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# How Much Do We Count? Interpretation and Error-Making in the Decennial Census

Roberta R. Iversen\*

Frank F. Furstenberg<sup>†</sup>

Alisa Alom Belzer<sup>‡</sup>

\*University of Pennsylvania, [riversen@sp2.upenn.edu](mailto:riversen@sp2.upenn.edu)

<sup>†</sup>University of Pennsylvania

<sup>‡</sup>University of Pennsylvania

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# HOW MUCH DO WE COUNT? INTERPRETATION AND ERROR-MAKING IN THE DECENNIAL CENSUS\*

ROBERTA REHNER IVERSEN, FRANK F. FURSTENBERG, JR., AND ALISA A. BELZER

*Following a critique of the 1990 decennial census procedures, we conducted a field study among low-income, inner-city residents in 1991 to examine how they conceptualized and managed the civic task of census response. Interpretations about the purpose and meaning of the census, about commitment to the task, and about connection to government, singly and together with literacy skills (e.g., reading and general literacy competence), were associated with errors that are not detectable by evaluative methodologies used regularly by the Census Bureau. The validity and reliability of census data, and possibly other self-administered survey research, will be increased by greater use of knowledge about both interpretation and literacy skills in formulating data collection procedures.*

The decennial census is described as “the cornerstone of our knowledge about our Nation” (U.S. Census Bureau 1997a:3). The quality of the data collected in the census is critical for decisions made by government agencies, policymakers, social science researchers, and the populace.

Although the census is a complete count, in recent decades it has been conducted primarily as a mail survey (Dillman et al. 1996). In effect, it is a self-administered questionnaire subject to a set of methodological problems as participants attempt to respond either to a short form of several pages or, for approximately one household in six, to a much longer form.

Results of the 1990 census heightened official and public concerns about the quality of census data, defined by some as its fitness for use (Colledge and March 1997; de Leeuw and Collins 1997; Groves 1991; Norwood 1987:215). Particular concerns about quality were the unreached goal of total population coverage, the persistent and systematic undercounting of people according to race and ethnicity, and inadequacies of the data collection instrument. The quality assurance principles for Census 2000, however, focus primarily on data collection and processing operations (U.S. Census Bureau 1997a), similar to most census research during this decade.

Although the Census Bureau conducted extensive research to improve the 2000 questionnaire, it focused on verbal and visual changes, such as color and format, to increase the likelihood that the questionnaire will be returned. Far less research attention was devoted to errors in responses provided by those who answer the census, to the factors that contribute to such errors, and to changes that could contribute to the accuracy and completeness of the information provided by respondents. Researchers conclude that there still is much to be learned in this regard from the 1990 questionnaire (Bell 1994; Miskura 1992).

This paper concerns a set of respondent errors: omitted, wrong, and incomplete answers created by “respondent confusion, ignorance, carelessness or dishonesty” (Biemer et al. 1991:xvii). Groves (1991) found that respondents varied in the amount of error in the data they provided because they differ in cognitive abilities or motivation to answer the questions well. We follow in Groves’s direction by examining how the quality of the content of census data is influenced by the cognitive domains of literacy and interpretation. We hypothesize that both domains affect the validity and reliability of census data, particularly the data collected from historically disenfranchised and underrepresented, poor urban residents. Because participation in the census collection process may be an indicator of the civic responsibility of the populace, we broaden the inquiry about cognitive influences on respondent error beyond the current focus on questionnaire wording and format to include civic knowledge and attitudes.

We report here on the results of a small-scale qualitative field study designed to examine how low-income census respondents in inner-city Philadelphia conceptualized and managed the 1990 decennial census. We show how elements of functional literacy, such as reading skills and general literacy competence, are associated with errors in census information. We also explore how census errors are associated with elements of interpretation, such as the respondents’ perceptions of the purpose and meaning of the census, their commitment to the census task, and their sense of connection to the government. Further, we suggest that literacy and interpretive elements contribute, both singly and together, to errors that were undetectable by 1990 optical scanning procedures and may remain undetectable in 2000, despite proposed changes in methods of data capture (Holmes 1998; U.S. Census Bureau 1997a). Findings suggested by our research may apply both to the final format of the Census 2000 questionnaire and to the improvement of formats already in process for censuses in the twenty-first century. Moreover,

\*Roberta Rehner Iversen, School of Social Work, University of Pennsylvania, 3701 Locust Walk, Philadelphia, PA 19104-6214; E-mail: riversen@ssw.upenn.edu. Frank F. Furstenberg, Jr., Zellerbach Family Professor of Sociology, University of Pennsylvania. Alisa A. Belzer, Graduate School of Education, University of Pennsylvania. This research was supported by Grant No. R117Q00003 from the National Center on Adult Literacy, University of Pennsylvania, and Grant No. 99-89-56 from the Russell Sage Foundation. We wish to thank Al Paez, U.S. Bureau of the Census for guidance in the use of the census forms and Jason Walthall for assistance with the data analysis. We also thank the anonymous reviewers and *Demography* editors for their extensive and helpful suggestions.

our findings suggest particular arenas of census data that social scientists and policymakers should address with caution because of problems with the quality of the data.

## BACKGROUND: QUESTIONNAIRE RESEARCH AND DESIGN

The Census Bureau has sponsored a vast body of research to improve the quality of census data, particularly after the collection procedure changed in 1970 from in-person enumeration to a self-administered mail-back format. Most of these studies aimed to reduce coverage and nonresponse errors, errors that result when measurements are not taken on part of the population, through improvement of the questionnaire. Some studies focused secondarily on how aspects of respondent error, such as item nonresponse, also could be remedied by questionnaire redesign (Dillman et al. 1996). Early census reassessments identified increased political disaffection, greater concern about privacy and confidentiality, and the perceived difficulty of completing the census form among the reasons for the 10-percentage-point decline in the rate of response between 1980 and 1990 (Bell 1994; Dillman and Reynolds 1991; Kulka et al. 1991; Singer, Mathiowetz, and Couper 1993). Yet subsequent research did not directly examine how attitudes influence response quality.

