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2006 Questionnaire Design and Experimental Research Survey: Demographic Questions Analysis

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Abstract

Two small studies were embedded into the 2006 Questionnaire Design and Experimental Research Survey (QDERS). Both of these studies pertained to testing different ways to collect and verify demographic data using a computerized data collection mode. These results can be applied to any demographic data collection including surveys or censuses.

The first study is an experiment focusing on how to confirm age, given a valid date of birth. The second study is an investigation exploring a real-time edit to fix problematic relationship data by verifying with the respondent seemingly misreported relationships.

Traditionally, the decennial census has gathered the age of all household members as of a particular date (Census Day, which has typically been April 1st of the year in which the census is conducted). Carter and Brady (2002) found respondents had problems reporting age when a person's current age differed from that person's age on a specific date. Norris (2005) also found many respondents had difficulty reporting an age in the past. The QDERS experiment attempted to determine if respondents had problems confirming an age in the past which differed from the current age, and whether confirming the current age would solve any cognitive demands of the former method. The 2006 QDERS did not find the same level of misreported data associated with confirming an age in the past as Norris or Carter and Brady found with reporting an age in the past. However, QDERS did demonstrate that confirming an age in the past does take significantly longer than confirming current age, and thus, causes more interviewer and respondent burden.

The decennial census also collects data on the relationship of each person in the household to a resident owner or renter. Love and Byrne (2005) found that respondents sometimes report relationships between members of a household in the reverse direction from the actual relationship (e.g., reporting "father" rather than "son"). Love and Byrne found that many people who were reported as parents were actually younger than the reported children; and similarly many "children" were older than the reported parents. Although these relationships could be true with blended families, the high instances of this kind of reporting cited in the Love and Byrne paper indicate that it is actually mistaken reporting. The QDERS study attempted to determine if a real-time edit to seemingly inconsistent relationship data could clean up the data while the interviewer was still speaking to the respondent. However, the 2006 QDERS did not find the same level of inconsistent relationship to age data as found by Love and Byrne. The edit was only invoked three times, clearing up an apparent confusion one of those times.

In conclusion, the 2006 QDERS did not find the same level of misreported data that the motivating papers, Carter and Brady (2002), Norris (2005) or Love and Byrne (2005), found. Yet, the strategies the QDERS paper used, confirming current age and adding an edit to seemingly inconsistent relationship data, at least preserved, if not improved the original questions without creating additional interviewer or respondent burden. Thus, we recommend using these strategies in future demographic data collections.

Key words: Date of birth question; Age confirmation; Relationship question; Real-time data editing; Mode consistency

2006 QDERS: Demographic Questions Analysis

I. Introduction

This report chronicles the findings of two studies exploring alternative ways to collect simple demographic data for decennial census (or other demographic survey) operations. The first study is an experiment focusing on how to confirm age, given a valid date of birth. The second study is an investigation exploring a real-time edit to fix problematic relationship data by verifying with the respondent seemingly misreported relationships. Though the two studies are not explicitly related, they are presented together because of how they relate to past research.

II. Background

For decennial census operations, age data has typically been gathered as of Census Day (April 1st), so the U.S. Census Bureau can produce statistics on the age of the U.S. population at a very specific point in time. In past censuses, with few or no automated data collection instruments, respondents were asked to provide both age as of April 1st as well as date of birth. This increased the likelihood of gathering valid age data (Spencer and Perkins, 1998). As the Census Bureau has tested automated data collection instruments in the years leading up to the 2010 Census, we have acknowledged the technological advantages offered by automation. When a respondent provides a date of birth for either him or herself, or for another member of the household, the interviewer's computer automatically computes an age for the interviewer to verify with the respondent (see Martin, et al., 2007). This question sequence functions like an edit to pick up an error in the date of birth given by the respondent or a data entry error by the interviewer. In automated instruments for the 2010 Census, including the Nonresponse Followup (NRFU), the Census Coverage Measurement Person Interview and the Coverage Followup, date of birth will be gathered from the respondent, and then age will be confirmed as of Census Day, April 1, 2010.

The problem is that these operations begin almost a month after Census Day and continue for up to seven months; thus, the age confirmed in these operations is an age that occurred on a date in the past. We suspect that confirming an age in the past may be difficult for respondents, and we contend that it is unnecessary in an automated instrument.

