Respondent Consent to Link Survey Data with Administrative Records: Results from a Split-Ballot Field Test with the 2007 National Health Interview Survey

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Introduction

Data from the National Health Interview Survey (NHIS), a multi-purpose household health survey conducted annually by the National Center for Health Statistics, Centers for Disease Control and Prevention, are routinely linked to other health-related administrative records to enhance their analytic potential. Previous NHIS linkages include matches to death certificate records collected by the National Death Index, Medicare enrollment and claims records collected from the Centers for Medicare and Medicaid Services, and Social Security benefit histories collected from the Social Security Administration. Linked survey and administrative data records provide the opportunity to study a variety of risk factors and health outcomes, increase the accuracy and level of detail of health data resources, and reduce respondent reporting burden.

To improve the accuracy of person level record matches, the NHIS attempts to collect unique identifiers such as Social Security numbers (SSN) and Medicare Health Insurance Claim Numbers (Medicare number). In previous years of NHIS data collection, survey respondents were first informed of the intent to collect and use SSNs to link survey data to government statistical files through the use of advance letters sent to sampled households. During the course of the interview, survey respondents were asked to provide their SSN and Medicare number (if applicable) to link with health-related records held by other government agencies. If a respondent refused to supply an SSN this was viewed as lack of consent to allow record linkage.

Recently, increasing SSN refusal rates have resulted in significant sample loss for record linkage projects. Public concerns over identity theft have grown, and the percentage of NHIS respondents providing SSN information has decreased dramatically. In the 2005 NHIS over 50% of adult NHIS respondents refused to report their SSN, up from 15% in 1993. In response to these data collection challenges, NCHS began to explore alternatives to the process of obtaining survey respondent consent to record linkage and to the collection of unique identification numbers.

Previous experiments conducted by the U.S. Census Bureau (Bates and Pascale, 2006) and NCHS (Dahlhamer, Meyer, and Pleis, 2006) suggested that response rates could be improved by separating the issue of record linkage consent from the collection of SSNs and/or by collecting non-unique partial SSNs (e.g. last four digits only). NCHS also conducted linkage experiments to test the accuracy of record linkage with partial SSNs (e.g. last six digits only) in conjunction with other personal identifiers including, name, date of birth, and gender. Initial results of these linkage experiments were favorable (Sayer and Cox, 2003).

In an effort to ensure the future of NHIS record linkage, NCHS developed a split-ballot field test implemented as part of the 2007 NHIS to test response to two sets of experimental questions on consent to record linkage and partial SSN (and Medicare number) collection. Using the field test data, we provide a preliminary evaluation of the relative effectiveness of the two treatments for inducing respondent consent to record linkage overall, and respondent consent to record linkage with the supply of a partial SSN.

Methods

The analysis presented here utilizes 15 weeks of data collected as part of a split-ballot field test administered during the first two quarters of the 2007 NHIS.[1] The NHIS is a continuously-administered survey of the health of the civilian, noninstitutionalized household population of the United States. Utilizing a multistage, clustered sample design, the NHIS produces data on health insurance coverage, health care access and utilization, health status, and health behaviors, as well as special topics that change from year to year. Public use microdata files are released annually.

Data are collected by U. S. Census Bureau interviewers using computer-assisted personal interviewing (CAPI). The survey contains four main modules: Household, Family, Sample Child, and Sample Adult. For the household composition module, a household respondent provides basic sociodemographic information on all members of the household. Within each family in the household, the family module is completed by a knowledgeable adult who provides health information on each member of the family. Additional health information is collected from one randomly selected adult (the "sample adult") 18 or older and from someone knowledgeable about the health of one randomly selected child under age 18 (the "sample child").

For the split-ballot field test, the sample adult and sample child respondent received one of two sets of consent to record linkage questions (see treatments below). The same randomly selected set of questions was administered to both the sample adult and sample child respondent (answering for the sample child). The consent questions appeared at the end of the sample adult and sample child modules.

Question Treatments

On the first ballot (hereafter referred to as treatment 1):

- Sample adults:
    - The sample adult received a question asking for permission to link his/her survey data with health-related records of other government agencies. The purpose of record linkage was explained in the body of the question. If the sample adult refused to answer or gave an answer of "no" or "don't know," no more consent questions were asked. If the sample adult answered "yes" to this initial consent question, he/she was asked to provide the last four digits of his/her SSN. If the sample adult had Medicare, he/she received an additional question asking for the last four numbers and any letters of his/her Medicare number.
- Sample child respondents:
    - The sample child respondent received a question asking for permission to link the sample child's survey data with health-related records of other government agencies. The purpose of record linkage was explained in the body of the question. If the sample child respondent refused to answer or gave an answer of "no" or "don't know," no more consent questions were asked. If the sample child respondent answered "yes" to this initial consent question, he/she was asked to provide the last four digits of the sample child's SSN.

On the second ballot (hereafter referred to as treatment 2):

- Sample adults who don't have Medicare:
    - The sample adult received an introductory statement describing the need to collect the last four digits of his/her SSN to aid in linking his/her survey data with health-related records of other government agencies. The purpose of record linkage was explained in the body of the introductory statement. If the sample adult refused to continue, no more consent questions were asked. Otherwise, the interviewer continued by asking the sample adult to provide the last four digits of his/her SSN.

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[1] Separate NHIS samples are designated for each quarter of the calendar year, which are further distributed into weekly samples for each quarter. Each weekly sample is designed to be representative of the civilian, non-institutionalized household population of the United States.

        - If the sample adult provided the last four digits of his/her SSN, no more consent questions were asked. If the sample adult refused to provide the last four digits of his/her SSN, or answered "don't know" or "don't have an SSN," he/she received a final question asking for permission to link his/her survey data with health-related records of other government agencies without the use of the partial identifier.

- Sample adults who have Medicare:

    - The sample adult received an introductory statement describing the need to collect the last four digits of his/her SSN and the last four numbers and any letters of his/her Medicare Health Insurance Claim Number to aid in linking his/her survey data with health-related records of other government agencies. The purpose of record linkage was explained in the body of the introductory statement. If the sample adult refused to continue, no more consent questions were asked. Otherwise, the interviewer continued by asking the sample adult to provide the last four digits of his/her SSN, followed by the last four numbers and any letters of his/her Medicare number.

        - If the sample adult provided the four last digits of his/her SSN and the last four numbers and any letters of his/her Medicare number, no more consent questions were asked. If the sample adult refused to answer the SSN question, or answered "don't know" or "don't have an SSN," and/or the sample adult refused to answer the Medicare number question, or answered "don't know," the sample adult received a final consent question asking for permission to link his/her survey data with health-related records of other government agencies without the use of the partial identifier(s).

- Sample child respondents:

    - The sample child respondent received an introductory statement describing the need to collect the last four digits of the sample child's SSN to aid in linking the sample child's survey data with health-related records of other government agencies. The purpose of record linkage was explained in the body of the introductory statement. If the sample child respondent refused to continue, no more consent questions were asked. Otherwise, the interviewer continued by asking the sample child respondent to provide the last four digits of the sample child's SSN.

        - If the sample child respondent provided the last four digits of the sample child's SSN, no more consent questions were asked. If the sample child respondent refused to provide the last four digits of the sample child's SSN, or answered "don't know" or the sample child "does not have an SSN," the sample child respondent received a final consent question asking for permission to link the sample child's survey data with health-related records of other government agencies without the use of the partial identifier.

The full questions, along with skip patterns and interviewer instructions, are included in Appendix I.

Both treatments allowed for the following three outcomes: no consent to record linkage, consent to record linkage without a partial SSN[2] (and/or Medicare number), and consent to record linkage with a partial SSN (and/or Medicare number). Consent to record linkage with partial identifiers was the preferred outcome, followed by consent to record linkage without the identifying information. The decision to collect the last four digits of the SSN (and the last four numbers and any letters of the Medicare number) in both treatments was borne out of previous research reporting higher response rates to requests for the last four digits versus the full nine digits (Dahlhamer, Meyer, and Pleis, 2006). Additionally, a previous study utilizing NHIS records confirmed the ability to perform accurate matches to the National Death Index with a partial SSN (Sayer and Cox, 2003).

The two approaches to gaining consent operate loosely on influence strategies known respectively as "foot-in-the-door" and "door-in-the-face" (Hippler and Hippler, 1986). Treatment 1 was based on the former where compliance with an initial demand (consent to record linkage) is hypothesized to increase the willingness to perform a more difficult task (provide an

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[2] To improve readability, the last four digits of the SSN will be referred to as a partial SSN from this point forward.

SSN).[3] Treatment 2 used a modified "door-in-the-face" technique whereby the interviewer begins with a more specific and extreme demand (consent imbedded within a request for a partial SSN) and, if refused, follows with a more moderate second request (ask for consent to link without the use of an SSN). This technique relies on norms of reciprocity: a concession by the interviewer is reciprocated with a concession by the respondent. Cognitive factors aside, a primary advantage of the second approach is that it provides two explicit opportunities to gain consent. As a result, we hypothesized that treatment 2 will elicit more consent to record linkage overall, but no detectable differences in rates of consent with an SSN (or Medicare number) will be observed across treatments.

Analysis

The analysis was limited to data collected during the first quarter of 2007 and the first four weeks of quarter two.[4] A total of 7,566 sample adults responded to the experimental consent questions, with 3,815 receiving treatment 1 and 3,751 receiving treatment 2. A total of 3,168 sample child respondents answered the consent questions: 1,586 received treatment 1 and 1,582 received treatment 2. For the period under analysis, the overall sample adult response rate was 68%, and the sample child response rate was 77%.