The assumption framing most census questionnaire research is that a respondent-friendly product will elicit participation according to principles of social exchange (Dillman, Clark, and Treat 1994). Specifically, if the task is easy, attractive, and nonthreatening, individuals will perceive that the benefits to themselves and/or others of participating are greater than the costs in time or effort (Jenkins and Dillman 1997). Initial large-scale questionnaire improvement efforts found that modifying the layout, format, and structure of the questionnaire improved both overall and item nonresponse (Bates 1991; DeMaio and Bates 1992). However, researchers increasingly recognized the complexity of the response process in an economically and culturally diverse populace. As Jenkins and Dillman (1997:165) noted, "Our understanding of self-administered questionnaire design clearly remains in its infancy."

Thus, a second major Census Bureau effort in the 1980s and 1990s utilized ethnographic research methods to discover the understanding and meaning that respondents apply to key census terms and concepts, particularly in racial/ethnic origin and residence categories. Macro-level demographic analyses revealed that the undercount, or persons missed in the enumeration process (U.S. Census Bureau 1997b:5), differed according to race and ethnicity, geographic area, and socioeconomic status (Hogan and Robinson 1993; Robinson et al. 1993). This led to an ethnographic examination of the behavioral processes that contributed to underenumeration (the Ethnographic Evaluation of the Behavioral Causes of Undercount; de la Puente 1993a, 1993b). Although passive or active resistance to addressing government and concerns about confidentiality contributed to underenumeration of Hispanic respondents, the ethnographers were not able to assess the relative ef-

fects of confidentiality concerns compared with other contributing factors, such as complex or irregular households and literacy or language barriers (de la Puente 1993a, 1993b). Nor did these examinations report whether the behaviors influencing underenumeration also influenced the quality of responses.

Cognitive research procedures also were part of this second Census Bureau research effort, which focused on both response rates and the response process. Cognitive interviews are designed to "understand how errors arise during the question-answering process" (Forsyth and Lessler 1991:394) and to "assess respondents' comprehension of the terms used, their ability to retrieve the information requested, and the processes they use in doing so" (Hess and Singer 1995:1075). Such studies found that the considerable disparity between census and individuals' taxonomies decreased response rates and increased respondent errors (Bates et al. 1994). This incongruence led to item nonresponse, misreporting, and attempts by participants to report their own view, for which the questionnaire made no provision. Results of cognitive interviews conducted in the National Content Survey and the Race and Ethnic Targeted Test led Gerber and de la Puente (1996) to underscore the complexity of developing questions about race and ethnic origin because of the highly and unsystematically varied interpretations of participants. These researchers were among the first to suggest a "choose-all-that-apply" category for 2000.

In similar examination of residence in the Living Situation Survey (Schwede 1993), researchers used cognitive interview procedures to explore the semantic meanings and understandings that participants attached to the concepts of *usual residence*, *household member*, *live*, and *stay*. Schwede hypothesized that understanding the subjective definitions of these terms and concepts among different cultural groups might lead to questionnaire designs that would draw broader response and reduce the differential undercount. Findings from the Cognitive Study of Residence Rules and Living Situation Survey reinforced Schwede's expectations (Gerber 1993; Gerber and Bates 1994): When participants experienced more consistency and congruence, task compliance increased. Unfortunately, these studies did not examine attitudes and respondent errors that might result from experiences of incongruence.

In sum, these research efforts addressed many interpretive implications of the census methodology: how individuals react to the census task and how they construct, interpret, and process their responses to specific questions. Despite the suggestion in many of the studies that issues beyond the visual and verbal significantly influenced response behaviors, improvements for the questionnaire in 2000 center mostly on graphic and linguistic changes that are expected to improve rates of response, thus improving overall census quality. In contrast, Groves, Cialdini, and Couper (1992) cautioned that principles of compliance, such as reciprocity and authority, may be as pertinent as social exchange principles to error-making among respondents. Related studies found complex and varied effects on response rates and item

nonresponse from experimental combinations of mandatory messages and assurances of confidentiality (Dillman et al. 1996), simplified forms together with requests for social security numbers (Tortora, Miskura, and Dillman 1993), and formats in which the respondent could remain anonymous (DeMaio and Bates 1992; Kearney et al. 1993). Although these tests were conducted in noncensus years, lessening their generalizability for the census, they suggest that respondents' attitudes may influence the census task.

We pursue some of these linguistic issues as well as another potential source of census error: the influence of civic attitudes, knowledge, and commitment. We ask three related questions: (1) How do individuals react to the civic task of completing the census?; (2) How do these reactions influence their responses to individual questions?; and (3) What magnitude and patterns of error-making are associated with these reactions?

## FRAMEWORK

We conceptualize the census task within sociological theory about citizenship, which encompasses the reciprocal relationship of rights and duties between governments and the populace, broadly termed the *citizenry*. In the paradigmatic theoretical work by British sociologist T.H. Marshall (1964), citizenship was formulated primarily as a status that results from maximal attention to citizens' rights. Persistent social, economic, and political inequalities and increasing social and political alienation in many Western countries, the United States in particular, have led scholars in the United States and Great Britain to develop theory that conceptualizes citizenship more as a practice or activity than simply a status (Oldfield 1990; Turner 1990, 1993). In these more recent works, social citizenship is an important theme in studies of the political-legal community (Roche 1992), appropriate to frame our study of the inclusive civic task of the census.

Modern theorists emphasize, first, that individuals must be "educated into the duties of citizenship" (Oldfield 1990:185). Enactment of these duties is predicated upon the ability "to read and write, to have basic literacy" (Janowitz 1991:207). However, the educational competence of residents of low-income communities, in particular, is believed to be a barrier to citizen responsibility (Danziger, Sandefur, and Weinberg 1994; Wilson 1996). Accordingly, we consider whether and how the quality of census data is affected by the reading and general literacy competence of our census respondents from poor, inner-city communities.