Our hypothesis is supported by past research using paper census questionnaires. In Census 2000, Carter and Brady (2002) found two situations where respondents had problems reporting age correctly on the Census form – both the self-administered form and the interviewer-administered paper NRFU form – which both asked for age as of April 1st.[1] The most notable problem identified was that respondents misreported age when the person's birthday was after April 1st and also after the date that the form was checked-in (meaning the respondent likely completed the form after the person's birthday, which made the person's current age older than his or her age on April 1st). Forty percent of the people in this category over-reported their age (suggesting they reported their current age, and not their age as of April 1). The other problem occurred when the person's birthday was before April 1st, and their form was checked in before April 1st.

[1] Because Census 2000 was predominantly a paper-only census, there was not the capacity to calculate and verify age as of Census Day given a date of birth.

In this situation, the person should report their age as of a date in the future. In 10.3 percent of cases, the person underreported his or her age, indicating that they were reporting their current, not future, age. This suggests that respondents did, indeed, have difficulty reporting age as of a date other than the current one.

Norris (2005) found indications of a similar problem in the 2004 Census Test. In that test, the NRFU was automated using a hand-held computer. Age was asked as of Census Day and then date of birth was asked. An edit on age was included in that instrument such that if the calculated Census Day age (based on the date of birth given) did not match the reported Census Day age, a confirmation question appeared:

> "For the Census, we need to record age as of April 1, 2004. Based on the date I just entered, your age was [fill: calculated age as of Census Day]. Earlier I recorded your age as [fill: reported Census Day age]. Which age is correct as of April 1, 2004?"

Norris (2005) found that for 17 percent of the people in one of the test sites and 11 percent of the people in the other test site, the edit check appeared and the respondent responded that the Census Day age originally reported was wrong. Although Norris (2005) does not speculate or investigate the reason so many people fell into this situation, we pose these possible reasons: (1) the interviewer asked the age question incorrectly (most likely excluding the Census Day reference date, thus eliciting the current age), (2) the age question was asked as worded on the screen but the respondent was confused and reported the current age instead, (3) the interviewer made a typing error while entering the age reported, or (4) the respondent guessed at the Census Day age and when presented with the edit, realized the mistake. Norris (2005) also found that for 5 percent of the people in each site, the edit check appeared and the respondent reported that the Census Day age given was correct and the calculated age was wrong. In this situation either the respondent initially gave the wrong date of birth, or the respondent was confused by the wording of the edit check. Additionally, behavior coding results showed that respondents had to request clarification in 7 percent of all administrations of the initial age question (Hunter and Landreth, 2006), also suggesting the age question was difficult for respondents to answer. All of these data supports the possibility that asking or confirming age in the past may be a difficult cognitive task for respondents.

As mentioned previously, the current plan for the 2010 Census is to ask date of birth and confirm age as of Census Day (April 1st), which will be between one month and seven months in the past (depending on the operation). Just as reporting an age in the past was difficult, especially for those whose birthday fell between the Census Day and the interview day, we hypothesize that confirming an age in the past will be problematic for respondents, especially for people whose birthdays fall between April 1 and the interview day. This could be easily remedied by having respondents confirm current age, and have the computer calculate and store age as of Census Day for data use.

In the Questionnaire Design Experimental Research Survey (QDERS) 2006, a split-panel experiment was conducted testing two different age-verification questions. If the respondent provided a date of birth, one panel calculated and verified current age, and the other panel calculated and verified age as of Census Day (April 1). We assume that if the respondent reports that the calculated age was not correct, but the date of birth was correct, this implies the respondent was confused by the age confirmation question. We compare how often the respondent demonstrated this confusion in the two panels and see if the birthday of the "confused" person was between April 1 and the interview day. If we find more "confusion" in the panel where we confirm an age in the past (either the respondent's age or the age of someone else in the household), then our hypothesis holds true that confirming age in the past is, indeed, problematic. This would lead us to the recommendation that age should be confirmed as of the current date, and recorded for data usage as age as of Census Day.

In addition to this experiment on age verification, an investigation was conducted using an edit to verify relationships in cases where age-inconsistent relationships had been reported. The decennial census gathers the relationship of all household members to the householder (i.e., the person who owns or rents the housing unit). Respondents sometimes report relationships between members of a household in ways that reverse the direction of the actual relationship (see Love and Byrne, 2005). For example, the relationship question might read, "How is Jamie related to you?" A respondent could answer the question in one of two ways: he could say, "I'm her father" or, "She's my daughter." The appropriate answer, implied by the direction of the question, is that Jamie is the daughter of the householder. However, we can easily see how a respondent could reply "father," and the interviewer could enter that as the response. When this happens, the data appear to reflect a situation where the parent is younger than the child or a child that is older than the parent. Using the 2004 Census Test NRFU data, Love and Byrne (2005) found that 63.6 percent of the people recorded as "parents" were more than 10 years younger than the householder. Using the same data, 4.9 percent of the reported "children" of the householders were *older* than the householder. Many of these are probably misreported relationships, which can be "fixed" via edits that use the date of birth and relationship data post-data collection processing. However, it is likely that not all of these are incorrect relationships (e.g., step-families), and a post-data collection processing edit would not be able to distinguish between truth and errors in reporting.

