past 12 months when discussing your condition and its treatment with your health care providers how often did they:* [a] *Explain things in a way you could understand* *Spend enough time with you* *Treat you with respect and dignity* *Help you set specific goals to improve your diet* *Help you set goals for exercise* *Teach you how to monitor your condition so you could tell how you are doing* *Read side effects of new prescription medications* [a] *Received call from physicians to check in on management of chronic condition in past 6 months* [a]
Satisfaction with Care	
General satisfaction (Section E)	Overall satisfaction with health care received by family Satisfaction with choice of primary care doctors [a] Satisfaction with choice of specialists [a]
Consumerism and Health Care	
Consumer Engagement (PAM 13 scale) (Section E)	*Agreement (5-point scale) with statements about personal health*[a, c]*:* • *Taking an active role in my own health care is the most important factor in determining my health and ability to function.* *When all is said and done, I am the person who is responsible for managing my health condition.* *I know what each of my prescribed medications does.* *I am confident that I can follow through on medical treatments I need to do at home.* *I am confident that I can tell when I need to go get medical care and when I can handle a health problem myself.* *I am confident that I can take actions that will help prevent or minimize some symptoms or problems associated with my health condition.* *I understand the nature and causes of my health condition(s).* *I know the different medical treatment options available for my health condition.* *I have been able to maintain the lifestyle changes for my health that I have made.* *I am confident I can figure out solutions when new situations or problems arise with my health condition.* *I am confident that I can maintain lifestyle changes like diet and exercise even during times of stress.*
Information seeking behavior (Section E)	Sought health information for a personal health concern[a] Sought health information for child's health concern Obtained info from Internet, family/friends, books, magazines, or media, *Brought information to doctor during health encounters* *Perceived effect of information on:*

	Their own approach to maintaining health *Course of treatment for an illness or condition* *Sought health information for another adult (family, friend)* [a]
Information Technology *(Section E)*	*Frequency of use of Internet or World Wide Web*[a] *Communication with doctor's office via Internet to:* [a] *Renew prescription* *Schedule appointment* *Discuss health problem* *See results of diagnostic test, medical history* *Get reminders for upcoming appointment* *Communicate with doctor's office on behalf of a child*
Consumer "Shopping" for Health Care *(Section E)*	*Looked for new personal doctor, new specialist, facility for a procedure in previous 12 months*[a] *Sources used to look for new personal doctor/specialist facility* *Used reports to compare costs* *Used reports to compare quality and performance* *Factors used in choosing a new doctor/ specialist/ facility*[a] *Cost of care; recommendation of doctor; reputation; short wait time for appointments; location; in health plan's network*
Consumer preferences (Section B)	Whether person would be willing to accept limited provider choice in order to save on out-of-pocket expenses [a]
Employment and Earnings	
Employment status and Characteristics (Section F)	Whether adult respondent has the following characteristics: Owned a business or farm Worked for pay or profit in the past week Had more than one job or business Worked for private company/government/self-employed/family business Average hours worked per week, at primary job and at other jobs Size of firm (number employees), at site where respondent works; at all sites Type of industry
Earnings (Section F)	Earnings, from primary job and from all jobs
Health insurance options at Place of employment (Sections B and F)	Whether eligible for health insurance coverage by employer Reasons for ineligibility Whether offered health insurance coverage by employer Reasons for declining coverage (if eligible but not covered) Whether offered multiple plans
Other Variables	
Demographics (Section A)	Age Gender Highest education level completed Whether the interview was administered in Spanish CTS Site State County (Restricted Use File only)

	Citizenship Length of time in country Race/ethnicity Country of origin/ancestry for Hispanic ethnicity
Health status (Section E)	Overall health status (5-point scale from excellent to poor) [a]
Chronic conditions (Section E)	Presence of chronic conditions including recent childbirth, abnormal uterine bleeding, diabetes or high blood sugar, arthritis, asthma, chronic obstructive pulmonary disease, hypertension or high blood pressure, coronary heart disease, skin cancer, benign prostate disease, or depression.[a, b] For children, repeated ear infections, ADHD, and asthma
Family income (Section G)	Family Income
Risk behaviors (Section E)	Whether person agrees that he/she is more likely to take risks than the average person [a] Whether person has smoked at least 100 cigarettes in lifetime [a] Whether currently smoking cigarettes every day, some days or not at all [a]
Body Mass Index (BMI) (Section E)	Weight without shoes [a,] Height without shoes [a,]

Note: New or changed questions shown in italics

[a] Information was obtained from self-response module.

[b] Available on the Restricted Use File only

[c]Patient Activation Measure (Hibbard et al., "Development of the Patient Activation Measure: Conceptualizing and Measuring Activation in Patients and Consumers," *Health Services Research* 39:4, Part 1; 1005-1026 (August 2004).

TABLE III.2

CUTS TO THE ROUND FIVE HOUSEHOLD SURVEY

ITEM	QUES #	TARGET SAMPLE	NEW TO R4?	TRACKING ITEM?	REASON FOR CUTTING
SECTION B. HEALTH INSURANCE COVERAGE					
Plan identifying information (except for plan name)	b2311-b23151, b2611-b26b	Privately insured persons	Yes	No	Not used.
Coverage of pre-existing conditions for nongroup plans	ngi2- ngi4	Persons enrolled in nongroup plans	Yes	No	Not used – very low prevalence
Managed care attributes, except for HMO enrollment	b331-b351, b371	Privately insured and Medicare	No	No	Outdated, low reliability
Number of months enrolled in current plan	b301, b421, b58, b68, b78	Insured persons	No	No	Intent is to identify how much of the year they were insured vs. uninsured, but this is rarely, if ever, used
Identify policyholder for military coverage and state coverage	b40, b71	Enrollees in military and state coverage	No	No	Not used
Availability of family coverage for uninsured in families that have privately insured members	b79, b791	Uninsured in families with some private coverage	No	No	Not used, fairly small samples
Perceived eligibility for Medicaid	b84a	Uninsured	Yes	--	Not used
Prior plan was HMO	b82, b871, b872	Persons who changed plans	No	No	Outdated, not used
History of HMO enrollment	b901-b921	All persons	No	No	Outdated, not used
SECTION C. RESOURCE USE					
Attributes of last ER visit	er1 – er9	Persons with ER visit	Yes	--	Unclear that it yielded useful information
Unmet need for specific services (other than Rx)	unmet1 – unmet5a	Persons with any unmet	Yes	--	Not used – unclear whether there is any added value to

ITEM	QUES #	TARGET SAMPLE	NEW TO R4?	TRACKING ITEM?	REASON FOR CUTTING
		need			overall unmet need item
Surgical procedures	c411-c431	All persons	No	No	Not used
Any mental health care use	c511	All persons	No	No	Not used
Visit for routine/preventive care	c3p1, c3c1, c351, c361	Persons with visit to physician and/or non-MD provider	No	No	Not used extensively
Section D. Usual source of care/ patient trust					
Reasons why persons haven't used affordable care place	sn6	Uninsured with affordable care place (but no use)	Yes	No	Not used, low prevalence
Change in USC and reasons for changing	d141-d171	Persons with USC	No	Not since R2	Hasn't been used since round two
Patient trust in physician (4 items)	d311 – d341	Persons with usual source of care or use of care	No	Yes (but not recently)	Somewhat outdated, low prioity
Attitudes about seeking medical care	d351,d361	All persons	Yes	No	Used mainly as control variables Superseded by proposed new questions on consumerism
Section E. Satisfaction, last visit, risk behaviors					
CAHPS questions on health plan satisfaction	CAHPS 10 – CAHPS38	Insured persons	Yes	--	Not used –low priority
Last visit sequence (total)	e161 – e341	Persons with physician visit in past year	No	Appt. waiting times	Question sequence simplified
Satisfaction with last visit	e301 – e321	Persons with physician visit in past year	No	No	Not used – not considered to be strong questions on satisfaction with care
Payment method and amount at last visit for uninsured	e331, e341	Uninsured with physician visit in past year	Yes	--	Not used
Perceived mental health and happiness (3 items)	e491 – GSS157	Adults	(Only happi-ness)	No	Low analytic value

ITEM	QUES #	TARGET SAMPLE	NEW TO R4?	TRACKING ITEM?	REASON FOR CUTTING
CHILDREN WITH SPECIAL NEEDS	scsn1 – scsn5b	Children	Yes	--	Small samples – unclear whether a key tracking component
SYMPTOM RESPONSE MODULE	srm1 – srm10	Uninsured and sample of insured (n = 3,299)	Yes	--	A more refined measure of unmet need obtained at high cost and limited sample
SECTION F. EMPLOYMENT					
Employer offers choice of HMO and non-HMO plan	F551, f561, b391	All employed adults offered coverage by employer	No	No	The HMO and non-HMO distinction seems outdated and not particularly meaningful
Relative cost of other plans offered by employer	F611 – f63b1	Employed adults not covered by employer's plan	Yes	--	Not used – intent and usefulness of quex unclear

