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Laboratory and Field Response Research Studies for the 1980 Census of Population in the United States

Naomi D. Rothwell[1]

Abstract: The paper describes a program of laboratory experiments and systematic observations of people as they tried to fill census forms. The objective of the laboratory studies was to obtain information to be used in field studies to improve the design and wording of the United States Census questionnaires. One such field study, an experiment conducted in the context of the 1980 Census is also described.

The paper then describes three kinds of field studies conducted for the Census Bureau's Public Information Office and it explains the synergistic effect of having the otherwise dissimilar studies with what were initially different objectives conducted by the same staff.

Key words: Applied behavior analysis; columnar form; linear form; laboratory experiment; laboratory or systematic observation.

1. A Note

The "I" in this paper is its author who headed a staff in the Statistical Research Division of the U.S. Bureau of the Census during the 1970s. At the end of the decade the staff became a separate center now known as the Center for Survey Methods Research. The "we" are colleagues or staff members, only some of whose names are cited in the reference list. I am indebted to and grateful for the work of both named and unnamed colleagues and to Tom Jabine and Harold Nisselson for their leadership and encouragement during the 1970s and to Leon Pritzker for his training and support during the 1960s.

Partners in the conduct of the laboratory tests were Jerry S. Cooper at the start of the decade and Samuel Johnson at its end. They headed the Community Services Staff in the Field Division. Albert Cosner's staff in the Administrative Services Division translated their own and my ideas about questionnaire design into reality.

2. History and Background about Census Data Collection

Until 1950 the forms used to collect information for censuses in the United States were documents with column headings which labeled the items of required information. (See Fig. 1.) Enumerators[2] were expected to

[1] Consultant, Washington D.C., U.S.A.

[2] The terms "enumerator" and "self-enumeration" are used by the United States Bureau of the Census instead of "interviewer" and "self-administration" to describe data collection for censuses rather than surveys.