Second, theorists specify the need for institutional provision of the rudiments of civic education: education about national political traditions, the organization of governmental institutions, and the relationship of the populace to these institutions (Janowitz 1991:209). Over the past 30 years, however, the content of civic education has been under attack as ethnocentric and culturally insensitive, courses in civics have all but disappeared from most U.S. high schools, and the overall political knowledge of the few teachers who continue to teach civics is believed to have lessened (Janowitz 1991). We examine how civic knowledge affects the

quality of census data through our respondents' interpretations of the purpose and meaning of the census.

Third, modern theorists view citizenship as an activity that is "underpinned by an attitude of mind" (Oldfield 1990:181), a position that results in a view of people (the citizenry) as agents who make choices about actions. These scholars also note, however, that continuing stratification in the United States is characterized by overt and covert political, civic, and social exclusion (Conway 1991), which results in perceived (and, in many cases, real) second-class citizenry status, a state that frequently is associated with demoralization about, and disengagement from, community participation (Roche 1992). Such negativity is exacerbated when some citizens perceive that their duties are greater than their rights. We examine how such civic attitudes affect the quality of census data through our respondents' commitment to this government-sponsored task and through their sense of connection to government.

## METHODS OF STUDY

### Recruitment of Participants

We drew our sample from a pool of 400 families that participated previously in a study of family life in inner-city Philadelphia (Furstenberg et al. 1999). The 75 participants were originally part of a randomly drawn household sample from five low-income census districts. Consistent with our heuristic orientation, only participants who completed the census form were eligible informants in this study. To avoid "creaming" our pool, we assigned priority to recruiting participants who had less than a high school education and were on public assistance. We located and completed interviews with 22 of the 54 individuals in this target group. The remaining 53 respondents were screened from the subsample of respondents who completed high school and/or were employed. Even so, most of these informants were poor, or near-poor, and working class. The interviews were conducted in spring and early summer of 1991.

The composition of the sample closely approximated the demographic characteristics of our informants' neighborhoods. Two thirds were African American, a small proportion were Hispanic, and most of the remainder were European-American Caucasians. About half had less than a high school education, two fifths graduated from high school or received a GED, and the rest had some college. Only two were college graduates. Thus, we surmise that the participants represented individuals who might have encountered some difficulties in completing the census form.

Even so, the participants were likely to overrepresent the more functionally literate residents of the sample neighborhoods, if only because they completed a census form in 1990. Moreover, the participants in this study, having agreed to participate in two studies in addition to completing the census, surely were more motivated individuals than might be expected in the population at large. Nevertheless, this sample offered us an opportunity to study civic participation among a population that historically has been undercounted by the

census procedure and underrepresented in research among census respondents.

Our participants completed a census form that was identical to the one they received in the mail in 1990. When participants were unsure about their original form, we assigned them the long form. The Census Bureau provided us with blank forms with the reference to government sponsorship deleted. In total, 43 respondents completed the short form and 21 completed the long form, as they did in the 1990 census, and 11 who completed the short form in 1990 agreed to fill out the long form for our study. Because the short form is embedded in the long form, we obtained 75 short forms and 32 long forms.

### Study Procedure

Our cognitive procedures were similar to those used in the census research discussed previously (DeMaio and Rothgeb 1996; Gerber and Wellens 1995; McKay and de la Puente 1995). One drawback of cognitive procedures is they generally are conducted on small purposive samples without control groups; thus generalizability of results is limited (Clogg 1992; Dippo and Norwood 1992; Hess and Singer 1995). Martin and Polivka (1995) caution that some cognitive techniques, such as hypothetical vignettes and direct probes, need further development and exploration before their usefulness can be judged. Nevertheless, when multiple cognitive interviews are conducted and compared, and when multiple procedures are used within a study such as ours, confidence in findings about participants' response processes may be strengthened (Fowler 1992; Martin and Polivka 1995; Schwarz 1997).

We conducted the research in the respondents' homes. We instructed respondents to use the same response strategies that they used in 1990, but to use current information for the questions. Because the interviews took place approximately one year after the 1990 census was conducted, and we did not have access to their original forms for comparison, we considered current information preferable in examining the quality of the responses. Participants could ask for help from other household members, but the field-worker did not provide assistance or answer questions on how to complete the form.

Field-workers used the concurrent think-aloud technique to gather information about how participants comprehended, perceived, strategized about, and emotionally responded to questions (Forsyth and Lessler 1991; Wolfgang, Lewis, and Vacca 1994). Although this procedure is cumbersome (Davis and DeMaio 1993), it exposes how individuals manage tasks like the census form and how they interpret questions in relation to their life histories and attitudes (Groves 1996; Schwarz 1997; Sudman, Bradburn, and Schwarz 1996). Supplemental probing questions revealed how the respondents experienced aspects of the task as they performed it. Both procedures particularly illuminate "don't know" responses and omissions (Drew and Betz 1995).

After respondents completed the form, we asked them to discuss their general feelings about completing the census

and any observations or experiences they wanted to share. These debriefing conversations were standardized only insofar as each interviewer began by asking how the respondent felt about completing the census and finished with the open-ended recall question. At the end of the interview, we administered the Botel Reading Milestones Test (Botel et al. 1989) because it is considered a good quantitative supplement to observations of individual reading.

All field visits were audiotaped. The completed forms, the transcripts, the observations of the field-workers, and the reading tests provided a rich set of data about the process of completing the census form. This data set yielded a question-by-question description of errors, difficulties encountered while completing the form, and the respondents' interpretive rationale. This report draws on both the coded and observational data. Although the findings of this study may not be generalized to the population at large or to every type of task pertaining to citizen participation, our results are sufficiently provocative to warrant a broader investigation of these topics.

## FINDINGS

### Respondent Errors

Initial comparisons between the 43 independent short forms and the 32 short forms that were embedded in the long form yielded no significant differences in types and proportions of error. Thus, the tables and findings in this report are based on data merged from the independent and embedded short forms ( $n = 75$ ). Findings about the magnitude and types of errors from the long forms ( $n = 32$ ) are based on the form as a whole, which also includes the short-form portion.