We could solve this problem in two possible ways. We could either modify the wording of the relationship question to make the desired direction of reporting clearer or, in automated instruments, we could do a real-time edit in cases where the ages conflict with the reported relationship. If the respondent verifies that we have recorded the correct data, then we can avoid post-processing edits, which could potentially change correct data. We tried the latter approach in the 2006 QDERS.

For the relationship edit investigation, an edit message appeared if the reported relationship of one person to another within the household seemed reversed. For example, an edit message appeared if a young person was reported to be the parent of an older person in the household, or if an older person was reported to be the child of a younger person. There was no split-panel test for the edit; it was programmed for all interviews.

This paper reports the results of these two studies. First, we discuss the methodology and limitations of the QDERS design. Then, we present the specific methodology and results of the age-verification experiment and the relationship-edit investigation. In the results section, we address concerns Census staff might have with embedding these in a production environment and recommendations for future directions. We end the paper with general conclusions based on both studies and recommendations for future larger-scale research.

III. Methodology

The data for these studies were collected in the 2006 QDERS, which is a split-panel controlled experiment developed by the Census Bureau's Statistical Research Division for conducting methodological experiments offline from the agency's ongoing production surveys. QDERS 2006 was conducted between November 3 and November 21, 2006, using a random digit dial (RDD) sample via Computer-Assisted Telephone Interviewing (CATI) from one of the Census Bureau's centralized calling centers. The sample was nationally representative (excluding Alaska and Hawaii), with independent samples for each of the two treatments.

There were two panels in the 2006 QDERS.[2] Panel A confirmed current age and Panel B confirmed age as of Census Day (April 1, 2006). Both panels included the same relationship question and relationship edit. Both panels also followed the same order of questions, first collecting a roster of current occupants, the demographics of those occupants, and then questions about residence status.[3]

The total sample size for each panel was 2996. Using the response rate calculation standards established by the American Association for Public Opinion Research (AAPOR, 2006), excluding cases of ineligibility and unknown eligibility, the response rate for Panel A was 60.77 percent compared to 55.92 percent for the Panel B.[4] These response rates were significantly different from one another ($p< .01$).

A total of 1870 interviews were completed: 982 in Panel A and 888 in Panel B. We limited the substantive analyses to people who had a "complete" flag set in the instrument, which means the interviewer reached the end of the instrument for at least one person in the responding household.

IV. Limitations

Because the two experiments contained in QDERS 2006 (age confirmation and residence determination) were not crossed, there could be confounding of results. However, at the point in the questionnaire when demographic questions were asked, the two panels were still identical; thus, we do not believe the residence determination experiment confounded results of the age-confirmation experiment.

The 2006 QDERS was fielded in November. Therefore, there was more than a seven-month lag time between Census Day (April 1) and the interview day. If birthdays were equally distributed

[2] The primary focus of the 2006 QDERS was to investigate a new way of measuring residence status for the decennial census, which did not pertain to the findings in the two papers cited above. Results of the larger residence study embedded in QDERS are reported in Childs and Nichols (forthcoming).
[3] See previous footnote.
[4] Rates reflect the AAPOR RR6 definition (AAPOR, 2006).

throughout the year, more people would fall into the situation of being one year older than they were on April 1st in QDERS than in the regular census operations (which should wrap up in October at the latest). If confusion results over verifying an age in the past with a seven-month time lag, we cannot conclude that the same level of confusion would exist with a shorter time lag.

This test did not investigate whether questions were accurately read. Confounding factors (such as the interviewer not reading the question clearly or a respondent who knew English as a second language) would have influenced any conclusions we might have drawn.

Additionally, though it was suggested by our survey sponsor, we did not pose both age verification questions to the respondent in a debriefing and ask the respondent for a preference because preference data can be biased in various ways (see Andre and Wickens, 1995). We do not consider this a limitation, but our sponsor might.