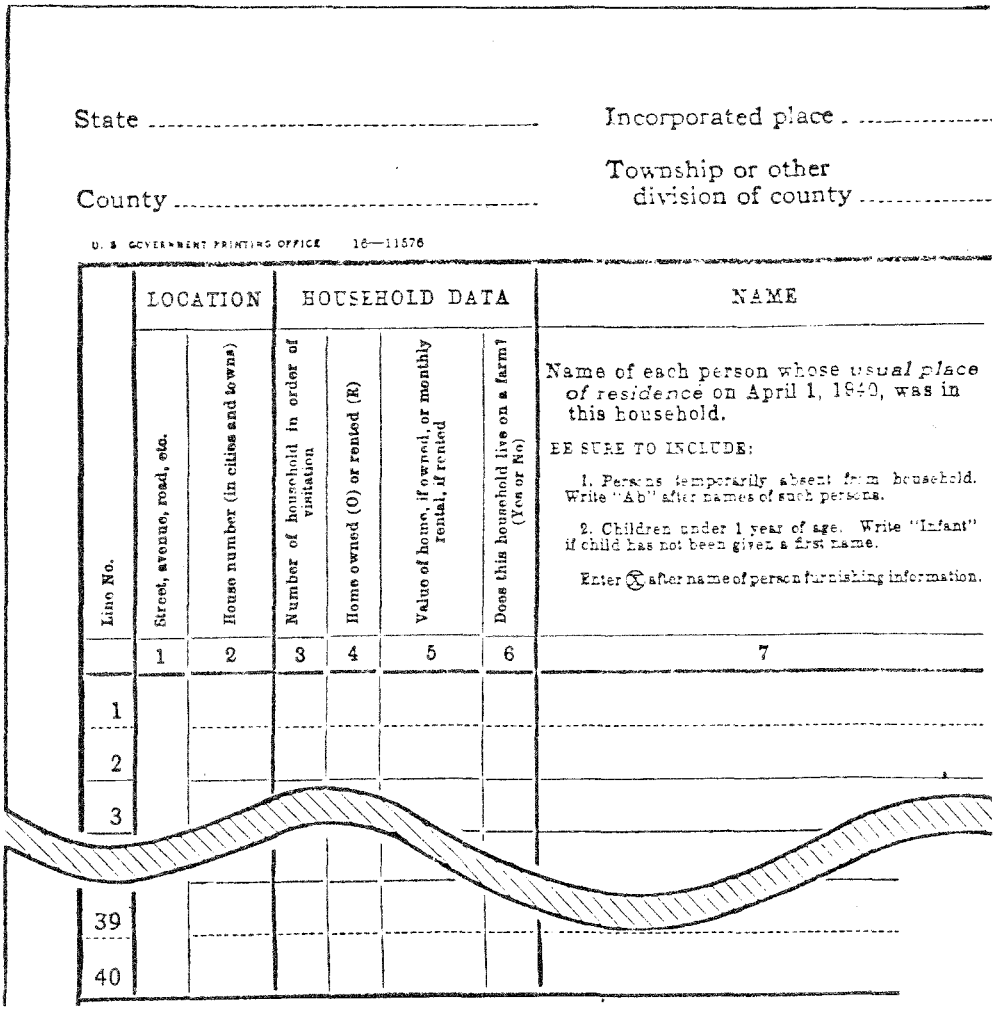
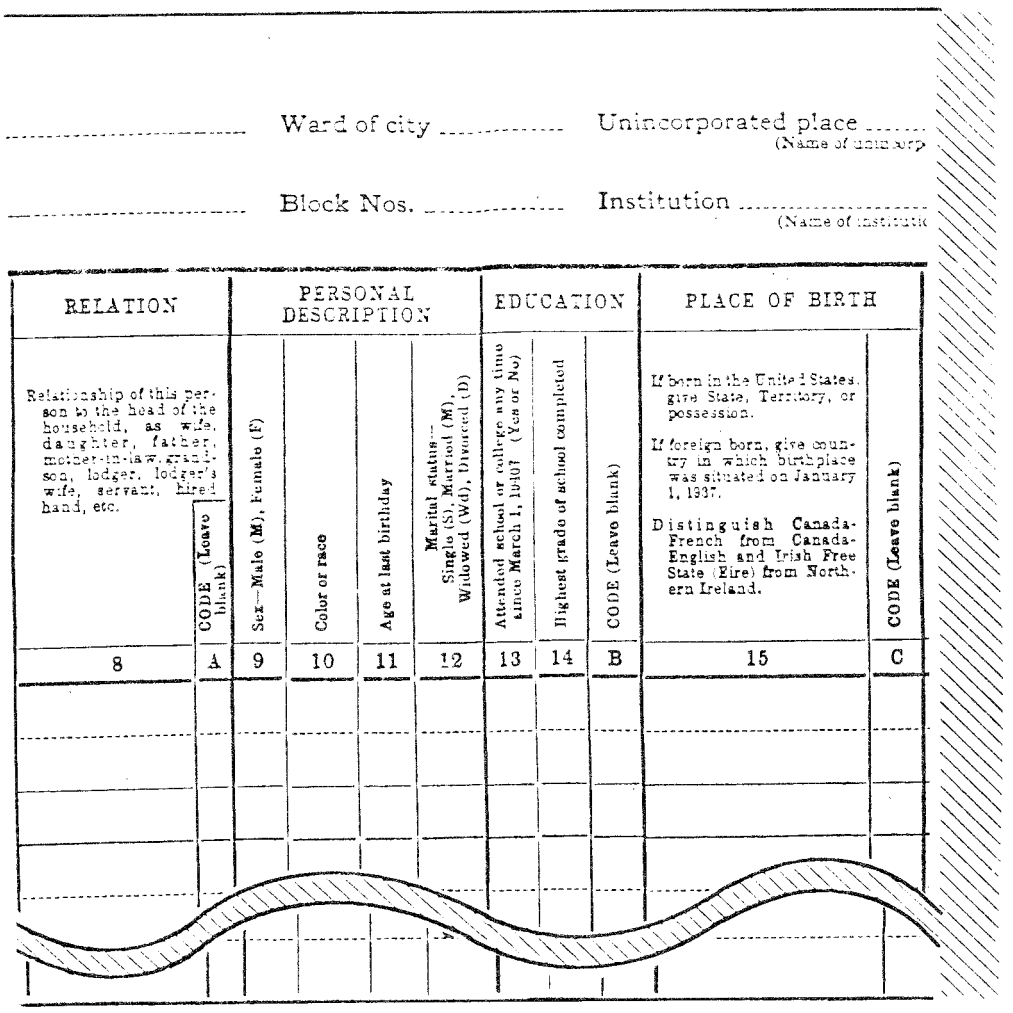