According to our coding, a respondent could have made more than one error on a given question if, for example, he or she failed to fill in an answer in the appropriate place (e.g., skipped a machine readable circle) and supplied an incorrect response. Consequently, there were many more opportunities for error than questions on the form. However, we counted errors of a specified type (e.g. skip, failed to fill in a circle, or a wrong response) only once per question, even if the same error was repeated again for another household member, to produce comparable error rates for households of different sizes.<sup>1</sup>

Tables 1a and 1b show that only 3 of the 75 census forms were without error. Slightly over 6 out of 24 possible errors were made on the average short form, and 31.7 out of 107 possible errors were made on the average long form. Thus, between one quarter and one third of the census questionnaire content had errors in response. The proportion of errors did not differ significantly according to the type of form.

1. The census asks each question once for each member of the household. We chose to count such a problem as only one error for two reasons. First, committing the same type of response error for several household members represents only one difficulty with the question. Second, because of complex skip patterns in the long form, counting every error makes a comparison of cases impossible.

**TABLE 1A. DISTRIBUTION OF THE TOTAL NUMBER OF ERRORS PER SHORT FORM**

Total Number of Errors	Frequency of Respondents	Percentage
0	3	4.0
1	4	5.3
2	10	13.3
3	7	9.3
4	5	6.7
5	12	16.0
6–10	20	26.7
11–15	8	10.7
16–20	5	6.7
21–24	1	1.3
Total	75	100.0

Notes:  $n = 75$  for the independent and the embedded short forms combined. There were 24 potential errors per form. The mean number of errors per form was 6.7 ( $sd = 5.2$ ).

Tables 2a and 2b show the distribution of three major types of errors and the average number per respondent. Although we present the tables separately in order to give detailed information about error-making, the types of errors did not differ significantly by type of form.

First, *form errors* were errors that we could detect simply by looking at the form: omissions, failing to skip when directed to do so, and putting correct answers in the wrong place. Form errors composed just over two thirds of the errors. Second, *wrong answers* were coded if the answer provided did not answer the question, as when the respondent wrote the occupation of the person for the question “for whom did this person work?”; if respondents said one thing and wrote another; or if the field-worker observed physical evidence that contradicted the accuracy of an answer (e.g., respondents answered “yes” to the question “is this house on ten or more acres?” when the house was a row with no yard). Wrong answers composed 12% to 15% of the errors. Third, *problematic answers* were responses that either were difficult for us to interpret or would be difficult for the Census Bureau to interpret. Typical problematic answers included supplying two answers; crossing one answer out and providing another—a technique employed by respondents using nonerasable pens; and providing partial answers, nonsensical answers (e.g., \$7:00.00 for income), illegible answers, and unlikely answers. Problematic answers composed 17% to 20% of the errors.

Although the electronic scanning procedure used in 1990 to process data could detect some of these errors, there was no simple procedure, short of the laborious process we conducted, to understand or correct most of them. Moreover, plans for data capture in 2000 stress increased use of optical technology and less paper handling (U.S. Census Bureau 1997a:45). Although the new technology will include “intelligent character recognition” of write-in responses (Holmes

**TABLE 1B. DISTRIBUTION OF THE TOTAL NUMBER OF ERRORS PER LONG FORM<sup>a</sup>**

Total Number of Errors	Frequency of Respondents	Percentage
6–10	5	15.6
11–20	5	15.6
21–30	9	28.0
31–40	5	15.6
41–50	2	6.3
51–60	2	6.3
61–70	1	3.1
71–80	2	6.3
81–90	1	3.1
91–107	0	0
Total	32	99.9 <sup>b</sup>

Notes: There were 107 potential errors per form. The mean number of errors per form was 31.7 ( $sd = 21.1$ ).

<sup>a</sup>Includes short- and long-form sections ( $n = 32$ ).

<sup>b</sup>Column does not sum to 100.0 because of rounding.

1998), our central concern is that the largest number of errors were generated by omission or skipping, the intentional or unintentional failure to answer a question. The Census Bureau still relies on the statistical principle of homogeneity to impute or assign values when data are missing or inconsistent (U.S. Census Bureau 1997b), based on the assumption that missing data occur randomly across the population. Our findings concur with other research suggesting that such imputation is erroneously simplistic (Gerber and de la Puente 1996); missing responses are *not* random. Further, imputation differentially disadvantages vulnerable subpopulations such as the one we study (Yamamoto and Kirsch 1995).

Failure to answer accounted for 30% to 40% of the errors. Most often when the respondents did not know the answer, did not want to give the answer, or were confused by the question, they skipped it. These omissions, especially on the long form, produced a great deal of incomplete and often invalid information. The problematic layout and design of the 1990 census, known to have contributed to low response rates, undoubtedly contributed to such omissions (Fay, Bates, and Moore 1991). Design and literacy aspects notwithstanding, omission was self-reported regularly by respondents in conjunction with the interpretive issues.

Of additional concern, one third of the errors were clearly wrong or problematic. Because even we were not able to identify all wrong answers, the numbers in Tables 2a and 2b represent underestimates. It is likely that many of the problematic responses resulted in inaccurate information as well. These findings are especially disturbing because Census Bureau technologies cannot detect wrong answers that are entered correctly on the form. For example, optical methods would not detect wrong answers to the questions regarding income, a particularly vital aspect of quality for users of census data.