TABLE III.3

SOURCE OF DATA FOR INDIVIDUALS IN THE ROUND FIVE HOUSEHOLD SURVEY, BY QUESTION TOPIC

Family Insurance Unit Member	Question Topic: Household Composition	Insurance Coverage	Resource Use/	Unmet Needs	Usual Source Of Care	Medical Costs	Health Care Quality and	Satisfaction	General Health Status/ Chronic Conditions/Risk Behaviors/BMI	Consummerism and Health Care	Employment/ Earnings/ Employer Plan	Family Income	Race
First Family Insurance Unit													
Family Informant	**H**	**F1**	**F1**	**F1**	**F1**	**F1**	**F1**	**F1**	**F1**	**F1**	**F1**	**F1**	**F1**
Spouse	**H**	**F1**	**F1**	**SRM**	**F1**	**FI**	**SRM**	**SRM**	**F1 and SRM**	**SRM**	**F1**	**F1**	**F1**
Randomly Selected Child	**H**	**F1**	**F1**	**F1**	**F1**	**FI**	**F1**	**FC**	**F1 and FC**	**Not Asked**	**Not Asked**	**F1**	**Not Asked**
Other Children	**H**	Data not available—not randomly selected child											
Second Family Insurance Unit													
Family Informant	**H**	**F2**	**F2**	**F2**	**F2**	**F2**	**F2**	**F2**	**F2**	**F2**	**F2**	**F2**	**F2**
Spouse	**H**	**F2**	**F2**	**SRM**	**F2**	**F2**	**SRM**	**SRM**	**F2 and SRM**	**SRM**	**F2**	**F2**	**F2**
Third Family Insurance Unit													
Unrelated Adult	**H**	**F3**	**F3**	**F3**	**F3**	**F3**	**F3**	**F3**	**F3**	**F3**	**F3**	**F3**	**F3**

H	Data provided by the household informant (typically person who answers the telephone, if adult)
F1	Data provided by family informant for FIU1
SRM	Data provided by the individual adult family member via the self-response module questions
F1/SRM	Data on general health status provided by the family informant. Detailed health information provided by the individual family member
FC	Data provided by adult in family who took randomly selected child to last physician visit

C. ADVANCE MATERIALS, SURVEY INTRODUCTION, AND INCENTIVES

Notifying potential respondents to a telephone survey by mail before an initial call is made can reassure them about a survey's authenticity and purpose. The general public's willingness to participate in a survey may also be increased by obtaining sponsorship or endorsement from a well-known public organization and by designing a convincing survey introduction that describes the survey's purpose and value. Monetary incentives also can be effective in increasing participation in surveys. For round five households for whom we located published addresses we used both pre-paid and offered incentives. A small five dollar incentive was included with the advance letter to encourage initial participation by households receiving the letter. Since the survey included about 20 minutes of questions that had to be answered by each adult in the household, the advance letter stated that we would mail checks for $20 to each eligible adult who participated in the survey. Households with unlisted telephone numbers were offered the $20 incentive for each adult during the survey introduction but could not receive the five dollar cash incentive or advance letter. To increase the response rate, the incentive was increased to $40 part way through the survey. (Advance letters are shown in Appendix B.)

1. Advance Letters

After the sample of phone numbers was selected, they were matched to data bases in an attempt to get an address associated with that number. Slightly over 50 percent of all numbers were matched to an address. As noted, we included a small five dollar cash incentive with the advance letter mailed to households with published addresses. To test the effectiveness of this procedure, we conducted a small experiment where a random half of a replicate did not receive the five dollar cash incentive and the other half did. The response rate was increased and the number of calls to resolve a case was reduced for the sub-sample receiving the cash incentive;

consequently, the pre-paid five dollar cash incentive was retained along with the $20 promised incentive. (As discussed below in Chapter IV, the promised incentive was subsequently increased to $40 to boost the response rate.)

2. Survey Introduction

The initial survey introduction was similar to that used in round four, briefly mentioning the survey's purpose, the advance letter (if one was mailed), and the promised incentive. We gave interviewers additional text to answer respondents' questions, including why health tracking is important, examples of the types of questions included in the survey, a contact at RWJF to verify the survey's authenticity, and additional background on sponsorship, interview length, and respondent selection. The initial introductions used for households with published and unpublished addresses are shown below:

PUBLISHED ADDRESSES:

>paa2< Hello, this is NAME, with the Community Tracking Study, a nationwide study to see how changes in health care are affecting people.. We recently sent your household a letter describing the study.. Did you receive it?

YES.....1 [goto paa3]
NO ……..0 [goto paa4]
===>

>paa3< As we mentioned in the letter,..we'll send you and each adult in your family who participates in the interview insert amount for helping us.. May I speak with an adult here who is familiar with the health care of family members.

CONTENT: the interview includes questions about your and your family's health and your views about the quality and cost of health care

SPONSOR: The study is sponsored by the Robert Wood Johnson Foundation, a non-profit organization whose sole purpose is to improve health care. It is not associated with any political party or private company.

LENGTH: For most families the interview averages about 30 to 40 minutes; it is about 15 to 20 minutes for single persons.

CONTACT: If you would like to find out more about the study or the foundation, you can call [insert] at [fill phone number]

CONFIDENITALTY: The survey is confidential and you don't have to answer any questions you don't want to.

SELECTION:Your telephone number was randomly generated by a computer to represent many others in your community.

UNPUBLISHED ADDRESSES (AND HOUSEHOLDS THAT DID NOT RECALL SEEING THE ADVANCE LETTER):

>paa4< We are conducting a nationwide study for a private foundation to understand how changes in health care are affecting people. We are not selling anything or asking for money. As a token of our appreciation, we'll send you and each adult in your family who participates in the interview INSERT AMOUNT for helping us.... May I speak with an adult here who is familiar with the health care of family members.

In response to interviewer debriefings, we shortened the survey introduction later in the survey for all households:

Hello, this is _INTERVIEWER NAME calling on behalf of the Robert Wood Johnson Foundation. The Foundation is conducting an important national health care study and would like you to participate. We will pay you and every adult member in your family who agrees to answer a short interview $20($40) for your time. May I speak to an adult in the household who is knowledgeable about your family's health care?

D. INTERVIEWER SELECTION AND TRAINING

1. Recruitment

Interviewing for the RDD sample was conducted by MPR in its Princeton, New Jersey, survey operations center (SOC). Altogether, 112 telephone interviewers were trained for the round five household survey. Interviewing supervisors received a detailed manual with additional information enabling them to respond to interviewers' questions and resolve routine problems. Interviewers received a question-by-question review of the survey, approaches to contacting respondents, disposition coding, and follow-up training on interviewing problems and refusal avoidance.

2. Telephone Interviewer Training Program

New interviewers were given MPR's standard general interviewer training program, which lasted 12 hours and was conducted in three 4-hour sessions. Topics included obtaining cooperation, understanding bias, using probing methods, using the CATI system, and resolving administrative issues. A variety of media and methods were used in training, including a videotape on the role of the interviewer, discussion on ways to avoid bias, role-playing, and written exercises.

Training on the survey instrument lasted 8 hours, with up to 8 hours of additional practice sessions, if necessary. The training session covered the following topics:

- An introduction to the project and sample design
- A review of the CATI instrument
- Question-by-question review of the instrument presented on a video screen
- Review of contact procedures, advance materials, methods for gaining cooperation, and appropriate responses to respondents' questions
- Hands-on practice with scripted mock interviews
- Exercises to test respondents' skills in obtaining cooperation
- Review of disposition coding and call scheduling

Appendix C of this report contains the training guide for round five. Supervisors reinforced training techniques throughout the survey by monitoring calls and providing regular feedback; approximately 10 percent of the interviews were monitored. In addition, we conducted refusal conversion training sessions, during which trainers reviewed effective approaches and interviewers shared experiences about the success or failure of various techniques. An interviewer bonus plan was initiated for the last two months of the interview period as an additional incentive to address high refusal rates. Interviewers were paid a bonus for every ten core interview or self-response modules they completed.

E. CATI SYSTEM

All data collected for the Household Survey were produced using computer programs made available through the Computer-Assisted Survey Methods Program (CSM), University of California, Berkeley.[10]

MPR used the CASES program to develop instruments and data cleaning programs for the Household Survey. In addition, we developed customized programs for allocating the sample and for controlling the distribution and timing of calls and developed specialized reports for monitoring the survey results (discussed in Chapter IV).

[10]Neither the CSM staff nor the University of California bear any responsibility for the results or conclusions presented here.

IV. DATA COLLECTION

A. OVERVIEW

For round five, we interviewed 9,407 family insurance units (FIUs), including 15,197 eligible adults and 2,600 sampled children younger than age 18, for a total of 17,797 people (see Table IV.1). Because the probability of selection of telephone numbers was uniform across the entire sample, the weighted and unweighted response rates are identical and are simply described as response rates. The round five household-level response rate was 47.2 percent, and the FIU-level response rate was 43.5 percent.

In this chapter, we describe the data collection efforts and changes from prior rounds, including (1) the organization of the survey, (2) response rate calculations and recent trends in the Household Survey and related surveys, (3) efforts to reduce nonresponse, including call-scheduling procedures, use of Spanish-speaking interviewers, refusal conversions, monetary incentives, and selective use of proxy respondents; (4) quality assurance procedures; and (5) data editing and file preparation.