State .....
Incorporated place .....
County .....
Township or other division of county .....
U. S. GOVERNMENT PRINTING OFFICE 16—11576
LOCATION
HOUSEHOLD DATA
NAME
Line No.
Street, avenue, road, etc.
House number (in cities and towns)
Number of household in order of visitation
Home owned (O) or rented (R)
Value of home, if owned, or monthly rental, if rented
Does this household live on a farm? (Yes or No)
Name of each person whose usual place of residence on April 1, 1940, was in this household.
BE SURE TO INCLUDE:
1. Persons temporarily absent from household. Write "Ab" after names of such persons.
2. Children under 1 year of age. Write "Infant" if child has not been given a first name.
Enter ⊗ after name of person furnishing information.
1 2 3 4 5 6 7
1
2
3
39
40

Fig. 1. Reproduction of a portion of the 1940 DECENNIAL CENSUS form showing how headings labeled the items of required information for enumerators to translate into questions.

translate those headings into questions for respondents. Aware that differences among questions which enumerators frame can contribute to errors in census statistics, planners of the 1950 Census designed standard questions for it. They also provided standardized enumerator training to achieve more nearly uniform understanding of the census items.

Subsequent studies showed that, even when trained staff were expected to word questions identically, enumerators' contribution to



..... Ward of city ..... Unincorporated place .....
(Name of unincorp

..... Block Nos. ..... Institution .....
(Name of institutio

RELATION		PERSONAL DESCRIPTION				EDUCATION			PLACE OF BIRTH	
Relationship of this person to the head of the household, as wife, daughter, father, mother-in-law, grandson, lodger, lodger's wife, servant, hired hand, etc.	CODE (Leave blank)	Sex—Male (M), Female (F)	Color or race	Age at last birthday	Marital status—Single (S), Married (M), Widowed (Wd), Divorced (D)	Attended school or college any time since March 1, 1940? (Yes or No)	Highest grade of school completed	CODE (Leave blank)	If born in the United States, give State, Territory, or possession. If foreign born, give country in which birthplace was situated on January 1, 1937. Distinguish Canada-French from Canada-English and Irish Free State (Eire) from Northern Ireland.	CODE (Leave blank)
8	A	9	10	11	12	13	14	B	15	C

measured response variation was large (see Hanson and Marks (1958) and U.S. Bureau of the Census (1979)). That was one, among a number, of reasons[3] for adoption of a proposal to employ mail self-enumeration as the initial and primary method of collecting census statistics in the 1970 Census.

[3] Other reasons were the expectation of more complete coverage by use of the master mailing list than had been achieved by dependence on enumerators following instruction; belief that quality of enumerators work would improve if a smaller and more select staff could be concentrated where the need was greatest, i.e., among those less willing or able to enumerate themselves; and the hope for economies derived from the use of mail in place of door-to-door visits for most of the population.

3. Initial Research Objectives and Plan

While enumerators can be trained to follow instructions about completing a form and can then interpret otherwise perplexing questions for their respondents, self-enumeration requires self-explanatory forms. The initial research described in this paper was designed to learn how to improve self-enumerative forms. It was initiated by Tom Jabine in May 1969 with the objective of developing "useful general principles for the design of self-administered questionnaires and mechanisms for applying these principles systematically in Census Bureau data collection programs." (See Rothwell (1983).)

There had been a few previous studies of self-enumerative questionnaires conducted in the 1950s and '60s but they were limited to field experiments with mailed forms (see Forsythe and Wilhite (1972) and Jabine and Rothwell (1970)). Field tests have some shortcomings. They are expensive, very difficult to control, and their results come slowly. For these reasons it was possible to test very few variants and at least one test failed because of unsuccessful randomization of the variants among respondents. These same reasons may explain inconclusive tests and tests of forms so different from each other that it was impossible to identify which differences in the forms contributed to the test outcome.

Dr. James A. Bayton was one of the people with whom we spoke about alternative ways of studying census self-enumerative questionnaires. Bayton (1958) recommended adoption of methods he had employed in product testing studies for commercial market research. Viewing the questionnaire as the Census Bureau's product, two kinds of laboratory or classroom studies seemed appropriate:

i) Product tests or *experiments* designed to compare selected features of forms which were varied systematically.

ii) Process studies or *observation* of people trying to fill census forms to learn what difficulties and misunderstandings they have.

Tests like these had not previously been tried by the Census Bureau and seemed promising, not as alternatives to field tests, but as preliminary adjuncts to them. We hoped that results from small-scale easily controlled, inexpensive, quick feedback laboratory or classroom tests could serve as the basis for design of field tests of variants among which researchers could observe the kinds of differences which affect the completeness and accuracy of data or the ease of data processing.