Finally, each interviewer worked on only one of the two panels. Although we attempted to balance the two groups of ten interviewers in terms of interviewer characteristics such as tenure, experience with a similar instrument, skill level, and gender, there may have been unanticipated, systematic, uncontrolled differences between the two groups. The significant difference in response rates between panels noted above, as well as observations made during the training sessions, suggest that Panel A might have included interviewers who were more skilled than those who worked on Panel B. Since each interviewer was assigned to only a single panel, we attempt to control for interviewer effects by including fixed and random-intercept effects of the interviewer in our statistical models.

V. Age-Confirmation Experiment

In both panels, for each rostered person, we collected the typical demographic items used by the census, though in a slightly different order: date of birth, confirmation of age (if date of birth was given) or current age (if complete date of birth was not given), sex, relationship, Hispanic origin and race.[5] We varied the confirmation of age in the two panels. In Panel A we calculated and confirmed current age and in Panel B we calculated and confirmed age as of Census Day. After date of birth was collected, the interviewer asked one of the two following age confirmation questions:

> Panel A: **"That would make NAME (fill: age as of today) years old. Is that correct?"**
> Panel B: **"For the Census Bureau, we need to record age as of April 1, 2006. So, just to confirm, NAME was (fill: age on 4/1/2006) years old on April 1, 2006?"**

If the respondent said "no" to this question in either panel, meaning the calculated age was not correct, we then went to a screen to confirm the date of birth given. That screen asked:

> **"I have recorded NAME's date of birth as (fill: MONTH, DAY, YEAR). Is that correct?"**

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[5] In 2008 and 2010, the NRFU instrument will collect the demographic data in the following order to be consistent with the self-administered form: relationship, sex, date of birth, confirmation of age (if date of birth was given) or age as of Census Day (if date of birth was not given), Hispanic origin, and race.

If the respondent reports that the calculated age was not correct, but the date of birth was correct, we assume this implies the respondent was confused by the age-confirmation question. We compare how often the respondent demonstrated this confusion in the two panels and see if the birthday of the "confused" person was between April 1 and the interview day. If we find significantly more "confusion" in Panel B where we confirm an age in the past as compared to the level of confusion in Panel A, then our hypothesis holds true that confirming age in the past is, indeed, problematic.

Respondent Confusion Results

Only two respondents seemed to be confused by the age verification. See the highlighted row in Part 1 of Table 1. The respondents in both cases said the age verified in the instrument was incorrect, but the date of birth was correct. Both these situations occurred in Panel B, which verifies the age as of Census Day. In one case, the birth date was between Census Day and interview day (meaning that the person was currently one year older than the age that was verified as of Census Day). In the other case the person in question was a newborn baby who was not yet born on Census Day. For this case the question read, "For the Census Bureau, we need to record age as of April 1, 2006. So just to confirm NAME was not born yet on April 1, 2006?" Both of these situations would support our hypothesis that the respondent was confused by the age verification and answered based on current, rather than Census Day, age. However, the fact that only two respondents were confused seems to suggest that most people in our study did not get confused when they confirmed an age in the past, especially since over 60 percent of the people who provided a complete date of birth had a birthday between Census day (April 1) and the QDERS interview day in November (and should have been more likely to report current than past age). Statistical tests comparing the differences between panels were not conducted because very few respondents exhibited confusion with the age verification question.

Table 1: Distribution and outcome of date of birth (DOB) and age verification by panel

	Panel A: Confirm Current age	Panel B: Confirm Census Day age
1. DOB complete		
Age is correct/DOB not verified	1891	1745
Age is incorrect/original DOB incorrect	5	5
Age is incorrect/original DOB correct	0	2
2. Some part of DOB missing		
Age not verified (DK, Ref)	0	2
Age is incorrect	0	18
3. Missing DOB		
Age not verified	648	582
Total	2544	2354

Additionally, interviewers were encouraged during training to write notes on any questions the respondent found confusing. Only one interviewer wrote such a note, and it was on one of the cases mentioned above.