TABLE 2A. DISTRIBUTION OF TYPES OF ERROR: SHORT FORM

Description	Total Number Occurring	Percentage of Total Errors	Mean Number per Respondent	Standard Deviation
Form Errors	341	68.1	4.6	3.7
Skip/Do not answer/Omission	157	31.3	2.1	2.6
Do not correctly fill in machine-readable circles	42	8.4	0.6	0.7
Fail to fill in machine-readable circles	42	8.4	0.6	0.8
Fail to skip	49	9.8	0.7	0.8
Write correct answer in wrong place	32	6.4	0.4	0.7
Use short cut	2	0.4	0.0	0.2
Mix up person order from one section to another	6	1.2	0.1	0.3
Wrong Answers	73	14.6	1.0	1.5
Answer is wrong	59	11.8	0.8	1.5
Answer inconsistent with previous answer	12	2.4	0.2	0.4
Problematic Answers	87	17.4	1.2	1.4
Gives two answers	22	4.4	0.3	0.5
Cross out one answer, write in another	18	3.6	0.2	0.5
Answer only part of question	16	3.2	0.2	0.4
Answer does not make sense	1	0.2	0.1	0.1
Provide additional information not asked for	15	3.0	0.2	0.4
Write answer illegibly	1	0.2	0.0	0.1
Because of previous skipped question, correctness of response is indeterminate	8	1.6	0.1	0.7
Answer seems unlikely	4	0.8	0.1	0.2
Total	501	100.1 <sup>a</sup>	6.7	5.2

Note:  $n = 75$  for the independent and the embedded short forms combined.

<sup>a</sup>Column does not sum to 100.0 because of rounding.

Although our data do not permit us to say unequivocally that specific skills or interpretive issues, or combinations of both, caused specific errors, we describe here the range of error possibilities and highlight the associations that we found. Although literacy skills and interpretive issues often are interrelated, we found that each also exerted independent influence. We separate them in our discussion of the results to provide a more layered sociological analysis of census task management.

### Literacy Skills and Error-Making

Functional illiteracy rates are estimated to run as high as 40% in some U.S. cities (Mullis et al. 1991); yet surprisingly little information exists about how reading skills affect management of the census task, and even less is known about their impact on the quality of the data. Most 1990 reassessments examined how literacy was associated with the undercount (Martin and de la Puente 1993) or with the differential undercount (de la Puente 1992). Notable exceptions were recent studies of literacy among specific groups. In a study among homeless persons, Gerber and Wellens (1995) suggested that literacy skills be examined further in the context of questionnaire reading, and Bates et al. (1994) identified problems in response quality among Hispanic residents resulting from the English-to-Spanish translation of the 1990

form. Although a complete discussion of the literature that compares self-administered with interview questionnaires is beyond the scope of this report, some work suggests that reading skills influence measurement issues more in mail surveys than in interview surveys (Dillman 1991).

**Reading skills.** Between one half and three quarters of our respondents exhibited one or more instances in which reading skills created a problem in responding to a question on the form. These observations underestimate reading difficulties that were not obvious as respondents completed the questionnaire. The most basic reading difficulty was a simple decoding problem: The respondent simply was not able to say or pronounce a word in the instructions, a question or multiple-choice answer. One respondent skipped a question because she could not decode the word "ancestry." Another simple problem was with vocabulary: A respondent may have been able to pronounce a word, but did not know its meaning. Many were unsure about the difference between manufacturing, wholesale trade, and retail trade, or the difference between private-not-for-profit, local government, state government, and federal government. In other cases, respondents skipped a question because they misinterpreted the instructions, sometimes caused by an incomplete or inaccurate reading. A typical example was the respondent who misread the question about specifics of the job location: "At what loca-

TABLE 2B. DISTRIBUTION OF TYPES OF ERROR: LONG FORM

Description	Total Number Occurring	Percentage of Total Errors	Mean Number per Respondent	Standard Deviation
Form Errors	823	68.5	25.7	18.6
Skip/Do not answer/Omission	480	39.9	15.0	14.9
Do not correctly fill in machine-readable circles	18	1.5	0.6	0.8
Fail to fill in machine-readable circles	48	4.0	1.5	2.5
Fail to skip	222	18.5	6.9	6.4
Write correct answer in wrong place	35	2.9	1.1	1.8
Use short cut	2	0.2	0.1	0.3
Mix up person order from one section to another	4	0.3	0.1	0.4
Wrong Answers	142	11.8	4.4	7.4
Answer is wrong	120	10.0	4.6	3.3
Answer inconsistent with previous answer	13	1.1	0.4	0.8
Problematic Answers	236	19.7	7.4	9.4
Gives two answers	13	1.1	0.4	0.7
Cross out one answer, write in another	23	1.9	0.7	1.1
Answer only part of question	19	1.6	0.6	0.8
Answer does not make sense	5	0.4	0.2	0.5
Provide additional information not asked for	39	3.2	1.2	1.9
Write answer illegibly	1	0.1	0.0	0.2
Because of previous skipped question, correctness of response is indeterminate	114	9.5	3.6	8.5
Answer seems unlikely	16	1.3	0.5	0.9
Total	1,201	100.0	37.6	27.8

Note: Includes short- and long-form sections (*n* = 32).

tion did this person work last week? If this person worked at more than one location, print where he or she worked most last week.” The respondent was puzzled and reread the question. Finally she decided she was right to skip it, which resulted in inaccurate information on employment status:

I don’t have to fill that out because she didn’t work more than one place? That’s what the question says. So, do I answer it? It say, if the person worked more than one location, print where he or she worked most last week, so I leave it blank.

A number of respondents linked their problems with the complex task to self-perceived weaknesses in comprehension abilities, as this woman whose reading level tested at grade 11.5 demonstrated:

I’m a good reader but I can read but a lot of times it takes a while for it to get into my mind. A lot of times I have to read something 2 or 3 times to comprehend what I’m reading. I love to read but my mind doesn’t take everything in that I’m reading.

We tested our observations about skill difficulties more formally by examining the association between reading level

(Botel 1989) and number of errors. Reading level accounted for nearly 23% of the variance in error rate on the short form ( $F = 20.84, p < .0001$ ) and 18% of the variance on the long form ( $F = 6.09, p = .02$ ), although the variance did not differ significantly by type of form. Overall, the association between reading and errors is remarkably strong considering that the reading level test topped off at grade 12.7,<sup>2</sup> and thus did not amplify variance at the upper ranges of reading skills.