Again, the primary goal of our analysis was to evaluate the relative effectiveness of the two sets of questions for eliciting respondent consent to record linkage, and respondent consent to record linkage while also providing partial identifying information. Therefore, we focused on two outcome or dependent variables. One is a trichotomous measure of consent: no consent to record linkage, consent to record linkage without an SSN, and consent to record linkage with an SSN.[5] The second dependent variable is a dichotomous measure of whether or not consent to record linkage was given (regardless of whether or not a partial SSN was given).

Using the trichotomous outcome measure, we first present comparisons of rates of respondent consent to data linkage by question treatment. Rate comparisons are presented overall and for a set of respondent/subject, family socioeconomic, social environment, and paradata (data about the data collection process) measures. For all rate comparisons presented in Tables 1 and 3, two-tailed t-tests were conducted at the .05 level. The rate comparisons are then followed with results of ordinary logistic (with the dichotomous dependent variable) and multinomial logistic regressions (with the trichotomous dependent variable) assessing the relationship between question treatment and consent to record linkage, net of the respondent/subject, family socioeconomic, social environment, and paradata measures. We also describe the associations between the control measures and the dependent variables. The rate comparisons and multivariate analysis for the sample adult are presented first, followed by the sample child results.[6] Since sample adult and sample child record weights were not yet available, all analysis was unweighted.[7] To account for the clustered sample design and produce appropriate standard errors, all analysis was performed in SUDAAN (version 9.0, Research Triangle Institute, Inc., Research Triangle Park, NC).

The respondent/subject, family socioeconomic, social environment, and paradata measures used in the rate comparisons and multivariate analysis were consistent with those reported in prior research to be significantly associated with respondent consent to link survey data with administrative records, and with respondent consent to participation in follow-up studies. Respondent/subject characteristics identified in the literature include age (Banks, Lessof, and Taylor, 2005; Bates and Pascale, 2006; Dunn et al., 2004; Jenkins et al., 2004; Pullen, Nutbeam, and Moore, 1992; Woolf et al., 2000; Young, Dobson, and Byles, 2001); race and ethnicity (Bates and Pascale, 2006; Olson, 1999); sex (Bates and Pascale, 2006; Dunn et al., 2004; Woolf et al., 2000); education (Bates and Pascale, 2006; Olson, 1999; Pullen, Nutbeam, and Moore, 1992; Woolf et al., 2000; Young, Dobson, and Byles, 2001); employment status (Olson, 1999); marital status (Olson, 1999; Pullen, Nutbeam, and Moore, 1992); citizenship status (Olson, 1999); and health status (Dunn et al., 2004; Jenkins et al., 2004; Olson, 1999; Pullen, Nutbeam, and Moore, 1992; Woolf et al., 2000; Young Dobson and Byles, 2001). Accordingly, for the analysis of

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[3] In this case, however, the initial demand may be perceived as highly sensitive and difficult.

[4] Time constraints coupled with data unavailability kept us from analyzing all of quarter two, and quarter one is limited to 11 weeks of data since weeks one and two are reserved for interviewer training.

[4] Securing the last four numbers and any letters of the Medicare number was an important goal of the study; however, too few sample adults reported having Medicare during the time period covered in this analysis to perform meaningful subgroup analysis. We limit our analysis, therefore, to consent with or without an SSN.

[6] Due to model overspecification, control variables that were not associated with either dependent variable at the .10 level in chi-square analyses were excluded from the sample child ordinary logistic and multinomial logistic regressions reported in Table 4. In total, three variables were excluded from the models.

[7] Results from a preliminary analysis using base weights (inverse of the probability of household selection) were consistent with those presented here.

sample adult consent to record linkage we included measures of sample adult age, race and ethnicity, sex, education, employment status, marital status, citizenship status, health compared to 12 months ago (self-report), and the number of self-reported health conditions. For the sample child analysis, we included measures of the sample child respondent's and sample child's age, race and ethnicity, and sex; the sample child respondent's education, employment status, marital status, citizenship status, and health status; and the respondent's assessment of the sample child's health compared to 12 months ago and the number of respondent-reported sample child health conditions.

Additionally, socioeconomic measures such as family or household income (Banks, Lessof, and Taylor, 2005; Bates and Pascale, 2006; Olson, 1999; Woolf et al., 2000), and measures of the social environment including region of residence and level of urbanicity (Jenkins et al., 2004; Olson, 1999) have been cited in the literature as significant correlates of consent to record linkage and study participation. To be consistent with earlier studies, we included measures of total family income, home ownership status, region of residence, and metropolitan statistical area (MSA) status[8] in both the sample adult and sample child analysis.

Finally, paradata measures such as mode of administration (e.g. telephone versus face-to-face) and language of interview have been shown to influence consent to record linkage and study participation (Jenkins et al., 2004; Olson, 1999). Therefore, we included measures of language of sample adult/sample child interview and whether the sample adult/sample child interview was administered primarily by telephone or primarily in-person.[9] In addition, we explored two measures of easy/difficult households: total number of contact attempts made on the household and whether or not any household members expressed concerns or reluctance about participating prior to the interview. The coding of all variables can be found in Table 1 (sample adult) and Table 3 (sample child).

Results

To determine whether the field test provided a valid assessment of the difference in consent rates between treatments, we compared the two treatment groups with respect to a set of respondent/subject characteristics. For sample adults, we performed a total of 53 comparisons and identified two significant differences. First, there was a higher percentage of sample adults between the ages of 45 and 54 in the treatment 1 group than in the treatment 2 group (20.1% versus 18.2%). And second, there was a higher percentage of high school graduates and G.E.D. recipients among the treatment 2 cases (30.3% versus 27.5%). We performed 66 comparisons (two-tailed t-tests) for the sample child cases and found only one significant difference: the treatment 2 group had a significantly higher percentage of sample children aged 14-17 (27.1% versus 24.2%). These results suggest that any differences observed in consent rates by question treatment are likely due to the treatments themselves as opposed to differences in the characteristics of respondents receiving the treatments.

Sample Adult Results[c1]

Table 1 presents the percentage of sample adults who consented to record linkage and provided a partial SSN, the percentage of sample adults who consented to record linkage and did not report a partial SSN, and the percentage of sample adults who did not consent to record linkage activities by question treatment. Focusing on the overall rates (first row of rates in Table 1), treatment 2 outperformed treatment 1. First, treatment 2 produced a significantly lower percentage of sample adults who were unwilling to consent to record linkage (28.1% versus 33.8%). Conversely, 71.9% of sample adults receiving treatment 2 of the questions consented to record linkage activities, compared to 66.2% of sample adults receiving treatment 1. The higher rate of consent to record linkage among adults receiving treatment 2 was largely driven by the significantly higher rate of consent to record linkage coupled with the reporting of a partial SSN. Over 53% of sample adults receiving treatment 2 gave consent to record linkage and provided a partial SSN, compared to not quite 49% of sample adults who received treatment 1. And finally, while not statistically significant, a higher percentage of sample adults who received treatment 2, compared to sample adults who received treatment 1, gave consent to record linkage, but did not report a partial SSN (18.4% versus 17.4%).

Table 1 about here

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[8] MSA status is a measure of population density as defined by the U. S. Census Bureau.

[9] Interviews must be initiated face-to-face. Telephone follow-up is permitted to complete partial interviews or to collect other missing parts of the interview. At the end of the interview, interviewers are asked to indicate which main sections (including the sample child core and the sample adult core), if any, were conducted "primarily by telephone."

Next, we performed the same rate comparisons by treatment for each category of the sample adult, family socioeconomic, social environment, and paradata measures. Of 159 comparisons, 33 produced statistically significant differences, and all 33 favored treatment 2 (see Table 1). Twenty-one of the 33 significant differences emerged when comparing the treatments, by subgroup, on the percentage of sample adults who did not consent to data linkage, while the remaining 12 significant differences came from treatment comparisons, by subgroup, of sample adults who consented to data linkage and gave a partial SSN.

Some of the significant differences in rates by treatment were sizeable. For example, 27.8% of treatment 2 sample adults between the ages of 45 and 54 failed to give consent to record linkage compared to 36.1% of treatment 1 sample adults of similar ages. Similar differences in the percentage of sample adults who did not give consent to record linkage were also observed for families that required five or more contact attempts to complete an interview, and for families where members expressed concerns or reluctance about participating prior to the interview. These findings suggest that treatment 2 fared better than treatment 1 with sample adults from families or households that could be characterized as difficult or less cooperative.

The size of the differences observed for treatment comparisons, by subgroup, of the percentage of sample adults who consented to record linkage and gave a partial SSN were generally smaller than those observed for treatment comparisons, by subgroup, of the percentage who failed to give consent to record linkage. A few notable differences, however, emerged for sample adults with one or two health conditions, sample adults from families with incomes less than $35,000, and sample adults from families that required five or more contact attempts to complete the interview. Of the treatment 2 sample adults reporting one or two health conditions, 54.5% consented to record linkage and reported a partial SSN, whereas just less than 47% of treatment 1 sample adults with one or two health conditions gave a similar level of consent. For treatment 2 sample adults from five or more contact attempt families, 52.6% gave consent and a partial SSN, compared to 44.7% of treatment 1 sample adults. Again, treatment 2 appears to have fared well with respondents from more difficult families.