In both panels, for all cases where a year of birth was given, we calculated an age. For 20 people in Panel B (see Part 2 of Table 1), the respondent did not provide the month and day of birth, but did provide the year.[6] For these people, we assumed a birth date after April 1st. We made this assumption because more than half of the people should have had a birthday within the seven months between Census Day (April 1) and the QDERS interview (in November), assuming the birth month distributions have stayed relatively consistent over time (Seiver, 1985). So, for these people the confirmation question read, "For the Census Bureau, we need to record age as of April 1, 2006. So, just to confirm, NAME was (fill: age on 4/1/2006) years old on April 1, 2006?" (The question filled an age that most likely was one year less than their current age, assuming most people had a birthday after April 1st.) Eighteen of the 20 people said the calculated age was incorrect, but we could not confirm the birth date provided since the respondent only provided a year. In all of these instances we asked for the current age, and in 17 cases the respondent reported an age that was one year older than the Census Day age we calculated and confirmed. So, one of two things occurred when the respondent said the age on Census Day was incorrect: either, all of the 17 people had a birthday before Census Day and the calculated and confirmed age was really incorrect, or the respondent was confused by the Census Day age confirmation question. The former seems unlikely given the distribution of U.S. birth months in 1947 - 1976, which shows more births occurring in the six months from May to October than during the other six months of the year (Seiver, 1985). We therefore propose that respondents were confused by the Census Day age confirmation question, answering it as if they were confirming age as of today, instead of age as of Census Day.

The lack of explicit confusion of respondents is surprising, given the previous findings by Carter and Brady (2002) and Norris (2005). Examining differences between our study and theirs, we note that the previous studies looked at self-responses and interviewer-administered forms completed by novice temporarily-employed interviewers. Our study employed permanent, professional telephone interviewers. We hypothesize that the Census Bureau's QDERS interviewers might have had experience in previous surveys with the difficulty of confirming age in the past, and might have helped the respondent accordingly. We were not able to determine whether or not the interviewer actually did try to help the respondent, but we can imagine an exchange such as the following that might have occurred:

> Respondent: "I'm not sure. Mary just had a birthday and is now 10 years old"
> Interviewer: "So, that would have made Mary 9 on April 1st, right?"

Additionally, in the Carter and Brady (2002) study, age was asked, not verified, as of Census Day. It is possible that verifying an age in the past is easier than reporting an age in the past. We know from past behavior coding (Childs, et al., 2007b; Hunter and Landreth, 2006) that in NRFU interviews, interviewers sometimes omit the reference date of the age question, which would lead to reporting current age rather than age as of Census Day. This could have been a factor in the Carter and Brady findings as well.

[6] We did not perform a statistical test comparing the two panels because there were no cases in Panel A where the date of birth was partially missing. Thus, the statistical test would not be meaningful.

Timing Results

Interestingly, the time it took to complete the demographic section differed between panels. For any given household size in this study, the demographic section in Panel B, which confirms age as of Census Day, took significantly longer to complete than did the demographic section in Panel A, which confirms current age (see Table 2). We conducted a linear regression to predict time to complete the demographic section using panel, number of addresses reported at a household level (No. of addresses), number of people in the household (Size of HH), respondent race, and an interaction term between panel and number of people in the household as predictors, as well as including a random interviewer effect.[7] The interaction term between household size and panel was a significant predictor of time to complete the demographic section despite including the other terms in the model.

Table 2: Linear Regression Model of Time (Seconds) to complete the Demographic Section

Predictor	Parameter Estimate	Standard Error
Intercept	13.31**	4.8
No. of addresses per HH	0.82	1.3
Size of HH	21.70**	0.9
Race of the respondent		
Black	8.02**	3.2
Don't Know/Refuse	21.93**	5.6
Multiple races	42.46**	5.9
Other race	9.77*	5.4
White (Control group)		
Panel		
B: Confirm Census Day age	6.48	6.4
A: Confirm current age (Control group)		
Size of HH by Panel		
B: Confirm Census Day age	4.01**	1.21
A: Confirm current age (Control group)		

N=1866
* $p \leq .05$
** $p < .01$

The only difference between panels in the demographic section is how age is confirmed. The average time taken in the demographic section where the age was confirmed as of Census Day (i.e., age was confirmed as of a date in the past) was 1 minute and 32 seconds. The average time taken in the section that confirmed current age was 1 minute and 14 seconds. There was, on average, an 18-second difference between the two panels.[8] Interpreting the significant interaction effect between household size and the panel, the model shows an estimated 4-second

[7] These covariates were included either because the two experimental panels differed in these characteristics or because the variable was expected to impact the amount of interview time.
[8] This is using pure means, not factoring in the covariates.

time savings for each person in the household when the interviewer confirms the current age instead of the age as of Census Day. For example, for a single-person household, the demographic section of an interview confirming current age is on average 4-seconds shorter than the demographic section of an interview confirming the Census Day age. For a four-person household, an interview confirming current age is on average 16 seconds (4 persons x 4 seconds) shorter than an interview confirming the Census Day age. The larger the household, the greater the time savings will be with the version confirming current age, controlling for the other variables in the model.