TABLE IV.1

NUMBER OF INTERVIEWS COMPLETED WITH FIUs AND PERSONS BY ROUND OF THE HOUSEHOLD SURVEY
(Numbers)

	Round One	Round Two	Round Three	Round Four	Round Five
Number of FIUs					
RDD	32,079	31,278	31,744	24,613	9,407
Field	635	769	925	806	0
Total	**32,732**	**32,047**	**32,669**	**25,419**	**9,407**
Number of Persons					

Adults	49,807	48,724	49,603	39,260	15,197
Children	10,639	10,232	10,122	7,327	2,600
Total	**60,446**	**58,956**	**59,725**	**46,587**	**17,797**

B. ORGANIZATION OF THE SURVEY

Interviewing was conducted from April 2007 to February 2008 in MPR's Princeton, New Jersey survey operations center by 113 interviewers.

Reports on the progress of data collection were transmitted daily to the operations centers. The survey reports enabled project managers and interviewing supervisors to monitor production and performance continuously. Several reports were produced, including:

Status Disposition reports. These showed daily and cumulative distributions of interim and final survey disposition codes (completions, various nonresponse and ineligibility dispositions, and current statuses for active cases), for the total sample; for each stratum; and for subgroups, including Spanish-speaking and refusal conversion samples.

Daily Interviewer Performance reports. These monitored last-day and cumulative performance statistics, including completions, separate self-response modules, first refusals, final refusals, number of calls, time per call, and time per completed interview.

These reports were supplemented by regularly scheduled weekly conference calls with survey supervisors and by visits to the survey operations centers by survey managers.

C. RESPONSE RATES

1. Calculation of Response Rates

Response rates were calculated at the household and FIU levels. The response rate is based on the standard definition the American Association for Public Opinion Research has proposed for surveys with unknown eligibility for some interviewing units (American Association for Public Opinion Research 2000):

(1) $RR=I/[(I + P) + (R + NC + O) + e(UH + UO)]$,

where:

- *RR = response rate*
- *I = complete interview*
- *P = partial interview (insufficient data for analysis)*
- *R = eligible refusal*
- *NC = eligible noncontact*
- *O = other eligible*
- *UH= unknown whether household or occupied household*
- *UO = unknown other*
- *e = estimated proportion of cases with unknown eligibility that are eligible*

The household-level response rate is the ratio of the number of households in which at least one FIU interview was completed to the estimated number of eligible households. This response rate calculation is comparable to that used in many surveys, such as the CPS. We could not determine residency for all sampled telephone numbers. Using methods described below, we estimated the number of telephone numbers with undetermined residency that were residential. Because the survey was designed to represent the civilian noninstitutionalized population, some residences were not eligible for the survey. We also estimated survey eligibility for confirmed residential households for which the household demographic section was not completed.

The primary interviewing unit for the Household Survey is the FIU, rather than the household. Consequently, we computed an FIU-level response rate that is the product of the household-level response rate and the percentage of eligible FIUs within completed households that responded. The following sections describe how we calculated response rates. Table IV.2 shows the disposition of the RDD household sample, by sample type, and Table IV.3 shows the disposition of the RDD sample at the FIU level.

TABLE IV.2

FINAL ROUND FIVE HOUSEHOLD-LEVEL SURVEY DISPOSITION

(Numbers)

Code	Status	Count
Complete		
1	All components complete	6,309
2	Core complete, self response missing	1,227
3	Core complete, secondary FIU missing	692
Ineligible		
41	No eligible person in household	39
42	Computer, fax, or modem	3,059
43	Disconnected, out of service	4,965
44	Cell phone or pager	85
45	Non-residence	3,573
48	Duplicate	68
Residential, Non-responding household		
22	Breakoff	220
20	Hung up during introduction	1,602
21	Household refusal	6,298
30	Language barrier	105
31	Illness barrier	44
34	Maximum calls	78
39	Other nonresponse	9
Undetermined Residency		
65	Ring, no answer	3,520
67	Mechanical answering device	49
36	Maximum calls, probable residence (interviewer noted that telephone number is linked to a probably residence)	2,913
66	Effort ended	20
Total		**34,875**

TABLE IV.3

FINAL ROUND FIVE FIU-LEVEL SURVEY DISPOSITION[a]

(Numbers)

Responding Eligible FIU	9,407
Nonresponding Eligible FIU	805
Ineligible FIU (no civilian adults)	95
Total	**10,307**

a. Determining Residency for the RDD Sample

When calculating a response rate, the denominator should reflect all eligible cases sampled. In many surveys, however, eligibility status is not determined for all cases and must be estimated. For RDD surveys, residency typically is not established for all sampled telephone numbers, even after many calls have been made. For example, some telephone numbers ring when dialed, even though the telephone number is not in use. Consequently, the first step in computing the RDD response rate was to estimate residency for sampled telephone numbers. Residency was determined for 81.4 percent of the 34,875 sampled telephone numbers (Table IV.2). Residency was not confirmed for the remaining sample, which included 10.1 percent ring, no answers; 0.1 percent mechanical answering devices or answering services; and 8.4 percent with some personal contact, but with no confirmation of residency after the maximum number of calls were made.

Various methods have been used to estimate residency for telephone numbers where eligibility cannot be determined by calling the number. For the third round of the Household Survey, we compared three procedures commonly used to estimate residency for RDD surveys (see Appendix E of Technical Publication 46 on HSC's website). We evaluated the CASRO

method (two variations),[11] the "business office" method, and the survival analysis method developed by Brick et al. (2002). The CASRO method assumes that the unresolved telephone numbers have the same residency rate as resolved telephone numbers. The "business office" method (see Brick and Broene 1997; Shapiro et al. 1995; Brick et al. 1998) involves asking telephone companies to provide the residential status of all, or a sample of, unresolved telephone numbers, or using estimates from other studies. Directly contacting telephone companies is problematic due to the lack of cooperation; estimates from other studies are usually based on dated information.

The survival analysis method not only looks at whether the number is resolved as residential or not (or left unresolved), but also models the time until resolution of a telephone number. The idea behind using this method is that the additional information about time until resolution should provide a more accurate estimate of the residency rate than simply using the final resolution status.

Carlson and Kasprzyk (2004) compared the survival and CASRO methods as part of a session at the 2004 Joint Statistical Meetings, concluding that the survival analysis method was too unstable in terms of the residency rates it generates for unresolved telephone numbers. The unresolved residency rates it generated varied significantly with slight changes in assumptions, while the CASRO residency rate and the overall residency rate from the survival analysis method both remained fairly stable under slightly different scenarios. The overall residency rate it generated was also quite comparable to the rate resulting from the CASRO method, likely due to

[11]CASRO stands for the Council of American Survey Research Organizations, and its special report, "On the Definition of Response Rates." L.R. Frankel, Chairman, "A Special Report of the CASRO Task Force on Completion Rates," June 1982. We refer to this method as CASRO, because one option in its recommendations is to apply the eligibility rate for cases with determined eligibility status to those with undetermined eligibility status.

the very large number of call attempts that we made in the Household Survey before classifying a telephone number as unresolved. As a result, we used the CASRO method for estimating residency for undetermined telephone numbers for rounds three and four.

For round five, we modified the way we calculated the CASRO residency rate by first dividing the sample into 11 categories or cells based on call history dispositions that were likely to be homogeneous in terms of residency rates. Our approach was adapted from a method described in a recent paper by Kennedy et. al. (2008). While their study was designed for RDD surveys with relatively brief field periods and more limited numbers of attempts than the Household Survey, their use of call history categories to stratify the sample to estimate residency for undetermined telephone numbers could be applied to the Household Survey.

Kennedy et.al. (2008) developed an empirical residency rate among unresolved telephone numbers that could be applied to other RDD surveys with similar designs (five day field period). Each number that was unresolved after five attempts but later resolved (during the main or extended field period) was classified as to whether an address could be linked to the number, and whether a busy signal was ever encountered during the main or extended field period.[12] They calculated the residency rate within each of the four categories resulting from the cross-classification of these two characteristics, and applied that to the phone numbers that were never resolved (after the extended period) to get an overall residency rate of 47 percent among those unresolved after the main five-day field period.

[12] They also report on a separate sample for which phone numbers unresolved after five days were sent to a data vendor for classification as residential or nonresidential/nonworking.