Table 2 presents results from ordinary logistic and multinomial logistic regressions assessing the impact of question treatment on consent to record linkage, net of the sample adult, family socioeconomic, social environment, and paradata measures. "No consent to link" is the reference category of the dependent variables for both models. Two comparisons were performed in the multinomial logistic regression: the sample adult consented to record linkage and provided a partial SSN versus no consent to link, and the sample adult consented to record linkage and did not provide a partial SSN versus no consent to link. For the ordinary logistic regression, the two consent categories were collapsed to create a dichotomous measure of consent to record linkage versus no consent to record linkage.

Table 2 about here

As shown in Table 2, a significant effect of question treatment on consent to record linkage emerged, net of several control measures. In the multinomial logistic analysis, sample adults receiving treatment 2 had higher odds of consenting to record linkage and providing a partial SSN (OR=1.40, CI=1.24-1.57), and higher odds of consenting to record linkage and not providing a partial SSN (OR=1.30, CI= 1.11-1.52) than sample adults receiving treatment 1. As implied by these findings, sample adults receiving treatment 2 had higher odds of providing some form of consent to record linkage (regardless of SSN response; OR=1.37, CI=1.22-1.54; see Table 2). Although we hypothesized higher levels of consent to record linkage in general, we did not anticipate the higher levels of consent to record linkage along with reports of a partial SSN induced by treatment 2.

Many of the controls were significantly associated with consent, though some of the effects were fairly small. Sample adults between the ages of 18 and 34 (OR=1.51, CI=1.17-1.95) and sample adults between the ages of 35 and 44 (OR=1.45, CI=1.16-1.82) had odds of consent to record linkage noticeably higher than the odds for older adults. The findings for overall consent to record linkage were largely the result of higher odds of consent with a partial SSN among these younger age groups. Our findings are consistent with the bulk of the consent literature (Banks, Lessof, and Taylor, 2005; Bates and Pascale, 2006; Dunn et al., 2004; Pullen, Nutbeam, and Moore, 1992; Young Dobson and Byles, 2001). With regard to education, sample adults[c2] with less than a high school education had higher, though modest, odds of providing consent without a partial SSN (versus no consent to link; OR=1.24, CI=1.02-1.51) than sample adults with at least a bachelor's degree. No differences were observed, however, in the ordinary logistic analysis.

Employment status and citizenship status both had significant impacts on the dependent variables. Sample adults who were not employed at the time of the interview had higher odds of consenting to record linkage without providing a partial SSN (OR=1.24, CI=1.04-1.48) compared to employed sample adults. And as might be expected, non-citizens had significantly lower odds of consenting to data linkage and reporting a partial SSN (OR=0.63, CI=0.47-0.84) than U.S. citizens. This finding is consistent with work by Olson (1999), and is likely due to a lower prevalence of SSNs among non-U.S. citizens. Interestingly, non-U.S. citizens were no more or less likely to consent to record linkage than U.S. citizens when responses to the SSN question were not considered.

Sample adults reporting health conditions had much greater odds of consenting to record linkage than sample adults with no reported health conditions. More specifically, the odds of providing consent for sample adults with one or two health conditions, for sample adults with three to five health conditions, and for sample adults with six or more health conditions were one-and-a-half, two, and not quite three times the odds of sample adults with no conditions. The effects were even stronger when differentiating consent to record linkage with a partial SSN from consent without a partial SSN. Sample adults with six or more conditions had odds of providing consent with a partial SSN over three-and-a-half times the odds of sample adults with no health conditions. These findings align with previous research on health conditions and consent to record linkage (Dunn et al., 2004; Woolf et al., 2000), and suggest the importance of topic saliency for gaining consent (Groves, Presser, and Dipko, 2004). Less healthy sample adults may better perceive the individual and societal benefits of follow-on research linking their health survey data with health-related records of other government agencies.

Consistent with earlier research (Bates and Pascale, 2006; Woolf et al., 2000), an unknown total family income was strongly associated with the absence of consent to record linkage. Sample adults with missing income information had considerably lower odds of granting consent with a partial SSN (OR=0.15, CI=0.11-0.20) than sample adults from families with reported incomes of $75,000 or more. This difference was reflected in considerably lower odds of overall consent among sample adults from families with unknown incomes. Missingness on the income items, which precede the consent questions, signals a heightened level of respondent sensitivity, and provides a useful barometer of the likelihood of affirmative responses to the consent items.

The social environment and paradata measures also had significant impacts on sample adult consent to record linkage. Sample adults from the Midwest had much higher odds of providing consent to record linkage with a partial SSN (OR=1.90, CI=1.25-2.89) and without a partial SSN (OR=1.71, CI=1.06-2.75) than sample adults residing in the West. These results are largely consistent with those reported by Olson (1999) in her study of consent to record linkage. Similarly, sample adults residing in rural areas had higher odds of consenting to record linkage with (OR=1.52, CI=1.15-2.02) and without a partial SSN (OR=1.54, CI=1.04-2.28), compared to sample adults residing in highly urbanized areas. This led to higher odds of consent (regardless of SSN reporting) among rural sample adults (OR=1.54, CI=1.15-2.05). This finding contrasts with the few urbanicity findings cited in the consent literature (Jenkins et al., 2004), although it is consistent with much of the survey response literature that has found rural households to be more cooperative (Groves and Couper, 1998).

As for the paradata measures, sample adults answering primarily over the telephone had lower odds of granting consent and reporting a partial SSN (OR=0.74, CI=0.62-0.89) than sample adults participating primarily in a face-to-face interview. This was directly countered by higher odds of providing consent without a partial SSN (OR=1.29, CI=1.05-1.57) among telephone respondents. This in turn may explain the nonsignificant effect of primary mode on overall consent. Similar findings were observed for language of the sample adult interview. Sample adults who were interviewed in a language other than English had significantly lower odds of giving consent to record linkage and reporting a partial SSN (OR=0.52, CI=0.36-0.76) than sample adults who were interviewed in English. As with primary mode of administration, this was countered by higher odds of giving consent without a partial SSN among the non-English sample adults, which, in turn, resulted in no significant differences in overall consent (regardless of SSN reporting). And finally, sample adults from families that expressed some level of concern about participating in an interview had lower odds of consenting to record linkage and supplying a partial SSN (OR=0.78, CI=0.64-0.95) than sample adults from more cooperative families. Not surprisingly, sample adults from less cooperative families (OR=0.83, CI=0.70-0.99) had lower odds of overall consent (regardless of SSN reporting), although the effect was fairly modest.

Sample Child Results

Consistent with the sample adult findings, treatment 2 of the consent questions elicited a significantly higher percentage of sample child respondents who consented to having the sample child's survey data linked with health-related records of other government agencies (67.8% vs. 60.7%). The higher overall rate of consent among respondents receiving treatment 2 was driven by higher rates of both consent to data linkage with a partial SSN and consent to data linkage without a partial SSN (see Table 3). The difference in treatment rates for consent to record linkage without a partial SSN was significant (36.0% vs. 31.5%).

Table 3 about here

Similar to the sample adult analysis, we performed the rate comparisons for each category of the sample child respondent, sample child, family socioeconomic, social environment, and paradata measures. In total, we performed 198 comparisons. Of those, 44 were statistically significant and all 44 favored treatment 2 of the questions (see Table 3). Twenty-six of the 44 significant differences emerged when comparing the percentage of sample child respondents who did not consent to data linkage, 13 emerged when comparing the percentage of sample child respondents who consented to record linkage but did not provide a partial SSN, and the remaining five significant differences emerged from comparisons of the percentage of sample child respondents that consented to record linkage and provided a partial SSN.

Many of the differences between treatment 1 and treatment 2 were substantial. For example, of the treatment 2 respondents from families with an unknown income, 56.0% did not give consent to record linkage. This compared very favorably to the 74.0% of treatment 1 respondents from families with an unknown income. And as we saw in the sample adult analysis, treatment 2 fared much better than treatment 1 when administered in more difficult households. Not quite 29% of treatment 2 respondents from more difficult families (five or more contact attempts) failed to give consent to record linkage compared to 44.8% of treatment 1 respondents from more difficult families. Other sizeable differences in the percentage of sample child respondents who did not give consent to record linkage emerged among male respondents, respondents 45 or older, respondents who are not U.S. citizens, and respondents that completed the interview primarily by telephone.

Although fewer significant differences were observed when comparing the treatments on the percentage of sample child respondents who consented to record linkage and gave a partial SSN or who consented to record linkage and did not give a partial SSN, notable and sizeable differences emerged for respondents of sample children with 0 health conditions, respondents of sample children with three to five health conditions, respondents from rural (non-MSA) areas, and respondents from families with unknown incomes. For example, 44.9% of treatment 2 respondents who answered for sample children with three to five health conditions gave consent to record linkage and reported a partial SSN compared to just 34.7% of similar treatment 1 respondents. And among treatment 1 respondents from families with an unknown total family income, 21.3% gave consent to record linkage and did not provide a partial SSN. This was significantly lower than the 38.7% of treatment 2 respondents from families with an unknown income.

Table 4 presents results from ordinary logistic and multinomial logistic regressions predicting consent to link the sample child's survey data with health-related records of other government agencies. Like the sample adult analysis, the reference category for the dependent variables in both the ordinary logistic and multinomial logistic runs was "no consent to link," and the same set of comparisons was performed. Question treatment was the independent variable, and a set of respondent/subject, family socioeconomic, social environment, and paradata measures were entered as controls.