Other covariates were also significant predictors of time spent in the demographic section. Households with more people in them led to longer demographic sections, as expected, since demographic data are collected for each person in the household. The race of the respondent was also a significant predictor of interview length given the other variables in the model. Respondents who did not identify a race or self-identified as a race other than white took longer to complete the interview than did respondents who were white. This could have been due to taking additional time answering the race question itself, and was not necessarily influenced by the age confirmation question.

Beyond all other factors, the increase in the amount of time needed for the panel that confirms age as of Census Day suggests that interviewers and respondents were going more slowly through this section, perhaps due to the more cognitively difficult nature of verifying an age in the past. Verifying an age in the past could be a four-step process: 1) Think about how old you are now, 2) Think about when your birthday is, 3) Decide whether your birthday was before or after April 1, and 4) Decide how old you were on April 1. Then repeat this process for everyone in the household. It makes sense that this four-step cognitive process would take longer than a single step of only having to remember one's current age. Additionally, if the interviewer has to assist the respondent by probing or offering clarification, this would also increase the time to administer the question.

In conclusion, for this experiment, we did not witness respondents having a large problem verifying age in the past; however, there is some indication that interviews verifying age in the past will take longer and cause more interviewer and respondent burden, than will interviews that verify current age. Because of that, we recommend confirming current age with the respondent, when given a valid date of birth. Age as of Census Day can still easily be calculated and stored for data usage. This would simplify the task for interviewers and respondents, and may increase data quality for cases where relatively unskilled interviewers are administering the survey (NRFU). Respondents could still be asked to report age as of Census Day for people for whom date of birth was not known.

This is, in fact, similar to what the American Community Survey (ACS) does. Because the ACS is continuously administered and has a rolling reference period, the ACS automated instruments ask for the date of birth and confirm current age instead of age as of a particular date.

Production Concerns with Age Verification

In this section, we will address some concerns that have already been raised about the proposal to confirm current age, rather than age as of Census Day. Some have expressed concern that confirming an age as of interview day would affect who was rostered as a household resident (we want to roster residents who were living or staying at the unit on April 1st, which would not include babies born after April 1st). The concern could only apply to person-based questionnaires where the respondent lists a person, completes the demographics for that person, lists the next person and completes the demographics for that person, etc. In this situation, a respondent might assume we wanted the current household members, as opposed to those living in the residence on Census day, based on the fact that we wanted their current ages (though this is purely speculation and has not been shown in any study). This is not even a possible problem for topic-based questionnaires, which collect a roster of people first and then collect the demographics of those people. Once the roster is collected and confirmed, there is little backing up in topic-based interviews, especially if they are interviewer-administered and the interviewer can explain that we need residents of the household on a certain day. In the 2006 QDERS, which was topic-based, we did not experience modifications to the roster after the demographics section.

A second concern was raised about verifying current age when date of birth was given, but asking for age as of Census Day when date of birth is unknown. We wonder whether using these two different questions, possibly in the same interview, affects data quality or respondent burden. In the 2006 QDERS, we always asked for current age when date of birth was unknown; so we were unable to determine any additional respondent burden resulting from asking two slightly different questions. This could be investigated in future tests, although any hypothesis about which is more cognitively difficult (confirming age as of Census Day and asking for age as of Census Day OR confirming current age and asking for Census Day age) is not readily apparent from theory or previous research. One might also investigate the impact to the data resulting if we asked a respondent who does not know someone's date of birth to provide current age instead of age as of Census Day.

VI. Relationship Edit Investigation

The relationship question we used in the QDERS instrument was worded as follows:

> **"How is NAME related to (fill: householder's name)?"**

In both panels, we added an edit to the relationship question. This edit was invoked if a person with an age older than the householder was said to be the child of the householder or if a person with an age younger than the householder was said to be the parent of the householder. The edit read one of the following two ways:

1) **"Let me make sure we've got this right. Is (fill: parent's name) the parent of (fill: child's name)?"** or,
2) **"Let me make sure we've got this right. Is (fill: child's name) the child of (fill: parent's name)?"**

For example, if the householder, Beth (29 years old) reported that George (8 years old) was her parent, the edit would read, "Let me make sure we've got this right. Is George the parent of Beth?" A "no" response would go back to the relationship question and allow the interviewer to select "Child" while a "yes" response would allow the interview to progress. Similarly, if the householder, Beth (29 years old) reported that Lisa (49 years old) was her child, the edit would read, "Let me make sure we've got this right. Is Lisa the child of Beth?" A "no" response would go back to the relationship question and allow the interviewer to select "Parent" while a "yes" response would allow the interview to progress.