Because our survey had a much longer field period (comparable to their study's "extended period"), we focused on how they handled the never-resolved cases, using known characteristics from the call histories. We first divided the sample into cases where residency was determined based on numbers of call attempts (five or more or less than five). For those with less than five attempts, a single residency rate was computed. For those with more than five attempts and known residency status, we ran a number of cross-tabulations, crossing residential status with release number, number of refusals or hang-ups, whether any calls reached an answering machine, whether any contact was made, and the number of calls reaching faxes. Release number was not related to household status (as expected), but the other four characteristics were, so we created composite variables crossing the values of all four variables, then collapsed some of the smaller categories with others that had similar residency rates. We ended up creating ten categories based on the number of refusals or hang-ups encountered, the number of call attempts resulting in fax/modem tones, whether any contact was made with a person, and whether any call attempts reached a mechanical answering device. The residency rates for telephone numbers with resolved residency are shown by category below:

- five or fewer call attempts: 31.92 percent residential
- more than five attempts and:
    - no refusals, no contact: 2.22 percent
    - no refusals, no mechanical answering devices (MAD), some contact, no fax: 60.9 percent
    - no refusals, no MAD, some contact, one or more fax: 21.88 percent
    - 0 or 1 refusal, some MAD, some contact, no fax: 81.10 percent
    - no refusals, some MAD, some contact, one or more fax: 51.81 percent
    - 1 refusal, no MAD, some contact, no fax: 71.24 percent

- 1 refusal, no MAD, some contact, one or more fax: 9.09 percent
- 1 refusal, some MAD, some contact, one or more fax: 43.48 percent
- 2+ refusals, some contact, no fax: 93.64 percent
- 2+ refusals, some contact, one or more fax: 70.51 percent

These residency rates were then applied to telephone numbers with unresolved residency and the same call history characteristics.

b. Household Response Rate for the RDD Sample

To calculate an interview response rate at the household level, we first determined whether each telephone number was residential and then determined whether each household completed at least one FIU interview.

We classified each telephone number according to the disposition codes in Table IV.2:

A. At least one eligible responding FIU in the household—codes 1, 2, 3 (n = 8,228)

B. Eligible nonresponding household—code 22 (n = 220)

C. Nonresponding residential household, with insufficient information to determine whether there is an eligible FIU—codes 20, 21, 30, 31, 34, 39, 66 (n = 8,156)

D. Residential household, where all FIUs in the household are ineligible—codes 41, 48 (n = 107)

E. Telephone number was coded by the interviewer as nonresidential or nonworking—codes 42, 43, 44, 45 (n = 11,682)[13]

F. Unable to determine whether telephone number was residential (n = 6,482)

- F1. Ring, no answer—code 65 (n = 3,520)
- F2. Mechanical answering device—code 67 (n = 49)

[13] This does not count those phone numbers screened out as nonresidential or nonworking by Genesys CSS, which excludes many business, nonworking, and cellular numbers before an interviewer calls the telephone number (n = 37,600). In previous rounds, these cases were included in the CASRO residency rate calculation. Because the new methodology excludes from the estimated residency rate any phone numbers that were resolved within five call attempts, and these screened out numbers were resolved with no call attempts, they were not included in these calculations.

- F3. Maximum calls—code 36 (n = 2,913)

Within each of the 11 categories described above (*c*) we calculated a residency rate among telephone numbers with resolved residency status; and within each cell defined by sampling stratum (*s*), we calculated a survey eligibility rate among residential households with known survey eligibility:

(3) $$RSRD_c = (A_c + B_c + C_c + D_c)/(A_c + B_c + C_c + D_c + E_c).$$

(4) $$SRE_s = (A_s + B_s)/(A_s + B_s + D_s).$$

We then calculated within each category the estimated number of eligible households as:

(5) $$HH_s = A_s + B_s + \left(C_s + \left(F_s \cdot RSDR_c\right)\right) \cdot SER_s.$$

Finally, we calculated a household response rate, as follows:

(6) $$HRR_s = \frac{A_s}{HH_s}.$$

c. Family Interview Response Rate

To calculate an interview response rate at the FIU level, we began with all FIUs in responding households (that is, households with at least one eligible responding FIU). We classified each FIU in the RDD sample according to the categories in Table IV.3 as follows:

a. FIU is eligible for the survey and responded to interview (n = 9,407).

b. FIU is eligible for the survey but did not respond to interview (n = 805).

c. FIU is ineligible for survey (n = 95).

We then calculated an FIU-level response rate conditioned on being in a household with at least one completed FIU interview:

$$(12) \qquad FRR_s = \frac{A_s}{A_s + B_s}.$$

The combined response rate (which we will call the *FIU response rate*) is the product of these two rates:

$$(13) \qquad RR_s = HRR_s \cdot FRR_s.$$

The round five household-level response rate is 47.2 percent, and the FIU-level response rate is 43.5. The FIU level response rate is lower because some households included multiple FIUs, where some but not all FIUs responded to the survey. All persons within responding FIUs had a completed core interview, by definition, because the informant responded on behalf of all persons in the FIU. For the self-response module (SRM), not all adults responded within responding FIUs. The SRM response rate among adults within responding FIUs was 88.9 percent, either through self or proxy response. The equivalent questions for the randomly selected child were part of the core questionnaire, and therefore had no non-response among responding FIUs.

2. Declining Response Rates in the Household Survey and Other RDD Surveys

The first four rounds of the Household Survey included both an RDD and field component; round five was conducted entirely by RDD. RDD response rates for families in the Household Survey declined over time from 65 percent in 1996-97, to 62 percent in 1998-1999, 57 percent in 2000-2001, 56 percent in 2003, and 44 percent in 2007.

In a recent review of changing response rates for RDD surveys, Battaglia et al (2008) cited several studies that show similar patterns from the late 1990s through 2003. Curtin et al (2005) showed that the overall response rate in the Survey of Consumer Attitudes declined from 1997 to 2003 at an average annual rate of 1.5 percentage points to 48.0 percent. The National Household Education Survey (2004) reported a decline in the response rate from 72.5 percent in 1999 to 62.4 percent in 2003. The Behavioral Risk Factor Surveillance System (2003), which is conducted in individual states, reported a decline in the median response rate for the 50 states from 68.4 percent in 1995 to 53.2 percent in 2003. The RDD component of the National Survey of American Families reported response rates of 61.8 percent, 59.4 percent, and 51.9 percent among adults surveyed in 1997, 1999, and 2002, respectively (2003).

The decline in the Household Survey response rate from 1996-1997 to 2003 was similar to other surveys cited above. The larger 12 percentage point decline in the FIU response rate from 2003 to 2007 was a result primarily of a change in survey design rather than continued secular decline in response rates. As discussed above (Chapter II), the Household Survey telephone survey design for rounds two through four included an "overlap" sample of telephone numbers that had been selected in the prior round (completed interviews, non-interviews, non-residential numbers, and numbers where residency could not be determined), as well as telephone numbers selected for the first time. The response rate for the overlap sample was significantly higher than for the new RDD sample, primarily because households that participated in prior rounds were very likely to participate again, perhaps because of interest in the study or receipt of a $25 incentive. For the 2003 round four surveys, the weighted FIU response rate for the overlap sample was 60.4 percent and was 45.1 percent for the new sample. Because the focus of the 2007 survey was national only, the overlap sample had to be dropped; the response rate for the

all new sample 2007 survey was 43.5 percent. Thus, the change in response rate between 2003 and 2007 for the new sample was less than two percentage points.

3. Response Rates for the Adult Self-Response Modules

The initial FIU interview was conducted with an informant who answered for all sampled FIU members. However, each adult in the FIU was asked to self-respond to a subset of subjective questions (the self-response module). In certain circumstances, such as when an adult FIU member was too ill to respond, temporarily unavailable, or unwilling to respond after several interviewing efforts had been made, the family informant was allowed to complete the self-response module for that FIU member. For round five, among the 15,197 adults in completed FIUs, 13,351 (87.8 percent) responded for themselves, 155 (1.1 percent) were completed by the family informant, and the remaining 11.1 percent did not respond. A separate weight was constructed for variables in the self-response module in order to account for the additional non-response to these questions (see section V.B.9).

D. EFFORTS TO INCREASE RESPONSE TO THE SURVEY

During data collection, we used several methods to increase response, including:

- Making up to 35 calls to determine residency and 50 or more calls to complete interviews with residential households
- Offering Spanish-speaking interviewers to respondents who preferred to conduct the interview in that language
- Making up to three rounds of refusal conversion calls (using more experienced interviewers); the number of rounds would vary by case, depending on the firmness of the refusal
- Offering monetary incentives
- Leaving messages on mechanical answering devices.

1. Initial Calls

Calls to households were dispersed across various times of the day and days of the week. There were seven respondent time slots defined over the interviewing week:

- Weekdays 9 A.M. to 6 P.M.
- Weekdays 6 P.M. to 8 P.M.
- Weekdays 8 P.M. to 9 P.M.
- Saturday 9 A.M. to 12 P.M.
- Saturday 12 P.M. to 9 P.M.
- Sunday 9 A.M. to 5 P.M.
- Sunday 5 P.M. to 9 P.M.

At the beginning of each time slot, an algorithm was used to calculate a priority for each non-appointment case based on the number of days since the case was last attempted, the number of attempts in the current time slot, and the number of attempts in all the other time slots. This algorithm was constructed so that, initially, a case would be called in each time slot, one call per day. Then it would be called in each time slot, one call every other day, then every third day, and so on (assuming adequate available sample and staffing).