Table 4 about here

Consistent with the sample adult results, sample child respondents receiving treatment 2 had higher odds of providing consent (with or without a partial SSN) to subsequent record linkage activities (OR=1.49, CI=1.26-1.76) than sample child respondents receiving treatment 1. Furthermore, the multinomial logistic results reveal that respondents receiving treatment 2 had appreciably higher odds of providing consent with a partial SSN (versus no consent; OR=1.51, CI=1.24-1.85) and consent without a partial SSN (versus no consent; OR=1.47, CI=1.22-1.77).

Among the sample child respondent controls, only sex and education were significantly associated with the dependent variables. Respondents with a high school diploma or a general equivalency diploma (G.E.D.) (OR=1.51, CI=1.11-2.05) and respondents with some college education or an Associate of Arts (A.A.) degree (OR=1.33, CI=1.01-1.75) had higher odds of providing consent without a partial SSN than respondents with a bachelor's or advanced degree. This may also explain the higher odds of consent to record linkage, regardless of SSN reporting, among respondents with some college education or an A.A. degree.

While no effects of sex were observed in the sample adult analysis, female sample child respondents had higher odds of providing consent with a partial SSN (OR=1.78; CI=1.39-2.30) than male respondents, which likely explains their higher odds of consent to record linkage, regardless of partial SSN reporting (OR=1.29; CI=1.05-1.57). This is an interesting finding in light of previous research that has identified a consistent bias toward consent to record linkage and follow-up study participation among male respondents. Much of this research, however, has focused on respondents consenting for themselves and not for someone else.

Focusing on the sample child characteristics, age and the number of health conditions were significantly associated with consent to record linkage. Compared to respondents of children between the ages of 2 and 4, respondents of sample children under the age of 2 had considerably higher odds of providing consent overall (OR=1.51, CI=1.12-2.03), and consent without a partial SSN (OR=1.85, CI=1.33-2.55). And similar to the sample adult analysis, the number of sample child health conditions had one of the more pronounced impacts on consent to record linkage. Respondents for sample children reported to have six or more health conditions had odds of consent to record linkage over two times the odds of respondents for sample children with no health conditions. In addition, respondents for sample children with one or two conditions (OR=1.67; CI=1.34-2.08), and sample children with three to five conditions (OR=1.83; CI=1.42-2.36) had higher odds of consent to record linkage compared to respondents of sample children with zero health conditions. Again, the higher odds of consent for sample children with poor health appear to be the result of both high levels of consent to record linkage with and without a partial SSN. As we observed with sample adults, the request for record linkage in support of additional health research resonated with respondents of less healthy children.

Finally, and largely consistent with the sample adult findings, several of the family socioeconomic, social environmental, and paradata measures were significantly associated with consent to record linkage. Sample child respondents from families that failed to provide an annual income figure had dramatically lower odds of giving consent to record linkage with a partial SSN (OR=0.08, CI=0.04-0.16) and consent without a partial SSN (OR=0.44, CI=0.29-0.66) compared to sample child respondents from families who reported the requested income information. This translated into appreciably lower odds of consent to record linkage overall (OR=0.29, CI=0.19-0.44).

Sample child respondents from the Midwest appear to be less sensitive to the idea of record linkage overall (OR=2.30, CI=1.40-3.79) than sample child respondents from the West. They also displayed a much greater willingness to grant consent without a partial SSN (OR=1.94, CI=1.16-3.24) and consent with a partial SSN (OR=2.89, CI=1.71-4.89). Sample child respondents from the South also had higher odds of giving consent to record linkage and reporting a partial SSN (OR=1.69, CI=1.01-2.81) than sample child respondents from the West. Urbanicity also had an impact on consent rates, as sample child respondents from rural (non-MSA) areas had higher odds of consent to record linkage, regardless of SSN reporting (OR=1.45; CI=1.03-2.06), and higher odds of consent to record linkage with reporting of a partial SSN (OR=1.56, CI=1.10-1.22) compared to respondents from suburban (MSA, non-central cities) areas.

While primary mode of sample child interview was not significantly associated with overall consent, sample child respondents who answered primarily by telephone had considerably lower odds of providing consent with a partial SSN (OR=0.58, CI=0.44-0.76) than face-to-face respondents. And finally, compared to sample child respondents from families that required just a single contact attempt to complete the interview, respondents from three-attempt families had higher odds of providing consent to record linkage activities (OR=1.38, CI=1.02-1.87), regardless of their response to the SSN question. This was likely the result of higher odds of granting consent without providing a partial SSN (OR=1.45, CI=1.06-2.00).

Discussion

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[10] We suspect that some of the regional differences may be explained by variation in Census regional office procedures. A limited number of cases per regional office precludes us from exploring this measure at the current time.

[11] For the period under analysis, the sample child response rate 0was.

[12] Interestingly, higher rates of consent were obtained from sample adults compared to sample child respondents. This may reflect a greater interest by parents in safeguarding the privacy and identity of children. Or the differences may reflect a higher overall response rate for the sample child versus sample adult modules, suggesting that fully responding sample adults may be more willing participants than sample child respondents.

In this paper we presented preliminary results from a split-ballot field test of questions on respondent consent to linking his/her (or the sample child's) survey data with health-related records of other government agencies. Implemented with the quarter 1 and quarter 2, 2007 NHIS, the test was designed to assess the relative effectiveness of two question treatments at eliciting respondent consent to record linkage, and eliciting respondent consent to record linkage coupled with the supply of the last four digits of an SSN (and the last four numbers and any letters of a Medicare number). The test was administered with the sample adult and the sample child respondent (answering on behalf of the sample child).

Our preliminary results suggest that asking for the last four digits of the SSN first (with consent embedded in the question), followed, if necessary, by a request for consent without the SSN (treatment 2) yields more consented adults and children than a sequence in which we first attempt to elicit consent and, if successful, follow with a request for a partial SSN (treatment 1). Overall, 71.9% of sample adults and 67.8% of sample child respondents who received treatment 2 consented to record linkage compared to 66.2% of sample adults and 60.7% of sample child respondents who received treatment 1. Treatment 2 also yielded higher rates of consent coupled with reports of partial SSNs: 53.5% of sample adults and 31.8% of sample child respondents versus 48.7% of sample adults and 29.2% of sample child respondents who received treatment 1. Furthermore, comparisons of rates by treatment for each category of the respondent/subject, family socioeconomic, social environment, and paradata measures revealed clear advantages to the treatment 2 questions. A total of 357 comparisons were performed for the sample adult and sample child analysis. Seventy-seven significant differences were identified with all 77 favoring treatment 2. And finally, the relative superiority of treatment 2 held when subjected to multivariate analysis. Treatment 2 produced significantly higher odds of consent overall, and consent with or without a partial SSN, compared to treatment 1, net of a set of controls.

Of notable importance is the resulting gain in numbers of consenting children and adults, regardless of question treatment, compared to NHIS consenting procedures used prior to 2007. Previously, consent to record linkage was embedded in a request for the subject's nine-digit SSN, with a refusal to report an SSN viewed as lack of consent. No follow-ups to this question were employed. Among sample adults the refusal rate had exceeded 50% by 2005, leaving less than 50% available for record linkage. Through the first 15 weeks of 2007, treatment 2 of the experimental questions increased the percentage of sample adults consenting to record linkage by over 20 percentage points compared to prior procedures. Similar improvements in sample child respondent consent were also observed.

Yet while the 2007 results were a vast improvement over consent rates from other recent years, a comparison to consent rates generated 15 years earlier highlights a drastically more cautious public now and the ever-increasing struggles currently encountered by survey systems in their attempts to collect personally identifying information. Changing the strategy from the collection of unique full-digit SSNs and Medicare numbers to the collection of non-unique partial numbers substantially increases the number of respondents available for subsequent record linkage[c5]. NCHS plans to conduct additional testing to assess whether the collection of partial identifiers increases the number of accurate matches beyond the number that could be achieved without the partial identifiers.

According to the Federal Trade Commission, the number of reported cases of identity theft in the United States grew from just under 100,000 in 2001 to over 250,000 in 2004 (GAO, 2005). Recent news reports of data breaches in both the public and private sectors continue to highlight the potential risks regarding the security of personal data and the potential harm that may result from misuse. The collection of SSNs and other unique identifiers will likely continue to be controversial, and future legislation both at the state and national level may hamper the ability of federal statistical agencies to continue collecting this type of data.

Data Limitations and Future Directions

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[13] Again, because of strong intercorrelations among race/ethnicity, citizenship status, and language of interview, only race/ethnicity was included in the model presented in Table 4. Separate models were run where race/ethnicity was replaced with each of the other two measures. In each model, the results for question version were consistent with those presented in Table 4.

[14] It has been hypothesized that respondents are more comfortable providing the partial information because they are accustomed to seeing it on credit card receipts, utility bills, and others.