To make the edit and possible relationship correction work smoothly, we reordered the questions in the QDERS instrument to collect age before relationship, allowing us to perform the edit immediately after the relationship question is asked. The QDERS instrument asked date of birth, age, sex, and then relationship (for households with 2 or more people rostered). This order differs slightly from the order of these questions on the decennial census (i.e., relationship, sex, date of birth, age). If we kept the original census order and performed the edit, we would invoke the relationship edit three questions after the relationship question. This could cause problems both for the interviewer and the respondent. The interviewer might be tempted to back up several questions to fix the original relationship. The respondent could also be confused because of the seemingly misplaced followup question. It would seem to the respondent that we were asking relationship, sex, date of birth, age, and then relationship again. Though we did not suspect this reordering would have any effect on the data reported, we did not experimentally test the effects of reordering. By design, both panels contained the edit; this was not experimentally evaluated.

Table 3 contains the distribution of relationships in the 2006 QDERS. Over the 1870 sufficiently completed cases, the edit message was purposefully triggered only three times.[9] In one case, a female reference person listed a "child" with an age older than her own; in another case a male reference person listed a "child" with an age older than him. Both times, the respondent reported the seemingly inverted relationships were correct. The third time the edit was flagged we suspect that the interviewer went back and changed the relationship because it appeared accurate in our data. For that case, a "too old child" was changed to a parent.

Table 3: Distribution of Relationship Categories for People in 2006 QDERS

	N	Percent
Respondent/householder	1864[10]	38.1%
Spouse	1119	36.9%
Child	1355	27.7%
Grandchild	108	3.6%
Parent	113	3.7%
Brother/Sister	45	1.5%
Other relative of reference person	100	3.3%
Unmarried partner	58	1.9%
Foster child	5	0.2%
Roommate	17	0.6%
Non-relative of reference person	103	3.4%
DK	11	0.4%
Total	4898	100%

[9] The edit was actually invoked 30 times over 16 households. We inadvertently let any situation where the person's age was "don't know" (recorded as -1) fall into the edit check. This made the person appear to be younger than anyone with an accurate age, and erroneously tripped the edit. This accounted for 27 of the 30 edit failures.

[10] There were 1870 sufficiently completed cases. There were 6 cases (probably due to an incomplete interview which was completed via a different respondent in a callback) where the original reference person (roster person 1) was assigned a relationship code.

Even though we had a substantial number of children rostered in QDERS (1355 children reported), we did not see the same quantity of possibly misreported relationships that Love and Byrne (2005) found in the 2004 NRFU data. They found 4.9 percent of children of the reference person had an age older than that person. If that had been the case in QDERS, we would have seen approximately 66 edits triggered and not just three. Similarly, of the 113 reported parents in the QDERS data, none reported an age younger than the reference person's age (Love and Byrne found 63.6 percent of "parents" having a younger age than the reference person, by 10 years or more, in the 2004 NRFU).

We are not sure why the QDERS relationship question seemed to work whereas the 2004 NRFU question did not. Upon closer investigation, the 2004 NRFU relationship question was slightly different from the QDERS question, reading:

> "**Which of these categories best describes how NAME is related to (fill: name of householder)?**" with the interviewer instructed to show the respondent a flashcard and read the response options as needed.

The QDERS wording was:

> "**How is NAME related to (fill: name of householder)?**" with an interviewer instruction to read the response options, if necessary.

The difference in wording, though slight, could have impacted respondents' ability to infer direction of relationship from the question.

Additionally, our QDERS interviewers were more experienced than were the novice interviewers employed for NRFU. Most of our QDERS interviewers have had many years of experience with Census Bureau surveys; so they may have understood and automatically corrected inverted relationships that respondents reported. Even so, we hypothesize there might have been a problem with either the 2004 NRFU training or instrument that caused the proportion of inverted relationships for parents to exceed correct reports of parents.

Future Plans for the Relationship Question

For the 2008 Census Dress Rehearsal, part, but not all, of the edit tested in this study was incorporated into the NRFU specification.[11] After the age has been determined for all household members, a relationship edit check looks for household members who are reported as a parent or parent-in-law to the reference person, yet their age is younger than the reference person. The edit reads:

> "**I have recorded that NAME is NAME's [parent/parent-in-law]. Is that correct?"**

We recommend adding the inverse edit check to the 2010 Census NRFU specification, when a biological or adopted child is reported that is older than the reference person:

> "**I have recorded that NAME is NAME's child. Is that correct?"**

[11] On a very technical note, when using these edits ensure that they are not tripped in cases where the age of someone is "don't know" or "refuse." In some instruments, these are stored as values of "-1" or "-2" and this "age" would seem less than any other provided age.