2. Follow-Up Calls for the RDD Sample

Telephone numbers in the RDD sample were controlled by the CATI scheduler, which randomly assigned sampled telephone numbers to interviewers. Nonscheduled calls were based on optimal calling patterns (according to the algorithm described above), dispersed over different times of the day and different days of the week.) Firm appointments were scheduled within a 20-minute window; other appointments were scheduled within a 60-minute time period, based on

information the interviewer provided. Separate queues were set up for Spanish-speaking interviews, for households with addresses and for refusal conversions (discussed below).

3. Interviews Conducted in Spanish

We prepared a Spanish version of the CATI instrument and trained bilingual telephone interviewers to conduct interviews with family informants or adults for whom self-response modules were required and who preferred to conduct the interview in Spanish.

4. Refusal Conversions

Based on our experience in prior rounds of the Household Survey, we anticipated a high volume of refusals and trained a pool of our best interviewers to convert refusals. Refusal converters used information about the reason and intensity of the prior refusals in planning their calls. We attempted to convert refusals with interviewing units (households, FIUs, or individuals) that had refused one or two times. To minimize antagonizing respondents, we allowed a minimum of four weeks between refusal conversion attempts.[14] The refusal pool included respondents who hung up the telephone before the interviewer completed the introduction (HUDIs), those who said they preferred not to be interviewed (refusals), those who terminated the call after the screener was completed (breakoffs), and those with electronic privacy managers.[15]

[14]Typically, a final status code of refusal would be assigned after two refusals; however, a few cases were tried more often if the supervisor felt that the prior refusals might have been miscoded and the respondent was simply busy when the interviewer called.

[15]A privacy manager is a call-screening device that works with Caller ID to intercept and identify incoming calls. The privacy manager requests the caller's name, which appears on the Caller ID box. The recipient can then choose to accept or reject the call, send the call to a mechanical answering device, or send a scripted rejection to solicitors.

Refusal conversion efforts were necessary to achieve an acceptable response rate. At least one refusal or HUDI occurred in 4,183 screened households, or 49 percent of the 8,544 households for which eligibility was determined. Overall, 27.7 percent of the refusals were converted, with 11.9 percent converted after the first refusal, 10.0 percent after two refusals, and 5.8 percent after three refusals.

Refusal conversions more than doubled the response rate. If no refusal conversions had been attempted, the household level response rate would have been 22.1 percent. The first round of refusal conversions increased the household level response rate to 32.6 percent, the second to 41.7 percent, and the third to 47.2 percent.

5. Monetary Incentives

Throughout the five rounds of the Household Survey, we used large cash incentives. We did this (1) to minimize the impact of nonresponse, (2) to maintain incentives comparable to those offered to people selected for other surveys using the Household Survey as a sample frame, and (3) to encourage participation in the self-response module by adults other than the family informant. Because data obtained from the self-response module were critical to many analyses, we did not want to risk losing observations as the length of this module increased. The development of the Household Survey incentive structure is discussed in technical reports for prior rounds (see Technical Publications 15, 34, 46, and 62 on HSC's Web site at www.hschange.org).

For round five, we used a mix of pre-paid and offered incentives to households with published addresses and offered an incentive to those for whom we could not obtain published addresses. Households with published addresses were mailed a letter (see the Appendix) with a five dollar bill prior to being contacted to encourage participation. The letter also noted that each adult participating in the survey would receive an additional $20. During the survey

introduction, the interviewer referenced the letter and again mentioned the $20 incentive for each adult in the household. For households without published addresses, interviewers mentioned the incentive as part of the introduction. To increase response rates, the incentive was increased from $20 to $40 during the survey; overall, 62.3 percent of the 13,211 individuals completing interviews received a $40 rather than a $20 incentive. By the time the $40 incentive was used, many of the household members had been identified by name, either from sample preparation or from contacts with household members, many of whom had initially refused. Consequently, we were able to mail $40 checks to many household members prior to conducting refusal conversion or follow-up calls with individuals who were difficult to reach.

Based on an analysis of the impact of pre-paid incentives (Carlson, et al, 2008), the $40 pre-paid incentive increased the final response rate by 5.2 percentage points compared with promising a $40 incentive to a comparison group of similar households. The use of pre-paid incentives also reduced the mean number of attempts per case made by interviewers compared with households promised incentives. In addition, pre-paid incentives were cost effective, as only 327 persons issued checks cashed them without completing interviews, which was more than offset by the 946 persons issued checks in households where one or more persons completed interviews but the checks were not cashed. Carlson (2008) provides a detailed discussion of the methodology used to evaluate pre-paid incentives for the round five household survey.

6. Messages on Mechanical Answering Devices

Some residential households were difficult to contact because they used mechanical answering devices to screen calls. Interviewers left the following message to counter these chronic no-answers:

> I'm calling for the Community Tracking Study, a research project to see how managed care and other health care changes are affecting people. We're not selling anything or asking for money. We would like your household to participate in a brief interview and we will send each adult $20 ($40) for helping us. Please call Jackie Licodo at 1-800-298-3383. Thank you!

The interviewer also was instructed to leave notes in the CATI system indicating that the message had been left on the answering device, and to reference the message when calling back the next time. A second message could be left after a one-week interval; the limit was two messages per month.

E. QUALITY ASSURANCE

Production reports and regular online monitoring were used to evaluate interviewer performance. Daily production reports provided information on several performance indicators, including completed interviews and self-response modules, number of calls made, number of refusals, refusal conversions, time per call, time per interview, and the ratio of completed interviews to time spent charged to interviewing.

Interviewer conduct during interviews was evaluated primarily by having supervisors monitor actual calls, supplemented by review of interviewers' notes maintained in the CATI system. (The CATI system maintains all calls and notes recorded about monitored calls.) Supervisors monitored approximately 10 percent of the RDD interviews, increasing the monitoring level for new interviewers and those experiencing problems. The monitoring system enables supervisors to listen to interviews without either the interviewer's or respondent's' knowledge. It also allows supervisors to view interviewers' screens while an interview is in progress. Interviewers are informed they will be monitored but do not know when observations will take place. Supervisors concentrate on identifying behavioral problems involving inaccurate presentation of information about the study; errors in reading questions; biased probes;

inappropriate use of feedback in responding to questions; and any other unacceptable behavior, such as interrupting the respondent or offering a personal opinion about specific questions or about the survey. The supervisor reviews results with the interviewer as soon as the interviewer has finished the interview.

F. DATA EDITING, CODING, AND CLEANING

One of the most important advantages of computer-assisted surveys is that errors can be identified and corrected during the interview by building logic, range, and consistency checks into the program. The CATI program (CASES) also permits interviewers to back up and change answers to previously answered questions without violating instrument logic.

A cleaning program was written that enforced questionnaire logic. An interview could not be certified as clean until all appropriate questions had either been answered or assigned an acceptable nonresponse value and until the data record for each interview was consistent with the instrument program logic.

Survey questions were primarily closed-ended. Questions on industry were open-ended, and text responses were coded to the two-digit (1987) Standard Industrial Classification (SIC) coding structure.[16] A program was written to read text responses and, based on character strings in the text, to assign two-digit codes. Responses without recognizable patterns were manually coded; in addition, a coder reviewed a sample of computer-generated codes.

Personal identifying information remained confidential and was maintained in a separate file used only to assign respondent payments and subsequent interviews.

[16]The SIC has been replaced with the North American Industry Classification (NAIC) System. However, to maintain consistency across all five rounds of the survey, we retained the industry categories used in prior rounds.

G. REFORMATTING DATA FILES AND FILE DELIVERY

A program was written to reformat the cleaned instrument responses into FIU- and person-level data files. Programmers at Social and Scientific Systems, Inc. (SSS) then prepared analysis files in SAS, and additional edits are performed. The additional edits included checks on the number of missing values for FIU- and person-level data, checks on relationship codes, deletion of FIU and person records for which inconsistencies among relationships could not be resolved, assignment of additional nonresponse values, and some constructed variables. Weights were applied to the data files (see Chapter V), and weighted data files were delivered to SSS, which was responsible for building the public use files. MPR maintained instrument cleaning and reformatting programs used in the preparation of these files.

V. WEIGHTING AND ESTIMATION

A. OVERVIEW

In this chapter, we discuss weighting and estimation procedures. The Household Survey sample design for round five was complex, using stratification and clustering within households to produce national estimates. Using unweighted data is likely to produce biased estimates because the unweighted samples are distributed differently than the populations they represent. Weights were designed to restore proportionality to the sample and were adjusted to compensate for nonresponse at the household, FIU, and person levels. This difference in proportionality occurred for the following reasons:

- ***Design***. With each FIU, we sampled only one child, which resulted in different sampling rates at the person level.
- ***Incomplete Sample Frame Coverage***. The RDD frame excluded telephone banks of 100 numbers containing no published household numbers and excluded households without landline telephone service.
- ***Differing Chances of Selection***. Some households had differing chances of selection because of the number of landline telephones they owned or interruptions in telephone service.
- ***Nonresponse***. Survey response rates differed among population subgroups.