[15] The Census Bureau recently undertook a split-ballot field test of four consent question treatments (Bates and Pascale, 2006). An SSN-less treatment yielded a consent rate of 63.4%, highest among all tested treatments. While encouraging, and possibly the future direction taken by NCHS, the non-SSN consent rate of 63.4% is substantially lower than the 71.9%

Like any research, important limitations were present in this study, many of which suggest potentially fruitful avenues of future research. First, the consent questions field tested in the split-ballot experiment were never cognitively tested. Amid reports of lost and stolen Census Bureau laptops and increasing incidents of identity theft, decisions to revise the NHIS consent questions came very late in the 2007 instrument production cycle. Although the questions would have benefited from cognitive testing, we suspect the relative performance of the two treatments would have been similar.

Second, help screens were not available during the field test. Again, the short timeline for question creation, programming, and instrument testing precluded their development. Like the impact of cognitive testing, we suspect their inclusion would not have noticeably impacted the relative performance of the question versions, although their inclusion may have boosted overall response to both treatments. Since a help screen was developed and implemented in quarter 3, we plan on testing the latter assumption by comparing quarter 3 and 4 results to quarter 1 and 2 results for treatment 2.

Third, as previously mentioned, sample adult and sample child record weights were not available at the time of this analysis and therefore all results were unweighted. However, a preliminary analysis using base weights (inverse of the probability of household selection) was performed and the results were consistent with those presented here. While substantial changes in results are not anticipated, this analysis will be fully replicated, using all of quarter one and quarter two data, once the appropriate record weights have been produced.

Fourth, the multivariate models may have been underspecified. For example, Jenkins and colleagues (2004) identified a strong association between family structure and consent to record linkage, a measure we failed to explore in this analysis. One of our next steps will be to extend the current analysis by exploring additional control measures such as family structure and family size, as well as possible interaction effects. Of particular importance to the sample adult analysis is the inclusion of a measure capturing response to the sample child consent questions (if asked). Although the vast bulk of sample child interviews predate the sample adult interviews, we could not adequately determine the time ordering of the respective consent questions for this analysis. Based on a crude, preliminary analysis, we expect a strong association between responses to the sample child consent questions and responses to the sample adult consent questions.

Fifth, no attempt was made for this analysis to ascertain the accuracy of the SSN data provided. We can hypothesize that treatment 2 may have induced more falsified responses since it started by asking for a partial SSN. The request for a partial SSN in treatment 1 was made on respondents already compliant with a request for record linkage. If true, would differences in misreporting be substantial enough to erase the statistically superior performance of the treatment 2 items? We plan to address this through an initial review of provided numbers, followed by a more extensive test of match rates across the question treatments.

And finally, no assessments of consent to record linkage bias have been made yet. Treatment 2 clearly produced higher rates of consent. But it is possible that sample adults, for example, who consented to data linkage under treatment 2 are less representative of the larger adult population than sample adults who consented to data linkage under treatment 1. Future analysis of consent bias would include comparisons to Census distributions of children and adults, and would need to account for overall unit nonresponse, sample child or sample adult nonresponse, and sufficient partial sample child and sample adult records where breakoffs occurred prior to the consent questions.

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induced by treatment 2 in this research (sample adults). In addition to other design features, part of the discrepancy may be explained by the RDD mode used in the Census research. However, treatment 1 of this test utilized a similar initial question and produced a consent rate of just over 66%.

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Table 1. Sample Adult Consent to Record Linkage by Selected Sociodemographic, Social Environment, and Paradata Measures for Two Versions of Record Linkage Questions: NHIS, 2007, Quarter 1 and Quarter 2 (weeks 1-4) (unweighted)

	Consent to Link Question Asked First (Treatment 1) (n=3,815)			SSN Question Asked First (Treatment 2) (n=3,751)		
	Consent to Link with SSN (%)	**Consent to Link without SSN (%)**	**No Consent to Link (%)**	**Consent to Link with SSN (%)**	**Consent to Link without SSN (%)**	**No Consent to Link (%)**
Overall	48.73*	17.43	33.84*	53.48*	18.42	28.10*
Sample Adult Characteristic						
Age						
18-34	50.61	16.68	32.71	51.69	20.33	27.98
35-44	48.00	17.66	34.34*	54.93	17.75	27.32*
45-54	47.72*	16.12	36.15*	54.93*	17.23	27.84*
55-64	49.82	17.10	33.09	54.26	18.26	27.48
65+	46.97	20.03	33.00	52.65	17.64	29.71
Race/Ethnicity						
Hispanic	37.01	19.49	43.50	42.05	23.29	34.66
Non-Hispanic white	53.13**	16.32	30.55**	59.04**	16.89	24.08**
Non-Hispanic black	49.22	19.12	31.66	49.41	17.98	32.61
Non-Hispanic other	41.48	17.47	41.05	47.32	19.20	33.48
Sex						
Male	49.12	16.71	34.17*	53.65	18.71	27.64*
Female	48.43	18.03	33.54	53.35	18.19	28.46
Education						
Less than high school	43.25	22.37	34.38	48.74	22.45	28.80
High school diploma/G.E.D.	46.88	18.89	34.23	52.17	19.22	28.61
Some college/AA degree	55.17	14.69	30.14*	59.94	16.27	23.80*
Bachelor’s degree or higher	49.42	14.85	35.74	53.40	16.89	29.71
Employment Status						
Employed	48.66*	16.23	35.11*	53.89*	17.55	28.56*
Not employed	49.02	19.50	31.49	52.95	19.82	27.23
Marital Status						
Never married	49.06	16.90	34.04*	53.27	19.85	26.88*
Married/cohabiting	47.48	17.42	35.10**	52.56	19.52	27.91**
Divorced/separated	52.90	16.61	30.48	56.79	14.56	25.65
Widowed	49.58	20.50	29.92	52.59	15.54	31.87

Table 1. (continued)

	Consent to Link Question Asked First (Treatment 1) (n=3,815)			SSN Question Asked First (Treatment 2) (n=3,751)		
	Consent to Link with SSN (%)	Consent to Link without SSN (%)	No Consent to Link (%)	Consent to Link with SSN (%)	Consent to Link without SSN (%)	No Consent to Link (%)
U.S. Citizen						
Yes	51.40*	16.34	32.26*	56.29*	17.20	26.51*
No	27.43	26.21	46.36	31.67	28.93	39.40
Health Compared to 12 Months Ago						
About the same	46.47*	17.99	35.54*	52.01*	19.16	28.83*
Worse/better	55.34	16.02	28.64	58.00	16.41	25.59
Number of Health Conditions						
0	35.15	18.91	45.94	37.54	22.94	39.52
1-2	46.73**	17.99	35.28*	54.53**	17.31	28.16*
3-5	56.09	17.09	26.82	60.87	16.16	22.97
6+	64.17	14.09	21.74*	67.58	16.36	16.06*
Family-Level Socioeconomics						
Total Family Income						
< $35,000	50.06*	18.49	31.44*	57.81*	18.61	23.57*
≥ $35,000 and < $75,000	53.71	16.05	30.24	53.57	17.58	28.85
≥ $75,000	53.86*	14.73	31.40*	60.36*	15.44	24.20*
Unknown	15.97	23.25	60.78	16.96	27.08	55.95
Own or Rent Residence						
Own/buying	48.77*	17.13	34.10**	54.29*	18.37	27.34**
Rent/other	49.07	17.92	33.01	52.59	18.61	28.81
Social Environment						
Region						
Northeast	48.77	14.45	36.78	53.67	15.66	30.67
Midwest	54.92	18.89	26.19	59.90	19.81	20.29
South	49.21	18.18	32.62	54.26	18.75	26.99
West	41.96	16.85	41.18	46.08	18.50	35.43
MSA Status						
MSA, central city	45.20	16.19	38.61*	49.89	19.08	31.03*
MSA, non-central city	47.88	18.22	33.91	53.13	17.59	29.28
Non-MSA	57.65	18.17	24.18	61.55	19.15	19.30

Table 1. (continued)

	Consent to Link Question Asked First (Treatment 1) (n=3,815)			SSN Question Asked First (Treatment 2) (n=3,751)		
	Consent to Link with SSN (%)	Consent to Link without SSN (%)	No Consent to Link (%)	Consent to Link with SSN (%)	Consent to Link without SSN (%)	No Consent to Link (%)
Paradata Measures						
Mode of Sample Adult Interview						
Primarily by telephone	41.26	22.76	35.99	45.22	22.96	31.82
Primarily in-person	51.01	15.81	33.19*	55.93	17.08	27.00*
Language of Interview						
English	51.14*	16.54	32.31*	55.92*	17.00	27.08*
Other	22.43	27.10	50.47	28.05	33.23	38.72
Number of Contact Attempts						
1	51.09	15.43	33.48	56.43	17.08	26.50
2	50.70	17.97	31.34	51.72	18.93	29.35
3	49.28	18.53	32.19	52.81	19.42	27.77
4	46.86*	19.47	33.66*	54.29*	18.41	27.30*
5+	44.74*	18.00	37.25*	52.63*	19.42	27.95*
Mention of Any Concerns Prior to the Interview (First Contact)						
Yes	41.19	18.91	39.90**	46.77	22.11	31.13**
No	50.91	17.30	31.78	55.67	17.57	26.76

* The difference between the treatment 1 and treatment 2 rates is significant at the .05 level (two-tailed t-test).