The recommended research strategy was to conduct preliminary laboratory tests using variants of census questionnaires and to field test only those variants which were shown to be superior as measured by item response rates, consistency among related items, and opinions of participants.

4. Developments During the Decade of the 1970s

Starting with the two kinds of laboratory studies just mentioned, I will describe a program, some of whose projects or branches grew enough to obscure the trunk from which they began. Conjectures about the reasons for the large branches from the slim trunk are of two kinds. First, laboratory or classroom observation and experimentation with which we started led us to examine the scope and limitations of the methods we were using and to seek answers which the methods weren't fashioned to find. Principally, the questions were about the role of the questionnaire in a census conducted initially by mail; questions like: How many people open the envelope to look at the form? Having opened the envelope, what, other than their ability, determines whether people will read and answer the

questions? What determines whether they will complete the form? Having completed it, is the act of mailing a form a significant barrier to response?

When the issues are put that way, the desired information is perspective about the importance of the questionnaire in the process; that is, to what extent have the forms themselves been limiting factors in obtaining any response? While we expected that the classroom studies would indicate whether changes in the questionnaire would affect completion, quality, and consistency of response, it was clear that these other factors, which could not be studied in the laboratory, were significant determinants of mail-back response.

A second reason why the program developed as it did was because of demand for survey findings about the Census Bureau's greatly expanded public information program at a time when less interest was shown in or use made of classroom findings by the Division responsible for census planning. So we set out to see what could be learned about questionnaires while pursuing other objectives. As a result, four kinds of studies evolved during the 1970s.

In the remainder of this paper I will describe the four kinds of studies in the order in which they were undertaken and try to show how they developed one from another and are interrelated. The sequence has nothing to do with the relative importance or value of any of the studies or with a recommended plan for organizing research. Nor did the four kinds of studies comprise a complete or separate program. They were, however, the most innovative studies involving questionnaire research which we undertook in the 1970s and, therefore, are the focus of the paper. To repeat, they are:

1. The already mentioned laboratory or classroom studies;
2. Knowledge, Attitudes and Practices (KAP) Surveys;
3. Applied Behavior Analysis Surveys (ABAS);
4. An experiment conducted in the context of the 1980 Census.

5. Descriptions of Four Kinds of Studies

5.1. Laboratory studies conducted during the 1970s

5.1.1. How they were planned and conducted

As described in the preceding section, classroom studies were undertaken to provide information for the staff responsible for design of the census questionnaires. Two kinds of questionnaires have been used in the 1970 and 1980 Censuses; namely, a basic or short form and a sample or long form. Because a large majority of households (80 % in 1970 and close to that in 1980) were mailed short census forms (see Fig. 2 for the content and design of the demographic items on the 1970 Census questionnaire), research focused on them. It was not until the end of the decade that experimental forms were designed to test hypotheses about the long or sample form.

Work started with a review of the kind of form, a portion of which is shown in Fig. 2, and with discussions with the Decennial Census Planning Staff (responsible for the operational aspects of the census), and with staffs in the Population and Housing Divisions which are responsible for the content of the census. We learned their plans for data processing and content changes in 1980. On the basis of those discussions and our review of the form, we designed census-like variants having the following features:

i) Instructions printed on the form itself rather than in a separate booklet. (In later tests, instructions were printed on the form and also in a separate booklet.)
ii) Use of red ink to emphasize key words and instructions.
iii) Placement at the top rather than at the bottom of the page of questions asked to