Although the correct use of weights in analyzing Household Survey data substantially reduces the bias of estimates resulting from the sample design and survey nonresponse, the weights do not address the potential for bias resulting from item nonresponse or response errors. The procedures used to impute missing data for individual variables will be discussed in the round five Household Survey public use file (technical publication, forthcoming). Estimates of sampling error that do not account for the use of weights and the complex nature of the sample are likely to be severely understated. Specialized software is required to properly estimate

standard errors of estimates from this survey; procedures for using different statistical software packages are discussed in "Comparison of Statistical Software Packages for Variance Estimation in the CTS Surveys" (Technical Publication 40 on HSC's Web site).

1. Weights Provided for Public and Restricted Use Files

Three analysis weights, summarized in Table V.1, are available in both public and restricted use files researchers use when using the round five data. Weights were constructed to allow for national estimates for individuals and FIUs.[17] We use the term *national estimates* to include estimates for subgroups of the national population that are defined by geography or by economic or demographic classifications. The weights are computed using the features of the sampling design; therefore, all weights are design-based.

TABLE V.1

NAMES OF ROUND FIVE HOUSEHOLD SURVEY WEIGHTS

Level of Analysis	National Estimate
Person	WTPER4
FIU	WTFAM4
Self Response Module	WTSRM4

Separate weights are provided for analyzing FIU data and for conducting person-level analyses of the core survey data. A third weight, at the person level, is provided for analyzing responses to questions from the self response module which adjusts for additional non-response to those questions.

In surveys, nonresponse, poststratification, and other adjustments typically introduce variation in the sampling weights. In some situations, the combination of these adjustments

[17]Throughout this report, "national" refers to the population of the 48 contiguous states and the District of Columbia. It does not include Alaska and Hawaii.

produces disproportionately large weights. These large weights can decrease the precision of point estimates. We reduced the sampling error caused by extremely large weights by trimming them and distributing the excess among other weights. Although the difference between estimates using the trimmed or untrimmed weights is small, the trimmed weights result in better precision, with little or no additional bias.

2. Constructing Weights

Each weight is the product of several factors:

- An initial weight, the inverse of the probability of selection, to correct for differences in probabilities of selection
- Nonresponse adjustment factors, to correct for differential nonresponse at the individual, FIU, and household levels
- Factors to adjust for interruptions in telephone service
- Poststratification adjustments of weighted counts to external estimates of the population

The weighting steps associated with these factors are outlined below in Part B in more detail.

3. Sampling Error Estimation

Because sample-based estimates of population characteristics are not based on the full population, some element of uncertainty is always associated with these estimates. This element of uncertainty, known as *sampling error,* is an indicator of the precision of an estimate. Sampling error is generally measured in terms of the standard error or the sampling variance, which is the square of the standard error.[18]

[18]The sampling variance is a measure of the variation of an estimator attributable to having sampled a portion of the full population of interest, using a specific probability-based sampling design. The classical population variance is a measure of the variation among the members of the population, whereas a sampling variance is a measure of the variation of the *estimate* of a population parameter (for example, a population mean or proportion) over repeated samples. The population variance is different from the sampling variance in the sense that the

The complexities of the Household Survey design preclude the use of statistical software packages for variance estimation that do not account for such a design in their algorithms. The variance estimates from these statistical packages may severely underestimate the sampling variance in the Household Survey. Therefore, the survey data require the use of survey data analysis software or specially developed programs designed to accommodate the sample design and the statistic being estimated.

The sampling variance in the Household Survey is a function of the sampling design and the population parameter being estimated and is referred to as a *design-based sampling variance*. The survey database contains fully adjusted sampling weights for national estimates of FIUs and persons, as well as the information on sample design parameters (that is, strata and clusters) necessary to estimate the sampling variance for a statistic.

Most common statistical estimates and analysis tools (such as percentages, percentiles, and linear and logistic regression) can be implemented using Taylor series approximation methods. Survey data software, such as SUDAAN (Shah et al. 1997), uses the Taylor series linearization procedure and can handle the multistage design and variance components in the Household Survey design.

The rest of this chapter discusses weighting procedures and sampling error estimation for the Household Survey in more detail. Sections B discusses construction of the weights and the procedures to identify and trim extremely large sampling weights. Section C covers sampling error and estimation.

(continued)

population variance is a constant, independent of the sample design, whereas the sampling variance decreases as the sample size increases. The sampling variance is zero when the full population is observed, as in a census.

B. CONSTRUCTING THE WEIGHTS

First, we outline the general approach for constructing weights at the household, FIU, and person levels. For each level, we then describe the relevant sampling weights (defined here as the reciprocal of the probability of selection) and the nonresponse and poststratification adjustments to the weights. Finally, we present issues pertaining to the construction of the sample weights for national estimates.

As explained in Chapter II, sampling took place in several stages. We selected telephone numbers, identified households, defined FIUs within households, and collected data on FIUs and people in FIUs (all eligible adults age 18 and older and one randomly selected child). Each of these stages was considered in weighting. The steps necessary for calculating FIU- and person-level weights are listed here and described in the sections that follow:

- Calculate probability of selection of telephone numbers
- Adjust for the telephone number resolution rate (determination of whether the telephone number was a working residential number)
- Adjust for the household screener rate (determination of the household's eligibility using household enumeration questions)
- Adjust for household nonresponse among eligible households
- Adjust for multiple telephones and telephone service interruption within a household
- Poststratify household weights to external estimates of telephone and nontelephone households
- Adjust for secondary FIU nonresponse within responding households
- Calculate the probability of selection for the randomly selected child
- Adjust for nonresponse to the self-response module

1. Telephone Number Initial Weight

The telephone number was the first stage of selection. The telephone number sampling weight accounted for the probability of selection of telephone numbers within each stratum**.** A telephone number 100-*bank* is defined as the first 8 digits of a 10-digit telephone number; a bank has 100 possible 10-digit telephone numbers associated with it. If at least 1 of these 100 possible telephone numbers was listed in a telephone directory as a residential number, then the bank was designated as a *working bank*. The probability of selection in round five is calculated, within stratum *h*, [19] as:

$$(1)\quad P(\text{case selected in R5, stratum } h) = \frac{n_h}{N_h} \cdot \frac{nrel_h}{n_h - nbad_h},$$

where N_h is the number of working telephone banks times 100*;* n_h is the number of these telephone numbers selected; $nbad_h$ is the number of these telephone numbers found to be nonworking or business or cellular numbers before release (using Genesys CSS); and $nrel_h$ is the number of these telephone numbers released for interviewing. For round five, there were 2,871,768 working banks in the frame, and we generated 72,475 telephone numbers in the sample across the five strata. Among these 34,875 were not rejected by Genesys-CSS and were released for dialing. The probability of selection in each stratum was .000252.

Once the probability of selection is calculated, the sampling weight is the reciprocal of that probability of selection:

$$(2)\quad SW(phone_h) = \frac{1}{P(\text{case selected in R5, stratum } h)}\ .$$

[19]Throughout this chapter, we use the term *stratum h*. In the low-intensity sites, in which substratification was not used, stratum *h* refers to the entire site. For the high-intensity sites, it refers to the substrata within sites used in selecting the sample. Strata and substrata are defined in Chapter II, Section E.

The sampling weight for each telephone number released into the sample was either 3,962 or 3,963, depending on which of the five strata the number was sampled from (due to rounding error)

2. Adjustments for Types of Household-Level Nonresponse

We formed weighting cells to adjust for three kinds of household-level nonresponse: (1) inability to determine whether a sampled telephone number was a working residential number, (2) nonresponse to survey questions used to determine whether the household was eligible, and (3) nonresponse to the survey by eligible households (residences that contain at least one eligible adult).[20] The final status codes described in Chapter IV for calculating response rates were used for weighting. The status codes were classified into household, non-household/non-working, or unresolved. Then among the ones classified as households, they were further classified into survey-eligible response, survey-eligible nonresponse, household ineligible for survey, or undetermined (household did not complete screener).

We formed primary weighting cells based on geography. We crossed metro status, census region, census division, and state. To meet minimum cell size standards for responding households, we collapsed cells as needed. For example, for non-metro areas, we collapsed across all states within census division to form cells. Based on generally accepted guidelines, we decided that each cell should contain at least 20 respondents and that the adjustment factor in

[20]A household was eligible for the interview if it contained at least one civilian adult. People who were not on active military duty at the time of the interview were considered to be civilians. To avoid giving unmarried full-time college students multiple chances of selection, they were excluded from sampled dwellings in which their parents did not reside. Unmarried children younger than age 18 with no parent or guardian in the household also were excluded. Adults on active military duty were classified as ineligible; however, they could have been an FIU informant if there was at least one civilian adult in the family. FIUs in which all adults were active-duty military personnel, or were otherwise ineligible, were considered ineligible for the survey.

each cell should be less than two. Cells that did not meet these criteria were combined with similar cells.

3. Adjustment to Telephone Weight for Resolution of Residency of Telephone Number

For the telephone number weight, we made an adjustment for the inability to determine whether a sampled telephone number was a working residential number. To adjust for the telephone numbers with undetermined residency, we created the following adjustment factor:

$$(3) \quad A'_{nr}(phone_c) = \frac{\sum_{phone \in c} SW(phone_h)}{\sum_{det\ phone \in c} SW(phone_h)},$$

for telephone numbers in stratum *h*, which are in cell *c*, where the numerator is summed over all telephone numbers in cell *c*, and the denominator is summed over telephone numbers in cell *c* with a known residency status.