** The difference between the treatment 1 and treatment 2 rates is significant at the .01 level (two-tailed t-test).

Table 2. Odds Ratios from Ordinary Logistic and Multinomial Logistic Regressions Predicting Sample Adult Consent to Record Linkage: NHIS, 2007, Quarter 1 and Quarter 2 (weeks 1-4) (unweighted)

	Ordinary Logistic Regression		*Multinomial Logistic Regression*			
	Consent to Link vs. No Consent to Link		**Consent with an SSN vs. No Consent to Link**		**Consent without an SSN vs. No Consent to Link**	
	Odds Ratio	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**
Intercept	0.84	0.51-1.37	0.61	0.37-1.00	0.21	0.12-0.37
Question Treatment						
Treatment 1[2]	1.00	---	1.00	---	1.00	---
Treatment 2	1.37	1.22-1.54	1.40	1.24-1.57	1.30	1.11-1.52
Sample Adult Characteristic						
Age						
18-34	1.51	1.17-1.95	1.58	1.21-2.06	1.28	0.93-1.76
35-44	1.45	1.16-1.82	1.52	1.19-1.95	1.22	0.92-1.62
45-54	1.22	0.97-1.52	1.23	0.97-1.56	1.13	0.84-1.52
55-64	1.12	0.89-1.40	1.10	0.87-1.39	1.12	0.83-1.52
65+[2]	1.00	---	1.00	---	1.00	---
Race/Ethnicity						
Hispanic	0.78	0.57-1.06	0.80	0.58-1.12	0.74	0.53-1.03
Non-Hispanic white[2]	1.00	---	1.00	---	1.00	---
Non-Hispanic black	0.80	0.63-1.03	0.76	0.58-0.98	0.95	0.73-1.24
Non-Hispanic other	0.84	0.62-1.16	0.86	0.61-1.21	0.86	0.58-1.29
Sex						
Male	1.08	0.97-1.21	1.11	0.99-1.25	1.03	0.88-1.20
Female[2]	1.00	---	1.00	---	1.00	---
Education						
Less than high school	1.20	0.96-1.51	1.13	0.89-1.44	1.35	1.02-1.78
High school diploma/G.E.D.	1.06	0.88-1.27	0.99	0.81-1.21	1.19	0.96-1.48
Some college/AA degree	1.19	0.99-1.44	1.21	0.99-1.48	1.12	0.88-1.43
Bachelor's degree or higher[2]	1.00	---	1.00	---	1.00	---
Employment Status						
Employed[2]	1.00	---	1.00	---	1.00	---
Not employed	1.09	0.95-1.24	1.02	0.88-1.19	1.24	1.04-1.48

Table 2. (continued)

	Ordinary Logistic Regression		*Multinomial Logistic Regression*			
	Consent to Link vs. No Consent to Link		**Consent with an SSN vs. No Consent to Link**		**Consent without an SSN vs. No Consent to Link**	
	Odds Ratio	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**
Marital Status						
Never married	1.00	0.85-1.18	0.98	0.83-1.16	1.06	0.85-1.33
Married/cohabiting[2]	1.00	---	1.00	---	1.00	---
Divorced/separated	1.01	0.86-1.19	1.05	0.87-1.27	0.89	0.72-1.11
Widowed	0.98	0.80-1.22	1.00	0.80-1.27	0.94	0.71-1.25
U.S. Citizen						
Yes[2]	1.00	---	1.00	---	1.00	---
No	0.81	0.63-1.05	0.63	0.47-0.84	1.21	0.94-1.56
Health Compared to 12 Months Ago						
About the same[2]	1.00	---	1.00	---	1.00	---
Worse/better	1.04	0.91-1.20	1.11	0.95-1.29	0.90	0.74-1.08
Number of Health Conditions						
0[2]	1.00	---	1.00	---	1.00	---
1-2	1.52	1.31-1.76	1.77	1.50-2.09	1.11	0.92-1.34
3-5	2.01	1.70-2.38	2.43	2.02-2.92	1.33	1.07-1.65
6+	2.87	2.36-3.49	3.61	2.90-4.50	1.62	1.27-2.06
Family-Level Socioeconomics						
Total Family Income						
< $35,000	0.90	0.74-1.11	0.88	0.71-1.09	1.01	0.77-1.33
≥ $35,000 and < $75,000	0.88	0.74-1.04	0.85	0.71-1.03	0.96	0.77-1.21
≥ $75,000[2]	1.00	---	1.00	---	1.00	---
Unknown	0.31	0.24-0.39	0.15	0.11-0.20	0.82	0.59-1.13
Own or Rent Residence						
Own/buying[2]	1.00	---	1.00	---	1.00	---
Rent/other	1.08	0.90-1.29	1.10	0.90-1.34	1.03	0.83-1.28
Social Environment						
Region						
Northeast	1.23	0.83-1.82	1.38	0.92-2.07	0.96	0.63-1.46
Midwest	1.83	1.20-2.78	1.90	1.25-2.89	1.71	1.06-2.75
South	1.34	0.89-2.00	1.37	0.91-2.07	1.29	0.83-2.00
West[2]	1.00	---	1.00	---	1.00	---

Table 2. (continued)

	Ordinary Logistic Regression		*Multinomial Logistic Regression*			
	Consent to Link vs. No Consent to Link		**Consent with an SSN vs. No Consent to Link**		**Consent without an SSN vs. No Consent to Link**	
	Odds Ratio	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**
MSA Status						
MSA, central city[2]	1.00	---	1.00	---	1.00	---
MSA, non-central city	1.06	0.87-1.29	1.02	0.83-1.25	1.16	0.91-1.49
Non-MSA	1.54	1.15-2.05	1.52	1.15-2.02	1.54	1.04-2.28
Paradata Measures						
Mode of Sample Adult Interview						
Telephone	0.89	0.76-1.05	0.74	0.62-0.89	1.29	1.05-1.57
In-person[2]	1.00	---	1.00	---	1.00	---
Language of Interview						
English[2]	1.00	---	1.00	---	1.00	---
Other	0.79	0.59-1.07	0.52	0.36-0.76	1.44	1.04-2.00
Number of Contact Attempts						
1[2]	1.00	---	1.00	---	1.00	---
2	0.99	0.80-1.23	0.98	0.78-1.22	1.05	0.81-1.36
3	1.05	0.81-1.37	1.01	0.78-1.32	1.16	0.84-1.60
4	1.04	0.82-1.32	1.02	0.79-1.31	1.12	0.85-1.47
5+	0.99	0.76-1.29	0.99	0.76-1.30	1.02	0.73-1.42
Mention of Any Concerns Prior to the Interview (First Contact)						
Yes	0.83	0.70-0.99	0.78	0.64-0.95	0.94	0.77-1.15
No[2]	1.00	---	1.00	---	1.00	---

[1] CI – confidence interval

[2] Reference category

Table 3. Sample Child Respondent Consent to Record Linkage by Selected Sociodemographic, Social Environment, and Paradata Measures for Two Sets of Record Linkage Questions: NHIS, 2007, Quarter 1 and Quarter 2 (weeks 1-4) (unweighted)

	Consent to Link Question Asked First (Treatment 1) (n=1,586)			SSN Question Asked First (Treatment 2) (n=1,582)		
	Consent to Link with SSN (%)	**Consent to Link without SSN (%)**	**No Consent to Link (%)**	**Consent to Link with SSN (%)**	**Consent to Link without SSN (%)**	**No Consent to Link (%)**
Overall	29.19	31.53*	39.28*	31.80	36.03*	32.17*
Sample Child Respondent Characteristic						
Age						
18-34	32.15	33.84	34.01	30.63	37.15	32.22
35-44	26.53**	34.00	39.47*	35.27**	32.45	32.38*
45+	28.83	24.23**	46.94**	28.33	39.71**	31.96**
Race and Ethnicity						
Hispanic	23.35	31.28	45.37	27.11	35.74	37.15
Non-Hispanic white	33.42	30.93	35.65**	36.13	36.13	27.75**
Non-Hispanic black	28.62	30.86	40.52	30.83	37.22	31.95
Non-Hispanic other	25.51	38.78	35.71	26.14	31.82	42.05
Sex						
Male	18.41	33.83*	47.76**	22.44	42.20*	35.37**
Female	32.85	30.74	36.40	35.07	33.87	31.06
Education						
Less than high school	24.38	33.33	42.28	30.95	35.71	33.33
High school diploma/G.E.D.	28.13	34.53	37.34	29.68	39.04	31.28
Some college/AA degree	35.76	30.19	34.05	35.59	35.59	28.83
Bachelor’s degree or higher	26.94	30.05	43.01	31.25	33.81	34.94
Employment Status						
Employed	27.16*	32.19	40.65**	32.93*	36.09	30.98**
Not employed	34.40	30.34	35.26	29.68	36.06	34.26
Marital Status						
Never married	29.73	31.89	38.38	38.73	33.82	27.45
Married/cohabiting	27.85	32.79	39.36	29.19	36.95	33.86
Divorced/separated/widowed	35.12	25.62	39.26**	38.82	33.76	27.43**

Table 3. (continued)