**General literacy competence.** We also examined whether educational attainment, as an index of general literacy competence, was associated with the number of errors.<sup>3</sup> Respondents with higher schooling might have more experi-

2. The Botel Reading Milestones Test (Form B) yields a functional comprehension score ranging from third grade–seven months to twelfth grade–seven months. Over 40% of the respondents scored at grade level 12 or above on both types of census forms.

3. We used data from another survey to determine educational attainment. A large proportion of the respondents in our study participated in the MacArthur Survey of Parents and Teens, which also was conducted by our research team. We merged the data on educational attainment given by the MacArthur respondents with their data in the census study. For the remaining respondents whose educational information was not covered in the MacArthur study and who filled out the long form, we simply took their response to the question that asks the highest grade of school completed. Using these two methods, we assigned a value for education to 55 of the 75 cases for the short form and to all 32 cases for the long form.

ence in test taking, possess higher academic skills, and have stronger commitment or greater confidence in managing the task apart from their reading skills. In fact, grade level contributed little to explaining the errors once reading level was taken into account. Given the limited number of cases, we were reluctant to reach a definite conclusion, but reading skills were much more essential to successful completion of the census than were years of schooling per se. Although more years of school may lead to greater reading skills, the correlation between reading level and education was quite modest (.30) in our sample. Many participants who completed high school and beyond had low reading skills and hence encountered more difficulty in completing the census. Although the linguistic redesigns for Census 2000 may eliminate some ways that reading skills contribute to error-making, our findings support theory about the relevance of educational preparedness for civic tasks.

Both good and poor readers, however, experienced difficulties with the task unrelated to or beyond the readability of a particular question or the format in general. Three quarters of the variation in errors was *not* accounted for by reading level. For this reason, we examined the role that interpretive issues played in explaining the remaining variation in error-making.

### Interpretative Issues and Error-Making

Of the 75 respondents, 74 initiated or responded with comments about their opinions, attitudes, and feelings toward the census during the interview. We considered these responses *attitudes* and drew on Tourangeau and Rasinski's (1988:299) view of attitudes as "networks of interrelated beliefs [that] encompass memories of specific experiences, general propositions, images and feelings...[that are] important in response to political issues." We coded the attitudes as positive (obligation/duty of citizenship; it's the law; need to be counted; provides information for economic/political allocation) or negative (don't know what it's all about; doesn't make sense; waste of time; doesn't do any good; probably unnecessary duplication of other government material; none of the government's business; government will find out anyway or they already know; inequality between short and long form; I feel used/exploited). Interrater reliability of the coded interview material was .94 for category and .98 for content.

Of the 75 respondents, 68 expressed at least one of the positive attitudes and 52 expressed one of the negative attitudes (Table 3). Three quarters of the respondents gave multiple responses within the positive and negative categories: In all, 115 positive and 84 negative comments were expressed. Almost two thirds of the respondents expressed *both* positive and negative attitudes. Negative comments, however, regularly accompanied questions about race and ethnicity, marital status, number of children, details about house value, rent or utility costs, job details, and income.

Global positive and negative attitudes about the census were not significantly associated with type of form. Correlations between individual attitudinal comments and the three types of errors (form, wrong answers, problematic an-

**TABLE 3. DISTRIBUTION OF POSITIVE AND NEGATIVE ATTITUDES AMONG RESPONDENTS ( $n = 75$ )**

Attitudes	Number of Respondents	Percentage of Respondents
Positive Attitudes	68	91
Obligation/Duty of citizenship;		
It's the law; Need to be counted	49	
Information for economic allocation	28	
Information for political allocation	8	
Other (Like forms; Fun)	4	
Negative Attitudes	52	69
Don't know what it's all about;		
Doesn't make sense	21	
Waste of time; Doesn't do any good;		
Unnecessary duplication of		
other government material	15	
None of government's business	19	
Government will find out anyway/already		
knows; Used/exploited; Inequality		
between short- and long-form tasks	26	
Both Positive and Negative Attitudes	46	61

swers) for both the independent short forms ( $n = 43$ ) and the long forms with the embedded short forms ( $n = 32$ ) showed only suggestive associations, largely, we think, because of the high proportion of respondents holding both positive and negative attitudes. There were more positive than negative attitudes expressed, but correlations between the negative attitudes and the types of errors were stronger than those between positive attitudes and types of errors, although only one reached statistical significance (discussed later). Negative attitudes were associated particularly strongly with omissions and wrong answers. Supporting the independent contribution of interpretation to error-making, attitudes were *not* correlated with reading or general literacy competence.

In sum, the direction of the correlations together with the content of the respondents' comments suggested that interpretive issues influenced error-making, particularly in the large proportion of omissions and wrong answers, many of which were self-reported as intentional. Thus, we organized the individual positive and negative responses as they pertained to three overarching interpretive domains that are integral to the practice of citizenship and task compliance: perceptions about the purpose and meaning of the census, commitment to the census task, and sense of connection to government. We discuss the content and range of the associations between interpretation and errors that we found from the interview material.

**Perceptions of purpose and meaning.** Of the 75 respondents, 43 indicated at least general civic knowledge through beliefs that the purpose of the census is to count the population, allocate funds, and/or direct political representation. Responses that mentioned any one of these pur-

poses was considered a positive perception of the purpose and meaning of the census. Although some might conceptualize *civic knowledge* and *level of detail* as part of functional literacy, we view it as knowledge that forms an interpretive base for decisions about personal action. In related survey research (Chong 1993), less education and knowledge about a political subject is associated with surface and vacillating responses.