A telephone number weight adjusted for determination of residency resolution was then calculated for these cases:

(4) $W1(phone_h) = SW(phone_h) \cdot A'_{nr}(phone_c)$, if eligibility of telephone number determined

$W1(phone_h) = 0$, otherwise.

After this adjustment, telephone numbers with undetermined residency and telephone numbers known to be ineligible (nonresidential or nonworking) were removed from the weighting process.[21]

[21]After each weighting adjustment involving eligibility determination (at the telephone number and household levels), we removed cases with undetermined eligibility status and cases known to be ineligible. After each

4. Screener Nonresponse Adjustment to Household Weight

The next adjustments accounted for whether a residential household was eligible for the survey. To adjust for households with incomplete information on household eligibility, we created the following household eligibility nonresponse adjustment factor:

$$(5) \quad A'_{nr}(hhold_c) = \frac{\sum_{hh \in c} W1(phone_h)}{\sum_{det\ hh \in c} W1(phone_h)},$$

for households in stratum *h*, which are in cell *c*, where the numerator is summed over all telephone numbers in cell *c* known to be households, and the denominator is summed over households in cell *c* with a known survey eligibility status.

A telephone number weight adjusted for determination of household eligibility was then calculated for these cases:

(6) $W1(hhold_h) = W1(phone_h) \cdot A'_{nr}(hhold_c)$, if eligibility of household determined

$W1(hhold_h) = 0$, otherwise.

After this adjustment, households with undetermined eligibility status and households known to be ineligible for the survey were removed from the weighting process.[22]

(continued)
adjustment involving nonresponse among known eligibles (at the household, FIU, and individual levels), we removed the nonrespondents from the remaining steps.

[22]After each weighting adjustment involving eligibility determination (discussed in Sections B.1.c and B.1.d), we removed cases with undetermined eligibility status and cases known to be ineligible. After each adjustment involving nonresponse among known eligibles (discussed in Sections B.1.e, B.1.h, and B.1.j), we removed the nonrespondents from the remaining steps.

5. Interview Nonresponse Adjustment to Household Weight

We then adjusted the weights for survey nonresponse among eligible households. A responding household was one in which at least one eligible FIU responded to the survey. We performed a weighting class adjustment for households using the same cells as defined for the household eligibility adjustment. We created a household survey nonresponse adjustment factor as follows:

$$(7) \quad A''_{nr}(survey_c) = \frac{\sum_{elig\ hh \in c} W1(hhold_h)}{\sum_{resp\ hh \in c} W1(hhold_h)},$$

for households in stratum *h*, which are in cell *c*, where the numerator is summed over all eligible households in cell *c*, and the denominator is summed over responding eligible households in cell *c*. The following household weight adjusted for survey nonresponse was then calculated for these cases:

$$(8) \quad W2(hhold_h) = W1(hhold_h) \cdot A''_{nr}(survey_c), \text{ if household responded}$$

$$W2(hhold_h) = 0, \text{ otherwise.}$$

6. Poststratification and Other Adjustments to Household Weight

We then adjusted for more than one telephone in the household and for interruptions in telephone service.[23] Because some households have more than one nonbusiness telephone

[23]Question h30 in the Household Survey asked one FIU in the household whether the household had any additional telephone numbers and, if so, how many; in the case of one or more numbers, question h31 asked whether the additional number(s) was (were) for home or business use. If h30 = 1, 2, 3, or 4 and h31 = 1 or 2 (home use or both), we then set the number of telephones equal to h30 plus 1. For all other cases, we set the number equal to 1.

number,[24] a household multiplicity factor was used to adjust for the number of telephone numbers in the household. This factor, which is the inverse of the total number of these telephones in the household, was applied to the nonresponse-adjusted household weight:

(9) $W3(hhold_{hi}) = W2(hhold_{h})/(number\ of\ phones\ in\ household\ i).$

One of the last steps in creating the household-level weight was to poststratify the sum of the weights to external estimates of current population totals. To create the weights summing to all households, we used information on telephone service interruption to inflate the RDD sample weights for telephone households to account for households without landline telephone service. We did this in two steps: (1) poststratifying to total households by census region and number of months without telephone service (using totals from the 2006 National Health Interview Survey [NHIS], including Alaska and Hawaii), then (2) poststratifying to total households by census region and metro status (using totals from the March 2007 Supplement to the Current Population Survey [CPS], *excluding* Alaska and Hawaii). Step (1) was necessary because the CPS did not have information on phone service interruption. For step (1), we collapsed cells defined by months of interruption as needed. In particular, any households with three or more months or interruption were combined within census region, but other combinations were necessary as well. Step (2) was necessary because the NHIS data were not available by metro status, and we were not able to remove counts for Alaska and Hawaii. The poststratification adjustment factor for households based on the NHIS is:

[24]By "non-business telephone number," we mean a telephone number from which the household received non-business calls. Dual-use numbers would fall into this category.

(10) $$A_{ps\text{-}nhis} = \frac{NHISHH_{\text{cenreg,interr}}}{\sum_{resp\ hh_i \in \text{cenreg,interr}} W3(hhold_{hi})}$$

where *NHISHH* is the estimated number of households by census region and months of telephone interruption in 2006 (for all 50 states and D.C.), and the denominator is the sum of the nonresponse-adjusted weights for all responding households in the corresponding category. The household-level weight poststratified to all households is:

(11) $$WT_{nhis}(hhold_{hi}) = W3(hhold_{hi}) \cdot A_{ps\text{-}nhis} .$$

For step (2), we use cells defined by census region and metro status. The poststratification adjustment factor for households based on the CPS is:

(12) $$A_{ps\text{-}cps} = \frac{CPSHH_{\text{cenreg,msa}}}{\sum_{resp\ hh_i \in \text{cenreg,msa}} WT_{nhis}(hhold_{hi})}$$

where *CPSHH* is the estimated number of households by census region and metro status in 2007 (for the 48 contiguous states and D.C.), and the denominator is the sum of the NHIS-poststratified weights for all responding households in the corresponding category. The household-level weight poststratified to all households is:

(13) $$WT(hhold_{hi}) = WT_{nhis}(hhold_{hi}) \cdot A_{ps\text{-}cps} .$$

7. Interview Nonresponse Weight Adjustment for FIUs

The probability of selection of each FIU was equal to the probability of selection for its household (that is, all FIUs in a selected household were selected for the interview). We therefore used the final household weight as the starting point for developing the FIU weight. The FIU weights accounted for FIU interview nonresponse within responding households.

Within responding households, FIU eligibility was based on information that the household informant provided.

We started with an FIU-level file containing all FIUs enumerated within responding households and assigned to each FIU its final household weight. Using the same cells as defined for the telephone- and household-level adjustments, we created an FIU survey nonresponse adjustment factor for FIUs in responding households *i* (stratum *h*):

$$(14) \qquad A_{nr}(FIU_c) = \frac{\sum_{elig\ fiu \in c} WT(hhold_c)}{\sum_{resp\ fiu \in c} WT(hhold_c)},$$

where the numerator is summed over all eligible FIUs in cell *c*, and the denominator is summed over responding eligible FIUs in cell *c*.

An FIU weight adjusted for survey nonresponse was then calculated for these cases:

$$(15) \qquad W4\ FIU() = WT(hhold_c) \cdot A_{nr}(FIU_c), \text{ if FIU responded}$$

$$W4(FIU_{hi}) = 0, \text{ otherwise.}$$

8. Initial Person Weight

The probability of selection for each adult member of an eligible responding FIU was equal to the probability of selection of the FIU (that is, all adults in each responding FIU were selected for the interview). We therefore used the final FIU weight to develop the person weight for adults. However, because only one child was selected at random per FIU, the within-FIU probability of selection for a child was equal to the inverse of the number of children in the FIU. The overall probability of selection for person *k* in FIU *j* in household *i* in stratum *h* can be expressed as:

(16) $$P(person_{hijk}) = \frac{P(FIU_{hij})}{(\delta \cdot numkids_{hij}) + (1-\delta)},$$

where $numkids_{hij}$ is the number of children in FIU_{hij}, and δ is equal to zero for adults and is equal to one for children. So, the initial person-level weight for all people was calculated as follows:

(17) $$W5(person_{hijk}) = W4(FIU_{hi}) \cdot [(\delta \cdot numkids_{hij}) + (1-\delta)],$$

for all persons *k* in FIU *j*, household *i*, stratum *h*.

All eligible persons in responding FIUs were assigned this weight, whether or not we had complete data on that person. Most of the survey data were obtained from the FIU informant about all family members; however, responses to subjective questions were obtained from a self-response module that each adult completed. Therefore, for some people, we had data that the FIU informant had provided but were missing data from that person's self-response module.