	Consent to Link Question Asked First (Treatment 1) (n=1,586)			SSN Question Asked First (Treatment 2) (n=1,582)		
	Consent to Link with SSN (%)	**Consent to Link without SSN (%)**	**No Consent to Link (%)**	**Consent to Link with SSN (%)**	**Consent to Link without SSN (%)**	**No Consent to Link (%)**
U.S. Citizen						
Yes	31.24	31.78	36.98*	33.38	35.79	30.83*
No	20.76	30.80	48.44*	25.35	38.03	36.62*
Health Status						
Poor/fair	35.39	25.84	38.76*	36.26	36.84	26.90*
Good	31.14	28.71	40.15	32.08	35.85	32.08
Very good	27.98	35.42	36.59	32.98	33.19	33.82
Excellent	26.65	32.02*	41.32*	29.08	38.51*	32.42*
Sample Child Characteristic						
Age						
< 2	25.81	41.94	32.26	27.72	43.07	29.21
2-4	30.74	29.26	40.00	32.34	29.00	38.66
5-7	26.64	33.61	39.75	29.65	38.05	32.30
8-10	35.00	29.58	35.42	32.29	35.43	32.29
11-13	26.18	31.64	42.18*	34.45	34.45	31.09*
14-17	29.92	27.76*	42.32**	32.78	37.26*	29.95**
Race and Ethnicity						
Hispanic	23.69	31.45	44.86	27.31	36.92	35.77
Non-Hispanic white	31.91	31.50	36.59**	36.06	35.47	28.47**
Non-Hispanic black	31.07	30.36	38.57	31.39	36.86	31.75
Non-Hispanic other	29.29	36.36	34.34	26.73	32.67	40.59
Sex						
Male	30.03	28.64*	41.33**	34.17	35.04*	30.79**
Female	28.26	34.47	37.26	29.37	37.04	33.59
Health Compared to 12 Months Ago						
About the same	29.05	31.36*	39.59	30.40	36.21*	33.39
Worse/better	29.86	32.33	37.81*	36.68	36.14	27.17*

Table 3. (continued)

	Consent to Link Question Asked First (Treatment 1) (n=1,586)			**SSN Question Asked First (Treatment 2) (n=1,582)**		
	Consent to Link with SSN (%)	**Consent to Link without SSN (%)**	**No Consent to Link (%)**	**Consent to Link with SSN (%)**	**Consent to Link without SSN (%)**	**No Consent to Link (%)**
Number of Health Conditions						
0	17.72	30.34*	51.94	15.17	40.46*	44.37
1-2	28.07	35.03	36.89*	30.11	40.88	29.01*
3-5	34.69**	30.43	34.89*	44.87**	29.24	25.89*
6+	41.35	30.29	28.37	45.56	32.22	22.22
Family-Level Socioeconomics						
Total Family Income						
< $35,000	33.52	29.30	37.18*	39.20	33.97	26.83*
≥ $35,000 and < $75,000	28.85	35.04	36.11	32.96	35.63	31.40
≥ $75,000	31.24	33.48	35.28	29.83	38.39	31.78
Unknown	[4.72]	21.26**	74.02**	[5.33]	38.67**	56.00**
Own or Rent Residence						
Own/buying	28.99	31.39*	39.62*	30.90	37.18*	31.93*
Rent/other	29.53	31.94	38.52	33.28	34.43	32.29
Social Environment						
Region						
Northeast	23.34	33.80	42.86	26.82	32.95	40.23
Midwest	37.81	36.25	25.94	39.75	37.22	23.03
South	31.11	28.83*	40.07**	35.74	36.58*	27.68**
West	23.01	30.14	46.85	23.04	36.27	40.69
MSA Status						
MSA, central city	25.61	32.58	41.81	28.73	36.00	35.27
MSA, non-central city	28.40	31.96	39.64	31.18	34.01	34.81
Non-MSA	38.52	28.27**	33.22**	39.24	41.32**	19.44**
Paradata Measures						
Mode of Sample Child Interview						
Primarily by telephone	18.38*	37.07	44.55**	25.50*	43.84	30.66**
Primarily in-person	31.99	30.17	37.85	33.58	33.82	32.60
Language of Interview						
English	30.91	31.50	37.59*	32.94	35.70	31.37*
Other	19.75	31.93	48.32	25.51	37.86	36.63

Table 3. (continued)

	Consent to Link Question Asked First (Treatment 1) (n=1,586)			SSN Question Asked First (Treatment 2) (n=1,582)		
	Consent to Link with SSN (%)	Consent to Link without SSN (%)	No Consent to Link (%)	Consent to Link with SSN (%)	Consent to Link without SSN (%)	No Consent to Link (%)
Number of Contact Attempts						
1	31.79	26.59	41.62	32.09	32.62	35.29
2	34.51	29.62	35.87	31.70	35.16	33.14
3	30.84	37.00	32.16	33.76	37.55	28.69
4	26.67	35.33	38.00	32.42	36.52	31.06
5+	23.49*	31.75*	44.76**	30.79*	40.63*	28.57**
Mention of Any Concerns Prior to the Interview (First Contact)						
Yes	21.78	35.64	42.57	27.50	38.13	34.38
No	31.75	30.78*	37.47*	33.52	35.63*	30.85*

* The difference between the treatment 1 and treatment 2 rates is significant at the .05 level (two-tailed t-test).

** The difference between the treatment 1 and treatment 2 rates is significant at the .01 level (two-tailed t-test).

[ ] Estimates in brackets are deemed unreliable.

Table 4. Odds Ratios from Ordinary Logistic and Multinomial Logistic Regressions Predicting Sample Child Respondent Consent to Link the Sample Child's Survey Data with Administrative Records: NHIS, 2007, Quarter 1 and Quarter 2 (weeks 1-4) (unweighted)

	Ordinary Logistic Regression		*Multinomial Logistic Regression*			
	Consent to Link vs. No Consent to Link		**Consent with an SSN vs. No Consent to Link**		**Consent without an SSN vs. No Consent to Link**	
	Odds Ratio	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**
Intercept	0.39	0.20-0.74	0.12	0.06-0.26	0.24	0.12-0.47
Question Treatment						
Treatment 1[2]	1.00	---	1.00	---	1.00	---
Treatment 2	1.49	1.26-1.76	1.51	1.24-1.85	1.47	1.22-1.77
Sample Child Respondent Characteristic						
Age						
18-34	1.20	0.92-1.57	1.14	0.82-1.57	1.29	0.97-1.72
35-44	1.18	0.98-1.44	1.19	0.94-1.51	1.20	0.96-1.49
45+[2]	1.00	---	1.00	---	1.00	---
Race and Ethnicity						
Hispanic	0.79	0.56-1.12	0.75	0.52-1.09	0.83	0.57-1.22
Non-Hispanic white[2]	1.00	---	1.00	---	1.00	---
Non-Hispanic black	0.86	0.65-1.14	0.75	0.53-1.05	0.98	0.71-1.73
Non-Hispanic other	1.08	0.73-1.60	1.06	0.70-1.62	1.11	0.71-1.73
Sex						
Male[2]	1.00	---	1.00	---	1.00	---
Female	1.29	1.05-1.57	1.78	1.39-2.30	1.04	0.84-1.30
Education						
Less than high school	1.38	0.97-1.97	1.20	0.81-1.79	1.50	1.00-2.25
High school diploma/G.E.D.	1.31	1.00-1.72	1.06	0.77-1.46	1.51	1.11-2.05
Some college/AA degree	1.32	1.03-1.68	1.26	0.94-1.68	1.33	1.01-1.75
Bachelor's degree or higher[2]	1.00	---	1.00	---	1.00	---
Employment Status						
Employed[2]	1.00	---	1.00	---	1.00	---
Not employed	1.01	0.82-1.25	1.03	0.81-1.32	1.01	0.79-1.29
Marital Status						
Never married	1.07	0.81-1.43	1.09	0.77-1.55	1.04	0.75-1.42
Married/cohabiting[2]	1.00	---	1.00	---	1.00	---
Divorced/separated/widowed	1.04	0.81-1.32	1.14	0.84-1.55	0.93	0.71-1.23

Table 4. (continued)

	Ordinary Logistic Regression		*Multinomial Logistic Regression*			
	Consent to Link vs. No Consent to Link		**Consent with an SSN vs. No Consent to Link**		**Consent without an SSN vs. No Consent to Link**	
	Odds Ratio	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**
U.S. Citizen						
Yes[2]	1.00	---	1.00	---	1.00	---
No	0.86	0.63-1.17	0.77	0.52-1.14	0.91	0.66-1.25
Sample Child Characteristic						
Age						
<2	1.51	1.12-2.03	1.09	0.75-1.58	1.85	1.33-2.55
2-4[2]	1.00	---	1.00	---	1.00	---
5-7	1.11	0.82-1.50	0.89	0.62-1.29	1.29	0.92-1.80
8-10	1.23	0.93-1.64	1.13	0.82-1.55	1.31	0.93-1.84
11-13	1.14	0.86-1.52	0.98	0.70-1.38	1.29	0.94-1.77
14-17	1.20	0.89-1.62	1.11	0.79-1.55	1.30	0.93-1.83
Sex						
Male[2]	1.00	---	1.00	---	1.00	---
Female	1.07	0.92-1.25	0.92	0.77-1.10	1.18	1.00-1.40
Health Compared to 12 Months Ago						
About the same[2]	1.00	---	1.00	---	1.00	---
Worse/better	1.10	0.90-1.34	1.13	0.88-1.45	1.08	0.86-1.34
Number of Health Conditions						
0[2]	1.00	---	1.00	---	1.00	---
1-2	1.67	1.34-2.08	2.18	1.64-2.91	1.46	1.15-1.85
3-5	1.83	1.42-2.36	3.14	2.31-4.25	1.25	0.96-1.63
6+	2.18	1.61-2.96	3.47	2.40-5.02	1.57	1.12-2.20
Family-Level Socioeconomics						
Total Family Income						
< $35,000	0.95	0.74-1.22	1.27	0.95-1.68	0.75	0.56-1.01
≥ $35,000 and < $75,000	0.93	0.72-1.21	1.04	0.77-1.39	0.86	0.64-1.15
≥ $75,000[2]	1.00	---	1.00	---	1.00	---
Unknown	0.29	0.19-0.44	0.08	0.04-0.16	0.44	0.29-0.66
Social Environment						
Region						
Northeast	1.21	0.74-1.99	1.28	0.76-2.16	1.16	0.69-1.96
Midwest	2.30	1.40-3.79	2.89	1.71-4.89	1.94	1.16-3.24
South	1.39	0.86-2.26	1.69	1.01-2.81	1.21	0.73-2.00
West[2]	1.00	---	1.00	---	1.00	---