The level of attention to the task varied in relation to the level of detail known about the census purpose. Where more than one purpose of the census was mentioned, the respondent was more likely to try to answer the question than to skip it. Although such attention to the task did not eliminate all mistakes, it lessened omissions, supporting the theoretical premise that civic knowledge is relevant to the successful practice of citizenship. The following level of detail about the purpose and meaning of the census was demonstrated by only a few respondents:

I know the importance of filling out your census and sending it back because it definitely does help this state of Pennsylvania. And once they have a head count of how many people there is...The government will be able to allocate enough funds to Harrisburg or whatever. That our government will be able to finance the different states, different cities within the state; that's what census means to me. How's the police going to be funded, the ambulance and so forth...You can't sleep too well at nights if you know that the fire station which would be in your neighborhood is now broke down because last year they had a million and a half people living in the state of Pennsylvania, now they have a half a million... Naturally more funds is going to go to them, when actually we're increased a half a million if those people did not fill out the census. So there's no way that they could know. So we can assist them. When I see census I said....It has to be done.

Most commonly, respondents believed that the sole purpose of the census was to count the population. In many cases, categories other than those perceived to be relevant for counting were filled out perfunctorily, estimated, generalized, or intentionally omitted:

I think the whole thing makes me mad. Honestly it does. The whole thing makes me mad. [but she filled it out and sent it in?] Yeah, but I say they have to count heads. Like I said, this page here, after I filled out this page I really didn't see no need to fill out the other pages. But I did—*some of it* anyway.

The long form, in particular, elicited considerable uncertainty about the purpose and meaning of the census because of the broader range of questions perceived to be irrelevant to the predominant but narrow view of the census as a head count:

"During the week worked in 1989, how many hours did this person work each week?" Why do they ask a question like this? Why would they want to know how many weeks, how many hours, where did he work, what did he do? Are they going to find him a job? I thought the census was stupid anyhow. Because the census is for how many people have added to the United States.

The responses of 21 of the 75 participants reflected a lack of even such rudimentary civic knowledge with comments such as, "When I first got it I wasn't going to fill it out because I really didn't know what the census was..." and "I don't know...I don't know what they use it for."

**Commitment to the census task.** Positive commitment to the census task was characterized by comments expressed by 13 respondents such as "it's the law," "I just did it," and "I liked doing the forms." Negative commitment to the census task was expressed by 15 respondents through comments such as "it's a waste of time," "it doesn't do any good," and "it's probably an unnecessary duplication of other government material." Responses indicating lack of commitment were mentioned particularly in conjunction with wrong answers, often intentional, and omissions.

Statements about commitment frequently were coupled with the type of form the respondent received. Respondents filling in the short form hypothesized that they would have felt less commitment if they had received the long form:

It's a good thing I didn't get a long form. That's all I got to say at this point. They wouldn't get any good answers from me. How much truth do they expect to get on a long form? Do they have a percentage they're shooting for?

The long form strained the commitment of even those who had a detailed conception of the purpose and meaning of the census. Similarly, related research found that task compliance was associated negatively with the length of the survey (Groves, Cialdini, and Couper 1992).

Estimations and wrong answers were prevalent errors in cases like the following:

I wonder why they asked so much about income and things like that. Why they didn't ask about educational facilities? Does you child walk to school? Does he need public transportation? And they didn't ask anything about other kinds of things people have problems with such as, I went downtown to pay my water bill. It's the worst experience of my life... They didn't ask you anything about, do you have accessible transportation? Is it easy for you to make payments, paying bills and things? I mean, you have to go to two different buildings. I don't think it [census] paid enough attention to a certain part of the population, primarily the older adult. I mean it's okay for me. I'm 33 years old. I can get up and go,

thank God, but on the same token I could be 33 and confined to a wheelchair. It didn't ask anything about accessibility of the streets. I mean, are your streets wheelchair accessible? I'm not really sure exactly what they wanted to know. They seem like they want to know where I live, how much money I made, how much I pay for utilities, did I drive a car, and then did I move into this county or into this country within the last 5 years and had I been working. And I think that's all they wanted to know. And I figure if they found me to send me a census thing then I'm sure they have it written. I mean my tax forms show that I've been working steadily since I graduated school.

How the participants responded to task frustration was another index of commitment. These responses showed how literacy and interpretive issues sometimes are interrelated. When respondents encountered questions they did not know the answer to or did not understand the meaning of, they exhibited two main strategies: trying and not trying. Trying, which often was associated with the desire to be a responsible citizen, resulted frequently in constructing a rationale for the subsequent answer, which was not always a correct answer:

"Answer if you pay rent for this house. What is the monthly rent?" I don't pay that one. Skip all of that. You want me to cross it out or what? Should you cross the whole thing out? I mean, at least you know that I did something with it, didn't leave off nothing. That would clear it up that you had paid attention to it.

When a respondent tried and failed to construct a rationale for an answer, he or she generally skipped the question:

He just got out of high school, so they asking about wages and he never had or got a check or anything. So none of this would apply to him. But also I was looking for a part to say if it's a child, skip on to the next section, but it don't say that...So I did like I did before, I skipped it.

**Sense of connection to government.** Respondents expressed more negative than positive attitudes about their sense of connection to government. Thirty-one of the 75 participants indicated that they felt connected to government, mainly with responses that completing the census is "an obligation/duty of citizenship" and "it's the right thing to do." In contrast, 45 respondents reflected alienation from government through such comments as "the government will find out anyway or they already know," "I feel used/exploited," and "it's none of the government's business." Global negative attitudes were associated significantly with wrong answers ( $t = 2.30$ ,  $p = .02$ ). This finding, together with the stronger correlations between individual negative responses

and the three types of error discussed previously, suggested that negative feelings about one's connection to government influenced errors more than positive feelings did. Our conclusion is strengthened by Lau's (1985) related findings about negativity effects, or the greater salience of negative information on political behavior.

Respondents' attitudes about connection to the government frequently were accompanied by comments about confidentiality and privacy, which influenced wrong responses and omissions. Focus group participants in other census research expressed similar concerns about privacy and confidentiality, resulting in lessened response quality (Singer and Miller 1993). Many of our respondents assumed that the Census Bureau, the Internal Revenue Service, and various public welfare organizations shared information. This response was typical:

What my house is worth to a lot of people is just a drop in the bucket...it's just a matter of privacy. I let people know what I'm worth, or what my house is worth, or what my things is worth, because I want them to know. [supplied intentional wrong answer to house value] I don't know who else is going to get this information. I know they say it's confidential... people pay for the right to get information all the time. To my way of thinking, if it's on somebody's computer chip or disk, anybody can have access to it.