9. Nonresponse Adjustment to Person and Self-Response Module Weights

The next adjustment to the person weight accounted for unit nonresponse to the core interview among people selected for the survey. Because there was an FIU informant responding on behalf of all FIU members, there was no unit nonresponse to adjust for in the weights for the core interview. Furthermore, because only a few people were treated as unit nonresponders in prior rounds due to very high levels of item nonresponse, we chose not to carry out this step for round five. Therefore, the child-adjusted person-level weight is the final person-level weight for analysis of data in the core interview.

However, we created a weight specifically to be used for analyzing questions in the self-response module for round five. This adjusted for unit nonresponse to the self-response module (n=1,588) as well as high levels of missing information from this module (n=103).[25] All children were considered respondents to the module because responses to those questions were obtained as part of the core interview with the FIU informant. This step in the weighting process adjusted for unit nonresponse using the same weighting cells as defined for previous adjustments. We created a person-level self-response module nonresponse adjustment factor as follows:

$$(18) \qquad A_{srm}(missing_c) = \frac{\sum_{coreresp\ person \in c} W5(person_{hijk})}{\sum_{srmresp\ person \in c} W5(person_{hijk})},$$

for person *k* (in FIU *j*, household *i*, stratum *h*) in cell *c*, where the numerator is summed over all eligible and selected individuals in responding FIUs in cell *c*, and the denominator is summed over individuals with complete responses to the self-response module. A self-response module person weight adjusted for survey nonresponse was then calculated for these cases:

$$(19) \qquad W6(srm_{hijk}) = W5(person_{hijk}) \cdot A_{srm}(missing_c), \text{ if person met the editing rule, and}$$
$$W6(srm_{hijk}) = 0, \text{ otherwise.}$$

10. Poststratification of Person- and Self-Response Module-Level Weights

[25]An editing program was used to determine whether a person record contained too many missing items to be usable for analysis of the self-response module. The editing rule was that all person records with more than 10 missing data items for variables from the self response module were considered to be nonrespondents.

Person- and self-response module level weights were post-stratified by sex and age group, then by sex and whether or not Hispanic, then by sex and race (Black and non-Black), then by level of education.[26] After person-level weights were trimmed, weights were post-stratified again by the same demographic variables, as well as by the distribution of telephone and non-telephone households before trimming (discussed below.)

11. Trimming FIU and person weights

In analyses of survey data, even a few extremely large weights can reduce the accuracy of point estimates and inflate the sampling variance. To reduce the sampling variance, excessively large weights are trimmed, and the amount trimmed is distributed among the untrimmed weights to preserve the original sum of the weights. However, trimming of sampling weights can introduce bias into some point estimates. The objective in trimming weights is to reduce the impact of excessively large weights, while minimizing the introduction of bias.

We trimmed the person- and family-level weights and then assessed the effect of the trimming. We evaluated the extent of trimming and the inflation factor for the untrimmed weights necessary to preserve the original sum of the weights and then estimated the effect of the trimming on the sampling variance. We used a weight-trimming algorithm that compares each weight with the square root of the average value of the squared weight used to identify the trimming cutpoint and the weights to be trimmed. This algorithm has been referred to as the "NAEP procedure" (Potter 1990). The trimmed excess was distributed among the weights that were not trimmed.

[26]Age, sex, Hispanic, race, and education distributions and totals were from the March 2007 CPS (excluding Alaska and Hawaii).

The statistical measure of the impact of the trimming was based on the design effect attributable to the variation among the sampling weights. Unequal weighting (a result of differential selection rates and response rates) has the potential to decrease precision because variation in the weights affects the variance of weighted estimates. Person-level weights were trimmed to reduce this design effect; however, the extent of trimming was limited to minimize the risk of introducing bias into the sample estimates.

Specifically, let WT_i denote a set of weights and let n denote the number of people. We first established trimming classes based on stratum and the characteristics of the sample member (that is, adult or child). The weight-trimming algorithm establishes a cut-off point, T_c, in a trimming class, c, as:

$$(20) \qquad T_c = (k \sum_{i \varepsilon c} WT_i^2 \; / \; n_c)^{1/2},$$

where n_c is the number of observations in the trimming class, k is an arbitrary number (generally assigned a value of 10), and the summation is over the observations in the trimming class. Any weight exceeding the cut-off point, T_c, is assigned the value of T_c, and excess is distributed among the untrimmed weights, thereby ensuring that the sum of the weights after trimming is the same as the sum of the weights before trimming.

Using these newly computed weights, the cut-off point was recomputed and each weight again compared with the cutoff point. If any weight exceeded the new cutoff point, the observation was assigned the value of the new cutoff point, and the other weights were inflated to compensate for the trimming.

The cutoff point generated by the algorithm was generally used as the value of the trimmed weight. In some trimming cells, the algorithm indicated a trimming level that was judged to be

excessive, so a value larger than the computed cutoff point was used. In general, we used a larger value when the adjustment seemed excessive for weights that were less than the cutoff point or when a trimming class contained only a few observations. Our goal was to inflate the untrimmed weights by less than two percent.

The weights were evaluated for trimming separately for adults and children. Because only one child was randomly selected in each FIU and the sample size of children was smaller than that of adults, weights for children had greater variation and were larger on average than for adults. The weights for trimming were identified by using the NAEP procedure, as well as by visual inspection of outlier weights the NAEP procedure might have missed. The assessment of the impact of trimming was evaluated by inspecting the trimming level, the magnitude of the adjustment to the untrimmed weights, and the anticipated design effect from unequal weights.

FIU-level weights were also trimmed. We used the same trimming classes and procedures as were used for the two groups (adults and children) of person-level weights.

C. SAMPLING ERROR ESTIMATION

1. Background

Because the Household Survey sample design is complex, it requires specialized techniques for estimation of sampling variances. Procedures in standard statistical packages, such as SAS and SPSS, compute variances using formulas under the assumption that the data are from a simple random sample from an infinite population. Although the simple random sample variance may approximate the sampling variance in some surveys, it is likely to substantially underestimate the sampling variance with a design as complex as that of the Household Survey. Departures from a simple random sample design result in a design effect that is defined as the

ratio of the sampling variance *(Var)* given the actual survey design to the sampling variance of a hypothetical simple random sample with the same number of observations. Thus:

(21) $$Deff = \frac{Var\ (actual\ design\ with\ n\ cases)}{Var\ (SRS\ with\ n\ cases)}.$$

Based on the sampling variance, a series of measures of reliability can be computed for a parameter estimate or statistic. The standard error is the square root of the sampling variance. Over repeated samples of the same size and using the same sampling design, we expect that the true value of the statistic would differ from the sample estimate by less than twice the standard error in approximately 95 percent of the samples. The degree of approximation depends on the distributional characteristics of the underlying observations. The relative standard error is the standard error divided by the sample estimate and is usually presented as a percentage. In general, an estimate of a population parameter with a relative standard error of 50 percent is considered unreliable and is not reported. Furthermore, an estimate with a relative standard error of greater than 30 percent may be reported but also may be identified as potentially unreliable.

For the Household Survey, the sampling variance estimate, called the *design-based sampling variance*, is a function of the sampling design and the population parameter being estimated. The design-based variance assumes the use of fully adjusted sampling weights, which are derived from the sampling design, with adjustments to compensate for nonresponse and for ratio-adjusting the sampling totals to external totals (for example, to data on population totals by age and race/ethnicity generated by the Bureau of the Census from the CPS).

The data files for the Household Survey contain a set of fully adjusted sampling weights and information on analysis parameters (that is, stratification and analysis clusters) necessary for the estimation of the sampling variance for a statistic. Because of the stratification and unequal

sampling rates, it was necessary to account for the sampling weights and the sampling design features to compute unbiased estimates of population parameters and their associated sampling variances. The estimation of the sampling variance required the use of special survey data analysis software or specially developed programs designed to accommodate the population parameter being estimated and the sampling design.

Survey estimators fall into two general classes: (1) linear estimators, and (2) nonlinear estimators. Linear estimators are weighted totals of the individuals with an attribute, or means and proportions, if the denominators are known (for example, when the denominator is a poststratum total or a sum of poststrata totals). Nonlinear estimators include proportions and means (when the denominators are unknown and are estimated from the survey), ratios, and correlation and regression coefficients. In general, the variances of nonlinear statistics cannot be expressed in a closed form. Woodruff (1971) suggested a procedure in which a nonlinear estimator is linearized by a Taylor series approximation. The sampling variance equation is then used on this linear form (called a *linearized variate*) to produce a variance approximation for the original nonlinear estimator.

Most common statistical estimates and analytic tools (such as percentages, percentiles, and linear and logistic regression) can be implemented using Taylor series approximation methods. Survey data software, such as SUDAAN (Shah et al. 1997), uses the Taylor series linearization procedure and can handle the multistage Household Survey design, joint inclusion probabilities, and the stratification and clustering components of variance.

2. Variance Estimation

The round five Household Survey contains weights that are designed for national estimates. The sample is a national RDD sample using five strata—four geographic regions for areas within MSAs and the country as a whole for nonmetropolitan areas. Variance estimation assumed a

simple stratified random sampling with-replacement design, with households as the primary sampling units and no adjustment for the finite population correction.

The forthcoming Household Survey user's guide will provide instructions for deriving appropriate variance estimates.

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