Table 4. (continued)

	Ordinary Logistic Regression Consent to Link vs. No Consent to Link		*Multinomial Logistic Regression* Consent with an SSN vs. No Consent to Link		Consent without an SSN vs. No Consent to Link	
	Odds Ratio	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**	**Odds Ratio**	**95% CI[1]**
MSA Status						
MSA, central city	1.06	0.81-1.39	1.04	0.77-1.39	1.09	0.80-1.47
MSA, non-central city[2]	1.00	---	1.00	---	1.00	---
Non-MSA	1.44	1.02-2.05	1.53	1.08-2.18	1.38	0.94-2.03
Paradata Measures						
Mode of Sample Child Interview						
Primarily by telephone	0.85	0.66-1.09	0.58	0.44-0.76	1.08	0.82-1.43
Primarily in-person[2]	1.00	---	1.00	---	1.00	---
Language of Interview						
English[2]	1.00	---	1.00	---	1.00	---
Other	1.05	0.70-1.58	0.96	0.62-1.49	1.12	0.71-1.76
Number of Contact Attempts						
1[2]	1.00	---	1.00	---	1.00	---
2	1.13	0.89-1.45	1.14	0.85-1.53	1.13	0.85-1.51
3	1.38	1.02-1.87	1.30	0.89-1.90	1.45	1.06-2.00
4	1.21	0.91-1.60	1.15	0.82-1.61	1.25	0.91-1.73
5+	1.07	0.80-1.45	1.00	0.73-1.38	1.15	0.81-1.64
Mention of Any Concerns Prior to the Interview (First Contact)						
Yes	0.93	0.73-1.19	0.80	0.59-1.08	1.03	0.79-1.32
No[2]	1.00	---	1.00	---	1.00	---

[1] CI – confidence interval

[2] Reference category

Appendix I
Question Wording

Sample Child: Treatment 1

Finally, we would like to link [ALIAS]'s survey data with health-related records of other government agencies. This will allow us to conduct additional research without taking up your time with more questions. Any data obtained will be kept strictly private as required by law. May we try to link [ALIAS]'s survey data with other health-related records?

* Read if necessary. The specific federal laws are the Public Health Service Act (Title 42, United States Code, Section 242K) and the Confidential Information Protection and Statistical Efficiency Act (Title V of Public Law 107-347).

Yes
No
Refused
Don't know

IF NO, REFUSED, OR DON'T KNOW, NO MORE CONSENT QUESTIONS WERE ASKED.

IF YES:

To help us link [ALIAS]'s survey data with vital statistics and health-related records of other government agencies, we would like the last four digits of [ALIAS]'s Social Security Number. The National Center for Health Statistics uses this information for research purposes only. Providing this information is voluntary. Federal laws authorize us to ask for this information and require us to keep it strictly private. There will be no effect on [ALIAS]'s benefits if you do not provide this information.

* Read if necessary: The specific federal laws are the Public Health Service Act (Title 42, United States Code, Section 242K) and the Confidential Information Protection and Statistical Efficiency Act (Title V of Public Law 107-347).

What are the last four digits of [ALIAS]'s Social Security Number?

* Enter 'N' if no Social Security Number.

Sample Child: Treatment 2

Finally, we would like the last four digits of [ALIAS]'s Social Security Number. This information will help us link [ALIAS]'s survey data with health-related records of other government agencies, and allow us to conduct additional research without taking up your time with more questions. The National Center for Health Statistics uses this information for research purposes only. Providing this information is voluntary. Federal laws authorize us to ask for this information and require us to keep it strictly private. There will be no effect on [ALIAS]'s benefits if you do not provide this information.]

* Read if necessary: The specific federal laws are the Public Health Service Act (Title 42, United States Code, Section 242K) and the Confidential Information Protection and Statistical Efficiency Act (Title V of Public Law 107-347).

What are the last four digits of [fill 1: ALIAS]'s Social Security Number?

* Enter 'N' if no Social Security Number.

IF REFUSED, DON’T KNOW, OR NO SSN:

May we try to link [fill 1: ALIAS]’s survey data without a Social Security Number?

* Read if necessary: Any data obtained will be kept strictly private as required by law (Public Health Service Act, which is Title 42, United States Code, Section 242K; and the Confidential Information Protection and Statistical Efficiency Act, which is Title V of Public Law 107-347).

Yes
No
Refused
Don’t know

Sample Adult: Treatment 1
Finally, we would like to link your survey data with health-related records of other government agencies. This will allow us to conduct additional research without taking up your time with more questions. Any data obtained will be kept strictly private as required by law. May we try to link your survey data with other health-related records?

* Read if necessary: The specific federal laws are the Public Health Service Act (Title 42, United States Code, Section 242K) and the Confidential Information Protection and Statistical Efficiency Act (Title V of Public Law 107-347).

1. Yes
2. No
Refused
Don’t know

IF NO, REFUSED, OR DON’T KNOW, NO MORE CONSENT QUESTIONS WERE ASKED.

IF YES:

To help us link your survey data with vital statistics and health-related records of other government agencies, we would like the last four digits of your Social Security Number. The National Center for Health Statistics uses this information for research purposes only. Providing this information is voluntary. Federal laws authorize us to ask for this information and require us to keep it strictly private. There will be no effect on your benefits if you do not provide this information.

* Read if necessary: The specific federal laws are the Public Health Service Act (Title 42, United States Code, Section 242K) and the Confidential Information Protection and Statistical Efficiency Act (Title V of Public Law 107-347).

What are the last four digits of your Social Security Number?

* Enter 'N' if no Social Security Number.

IF THE SAMPLE ADULT HAS MEDICARE:

Earlier I recorded that you are covered by Medicare. To help us link your survey data with Medicare records of the Centers for Medicare and Medicaid Services, we would like the last four numbers and any letters of your Health Insurance Claim Number. The National Center for Health Statistics uses this information for research purposes only. Providing this information is voluntary. Federal laws authorize us to ask for this information and require us to keep it strictly private. There will be no effect on your benefits if you do not provide this information.

May I please see your Medicare card to record the last four numbers and any letters of the Health Insurance Claim Number?

* Read if necessary: The specific federal laws are the Public Health Service Act (Title 42, United States Code, Section 242K) and the Confidential Information Protection and Statistical Efficiency Act (Title V of Public Law 107-347).

IF SAMPLE ADULT PROVIDES THE LAST FOUR NUMBERS OF THE MEDICARE NUMBER:

*Enter the letters that appear after the claim number.

Sample Adult: Treatment 2

Finally, we would like the last four digits of your Social Security Number [/, and the last four numbers and any letters of your Medicare number]. This information will help us link your survey data with health-related records of other government agencies, and allow us to conduct additional research without taking up your time with more questions. The National Center for Health Statistics uses this information for research purposes only. Providing this information is voluntary. Federal laws authorize us to ask for this information and require us to keep it strictly private. There will be no effect on your benefits if you do not provide this information.

* Read if necessary: The specific federal laws are the Public Health Service Act (Title 42, United States Code, Section 242K) and the Confidential Information Protection and Statistical Efficiency Act (Title V of Public Law 107-347).

IF THE SAMPLE ADULT DOES NOT REFUSE TO CONTINUE:

What are the last four digits of your Social Security Number?

* Read if necessary: Providing this information is voluntary. Federal laws authorize us to ask for this information and require us to keep it strictly private (Public Health Service Act, which is Title 42, United States Code, Section 242K; and the Confidential Information Protection and Statistical Efficiency Act, which is Title V of Public Law 107-347).

IF THE SAMPLE ADULT HAS MEDICARE:

May I please see your Medicare card to record the last four numbers and any letters of the Health Insurance Claim Number?

* Read if necessary: Providing this information is voluntary. Federal laws authorize us to ask for this information and require us to keep it strictly private (Public Health Service Act, which is Title 42, United States Code, Section 242K; and the Confidential Information Protection and Statistical Efficiency Act, which is Title V of Public Law 107-347).

IF THE SAMPLE ADULT REFUSED TO ANSWER THE SSN QUESTION OR ANSWERED “DON’T KNOW” OR “NO SSN,” AND/OR THE SAMPLE ADULT REFUSED TO ANSWER THE MEDICARE HEALTH INSURANCE CLAIM NUMBER QUESTION OR ANSWERED “DON’T KNOW”:

May we try to link your survey data without [Medicare and Social Security numbers/a Social Security number/a Medicare number]?

* Read if necessary: Any data obtained will be kept strictly private as required by law (Public Health Service Act, which is Title 42, United States Code, Section 242K; and the Confidential Information Protection and Statistical Efficiency Act, which is Title V of Public Law 107-347).

Yes
No
Refused
Don't know