Fear of government reprisal or belief that the information might be used for social control was a frequently expressed negative view:

It seem like why am I asking this question right here, because it's none of their business [income question]. Cause you never know if the IRS is going to get in there and start looking around and figuring out something. I filled it out anyway. [honestly?] Yeah, *most of the time*.

Another prevalent belief was that the census serves government more than people. Lack of faith in the census process was accompanied by additional distancing from the government that supposedly serves him or her, as compliance principles predict:

If they get money for things like that [neighborhood budgets or funding] we haven't seen things around this neighborhood for years. I mean we have to get out and clean our own streets every couple of weeks or every month or so. The trash guys...you put your trash out there and if something's a little too heavy, they won't take it. If you get more money, we're not seeing it. I don't know who's seeing it, but we're not. Years ago, they used to come around and sweep the streets. When's the last time you saw a guy pushing a broom around outside on the street? Unless it's the neighborhood people getting out there and do-

ing it. I mean the water bill just went up 33%. What happened to all that money? That's a big increase. You don't mind paying more money, but you want to see some of it. We're not seeing anything.

In a few cases of extreme alienation, disbelief in the importance of the census led to deliberate wrong answers "for fun":

I think the mobile home or trailer home was first [lives in row house]...owned [was rented]...Well, we put it up for 50,000, just for the hell of it. For one thing, we feel like it doesn't change anything, whether you're counted or not, it doesn't matter. I think it was just having fun. Maybe you feel like once it gets there someone will throw it away, it won't even be counted.

Well, in this here part we put "now married," but as you can see that is not true. We put husband and wife, for fun, nothing else to do.

On the other hand, respondents' views of themselves as civically responsible were associated with greater attention to the demands of the task, repeated attempts to answer correctly, and self-descriptions as people who try to "do the right thing," again showing the intersection between literacy and interpretation. Although this attitude was not necessarily correlated with lack of mistakes, omissions or estimations were at least unintentional and less frequent:

I just always go back and make sure I did the right thing, and I know I did the right thing. I knew I wanted to be counted. If I didn't think it was important, I wouldn't fill them out at all.

## CONCLUSIONS

We examined how low-income, ethnically diverse inner-city residents conceptualized and managed the task of completing the 1990 decennial census. Between one quarter and one third of the questionnaire content consisted of errors in response. Findings from both the statistical and qualitative analyses suggest that literacy skills and interpretive issues—singly and together—were associated with errors in census information that are undetectable by evaluative methodologies used regularly by the Census Bureau. These findings must be considered a conservative estimate of literacy skills and political sentiments, as the participants were selected only from among those who reported returning the census form.

Literacy skills were associated with both detectable and hard-to-detect errors on census forms. Simple readability formulas cannot uncover the range of difficulties that respondents experience. Writing "down" to a respondent does not necessarily alleviate the difficulties of the task. Second, whether high school graduates or not, only a few respondents demonstrated knowledge about the purpose and meaning of

the census that indicated attainment of the rudiments of civic education. Although nearly half the respondents attributed their census participation to generalized civic responsibility, few articulated concrete social, political, or economic reasons for such participation. Error susceptibility was associated with limitations in both reading and civic knowledge. Literacy competence alone contributed but was not sufficient to fulfill civic duties. Thus, as citizenship theory posits, continued broad-based attention both to literacy skills and to the resumption or increase in civic content in secondary school curricula is necessary for the successful practice of a civic task such as the census.

More important, although such literacy and educational issues were associated with a significant proportion of errors in census responses, interpretive elements may be associated with an even greater proportion. Over half the respondents expressed *both* positive and negative attitudes about the census. Because the selection criteria biased the responses in favor of expressions of civic responsibility, the levels of alienation may be even higher in the general population of the hard-to-count than in our sample, suggesting overall data quality that is substantively compromised. We buttress this conclusion with our finding that a substantial proportion of respondents were either uncommitted to the census task or felt politically disenfranchised and disaffected. These respondents linked their alienation directly to the belief that they are excluded from political and economic processes that benefit other citizens more. In our study, these perceptions of alienation and inequality strongly influenced the process and content of the census responses, in concert with the theoretical predictions. Although the marketing and design efforts for Census 2000 are intended to invite greater and higher quality responses, our participants' comments suggest that these efforts will be insufficient to assuage their deep concerns about stratification and inequality.

The U.S. decennial census is an obvious case of a functional task that engages residents in the practice of a civic responsibility for which more awareness of the interplay between citizens' literacy skills and interpretive realities will yield more valid and reliable data. Although Census 2000 will have shorter forms and fewer questions (U.S. Census Bureau 1998), the long form will ask detailed questions about daily life (Stout 1997) that are particularly vulnerable to error-making through respondent interpretation. The forms will be time-consuming as well, despite efforts to simplify them. The Census Bureau estimates that the time to complete the short and long forms will be 10 and 38 minutes, respectively (Census 2000 Bulletin, 1997). Because the bureau did not provide information about the types of respondents that were the basis for these time estimates, we surmise that many people will need more time for the task, potentially heightening feelings of imposition and disaffection.

As our data and earlier research indicate, unless the purpose of research makes sense to participants, the quality of the data will suffer (Roth 1966). Although survey designers cannot always influence the motivation of respondents, they might derive better results by attending more to civic

knowledge and attitudes. Because a growing portion of social science research relies on self-administered, mail-back questionnaires, information about the management of the census might have implications about the quality of other self-report data. A similar directive also may apply to designers and users of standardized tests if they are viewed as a form of self-administered survey. The same conclusions may even pertain to other cases of the gathering of public data, such as tax forms, voter registration and ballots, school registration forms, and public assistance applications. Until the interpretative factors and literacy skills examined here are addressed fully, social scientists and others who draw conclusions from census and other public data to inform policy are advised to increase their caution about the quality of these data.

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