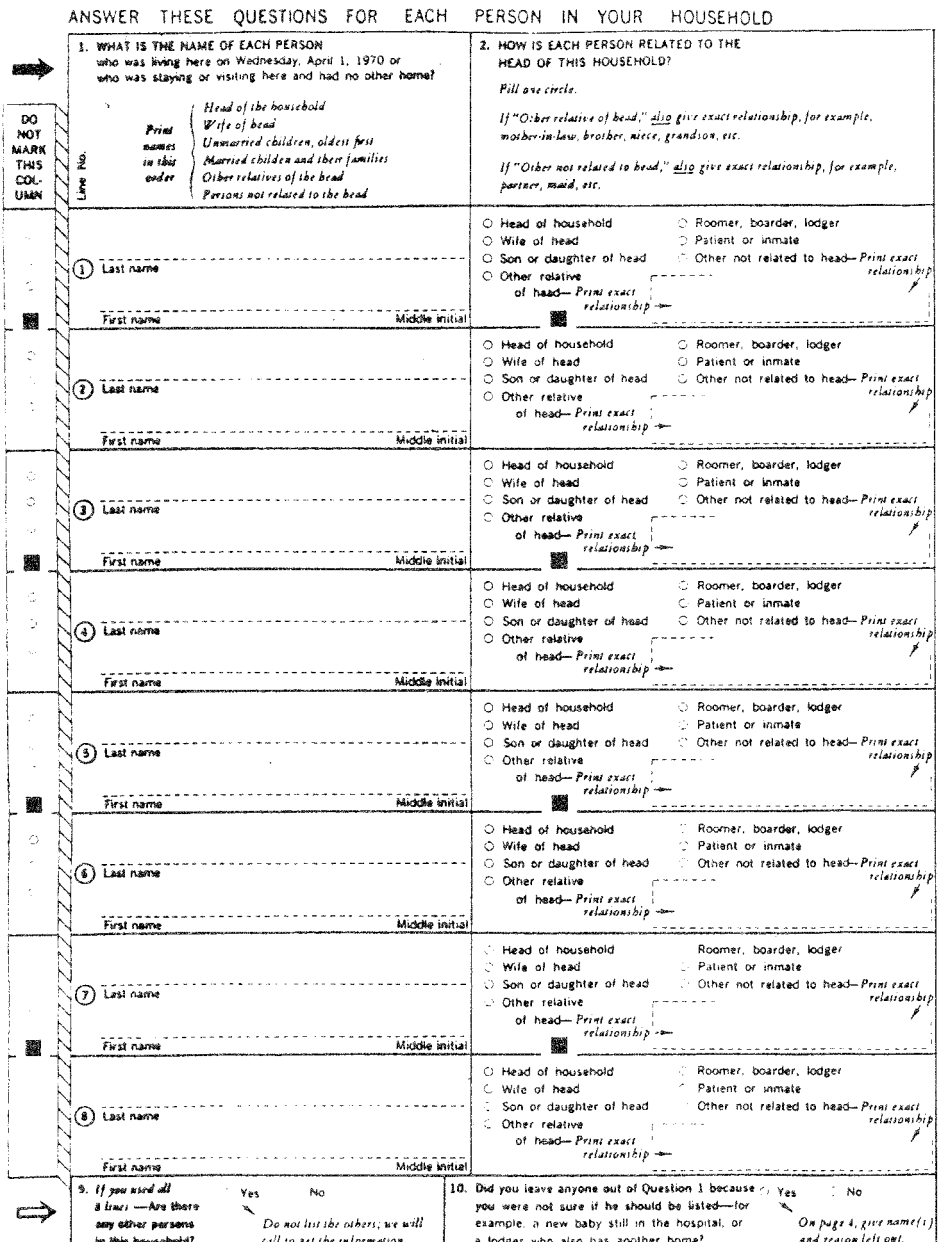


Fig. 2. Reproduction of a portion of the 1970 DECENNIAL CENSUS short form showing the linear format for supplying information about household members. It is a multiple fold form the replies to which are designed to be machine readable.