For the 2008 NRFU, the relationship question is asked first and then sex, date of birth, and age, as is consistent with the self-administered form. The relationship edit occurs after the question on age, and is separated from the original reporting of relationship data by three topics (sex, date of birth, and age). If the edit is triggered, and the respondent reports that the relationship is incorrect, the interviewer should report that in the instrument, which will direct the interviewer through a second series of relationship questions to capture the correct relationship data. From that series, the instrument will proceed to the next new question. The instrument does not expect the interviewer to back up to correct the relationship, although interviewers will not be prohibited from doing so.[12]

During the 2008 NRFU operation, we encourage NRFU observers to pay special attention if the relationship edit is triggered during an interview. Observers should make note whether interviewers follow the edit instruction and proceed forward to correct relationships, or if they try to back up to correct the relationship. Post-processing analysis should also look at how often the edit is triggered and whether the interviewers proceeded forward or backed up to correct relationships. If interviewers are backing up, we encourage experimentally testing a reordered series of demographic questions, as done in the study described here.

Recommendations for Future Research for the Relationship Question

In the 2006 QDERS, we used the same relationship question that is planned for the 2010 Census. Our investigation involved only adding an edit to correct for inverse relationships. For documentation purposes, we should mention that a modification to the actual relationship question has been cognitively tested and has shown promise (Childs et al., 2007a). In the modification tested, the relationship question was revised to a “fill-in-the-blank” format where the direction of the relationship was more evident than the standard relationship question previously used. See Figure 1.

[12] Generally backing up is discouraged because it could increase the amount of time the interview takes, cause respondents confusion, and possibly cause instrument or data errors.

SHOW FLASHCARD

Next I need to record relationships of everyone to (fill: name of householder) Using the categories on the card, please help me fill in the blanks.

NAME is (fill: name of householder)'s __________________.

Husband or wife	**Roomer or boarder**
Biological son or daughter	**Housemate or roommate**
Adopted son or daughter	**Unmarried partner**
Stepson or stepdaughter	**Other nonrelative**
Brother or sister	
Father or mother	
Grandchild	
Parent-in-law	
Son-in-law or daughter-in-law	
Other relative	

Figure 1: Fill-in-the-blank relationship question for a personal visit interview

In cognitive testing, respondents had very little trouble with this question. The fill-in-the-blank format worked well. Almost all respondents easily grasped the concept and mentioned that what they were supposed to do was clear.

Unfortunately, the fill-in-the-blank format does not translate smoothly into Spanish. We encourage further research into how to adapt this question into Spanish and recommend testing of this modification in a field test and using the telephone mode.

VII. Conclusions

We did not observe many errors in age or relationship reporting in QDERS 2006. We attribute this in part, at least, to the use of skilled, experienced interviewers. Evidence from behavior coding (Childs, et al., 2007b; Hunter and Landreth, 2006) suggests that NRFU interviewers, who are temporary interviewers employed only for a few months, often reword questions. In the 2004 NRFU behavior coding study, the relationship question was read with major changes in 45.5 percent of cases, and the age question was reworded in 33.2 percent of cases. Poor interviewer behavior (i.e., rewording of questions) could have contributed to the high rates of misreporting by respondents in the Love and Byrne (2005) study as well as to problems with age reporting in the Carter and Brady (2002) and Norris (2005) studies. Landreth, Krejsa, and Karl (2006) found that our permanent telephone staff consistently had better interviewer behavior than our temporary census field staff using Coverage Research Followup data from the 2004 Census Test.

To further investigate problems demonstrated by Carter and Brady (2002), Norris (2005) and Love and Byrne (2005), we recommend that a replication of the experiment and investigation described here be conducted using census interviewers in a census environment. A split-panel in-person field test would be ideal for investigating both errors in reporting age and relationship. This would better replicate previous circumstances surrounding the findings from census field tests and census operations. It would also provide more concrete evidence as to whether these findings are related to interviewer experience and skill; specific questionnaire treatments (e.g., reporting versus verifying age in the past); or other operational issues (e.g., telephone versus in-person reporting, differences in training). Additionally, this suggested research could determine how much, if any, cost savings occur as a result of shorter interviews.

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