3. SEX Fill one circle	4. COLOR OR RACE Fill one circle. If "Indian (American)," also give tribe. If "Other," also give race.	DATE OF BIRTH 5. Month and year of birth and age last birthday Print	DATE OF BIRTH 6. Month of birth Fill one circle	DATE OF BIRTH 7. Year of birth Fill one circle for first three numbers	DATE OF BIRTH 7. Year of birth Fill one circle for last number	8. WHAT IS EACH PERSON'S MARITAL STATUS? Fill one circle
Male ○ Female ○	○ White ○ Japanese ○ Hawaiian ○ Chinese ○ Korean ○ Negro or Black ○ Filipino ○ Other– Print race ○ Indian (Amer.) Print tribe →	Month ________ Year ________ Age ________	○ Jan.-Mar. ○ Apr.-June ○ July-Sept. ○ Oct.-Dec.	○ 186- ○ 192- ○ 187- ○ 193- ○ 188- ○ 194- ○ 189- ○ 195- ○ 190- ○ 196- ○ 191- ○ 197-	○ 0 ○ 5 ○ 1 ○ 6 ○ 2 ○ 7 ○ 3 ○ 8 ○ 4 ○ 9	○ Now married ○ Widowed ○ Divorced ○ Separated ○ Never married
Male ○ Female ○	○ White ○ Japanese ○ Hawaiian ○ Chinese ○ Korean ○ Negro or Black ○ Filipino ○ Other– Print race ○ Indian (Amer.) Print tribe →	Month ________ Year ________ Age ________	○ Jan.-Mar. ○ Apr.-June ○ July-Sept. ○ Oct.-Dec.	○ 186- ○ 192- ○ 187- ○ 193- ○ 188- ○ 194- ○ 189- ○ 195- ○ 190- ○ 196- ○ 191- ○ 197-	○ 0 ○ 5 ○ 1 ○ 6 ○ 2 ○ 7 ○ 3 ○ 8 ○ 4 ○ 9	○ Now married ○ Widowed ○ Divorced ○ Separated ○ Never married
Male ○ Female ○	○ White ○ Japanese ○ Hawaiian ○ Chinese ○ Korean ○ Negro or Black ○ Filipino ○ Other– Print race ○ Indian (Amer.) Print tribe →	Month ________ Year ________ Age ________	○ Jan.-Mar. ○ Apr.-June ○ July-Sept. ○ Oct.-Dec.	○ 186- ○ 192- ○ 187- ○ 193- ○ 188- ○ 194- ○ 189- ○ 195- ○ 190- ○ 196- ○ 191- ○ 197-	○ 0 ○ 5 ○ 1 ○ 6 ○ 2 ○ 7 ○ 3 ○ 8 ○ 4 ○ 9	○ Now married ○ Widowed ○ Divorced ○ Separated ○ Never married
Male ○ Female ○	○ White ○ Japanese ○ Hawaiian ○ Chinese ○ Korean ○ Negro or Black ○ Filipino ○ Other– Print race ○ Indian (Amer.) Print tribe →	Month ________ Year ________ Age ________	○ Jan.-Mar. ○ Apr.-June ○ July-Sept. ○ Oct.-Dec.	○ 186- ○ 192- ○ 187- ○ 193- ○ 188- ○ 194- ○ 189- ○ 195- ○ 190- ○ 196- ○ 191- ○ 197-	○ 0 ○ 5 ○ 1 ○ 6 ○ 2 ○ 7 ○ 3 ○ 8 ○ 4 ○ 9	○ Now married ○ Widowed ○ Divorced ○ Separated ○ Never married
Male ○ Female ○	○ White ○ Japanese ○ Hawaiian ○ Chinese ○ Korean ○ Negro or Black ○ Filipino ○ Other– Print race ○ Indian (Amer.) Print tribe →	Month ________ Year ________ Age ________	○ Jan.-Mar. ○ Apr.-June ○ July-Sept. ○ Oct.-Dec.	○ 186- ○ 192- ○ 187- ○ 193- ○ 188- ○ 194- ○ 189- ○ 195- ○ 190- ○ 196- ○ 191- ○ 197-	○ 0 ○ 5 ○ 1 ○ 6 ○ 2 ○ 7 ○ 3 ○ 8 ○ 4 ○ 9	○ Now married ○ Widowed ○ Divorced ○ Separated ○ Never married
Male ○ Female ○	○ White ○ Japanese ○ Hawaiian ○ Chinese ○ Korean ○ Negro or Black ○ Filipino ○ Other– Print race ○ Indian (Amer.) Print tribe →	Month ________ Year ________ Age ________	○ Jan.-Mar. ○ Apr.-June ○ July-Sept. ○ Oct.-Dec.	○ 186- ○ 192- ○ 187- ○ 193- ○ 188- ○ 194- ○ 189- ○ 195- ○ 190- ○ 196- ○ 191- ○ 197-	○ 0 ○ 5 ○ 1 ○ 6 ○ 2 ○ 7 ○ 3 ○ 8 ○ 4 ○ 9	○ Now married ○ Widowed ○ Divorced ○ Separated ○ Never married
Male ○ Female ○	○ White ○ Japanese ○ Hawaiian ○ Chinese ○ Korean ○ Negro or Black ○ Filipino ○ Other– Print race ○ Indian (Amer.) Print tribe →	Month ________ Year ________ Age ________	○ Jan.-Mar. ○ Apr.-June ○ July-Sept. ○ Oct.-Dec.	○ 186- ○ 192- ○ 187- ○ 193- ○ 188- ○ 194- ○ 189- ○ 195- ○ 190- ○ 196- ○ 191- ○ 197-	○ 0 ○ 5 ○ 1 ○ 6 ○ 2 ○ 7 ○ 3 ○ 8 ○ 4 ○ 9	○ Now married ○ Widowed ○ Divorced ○ Separated ○ Never married
Male ○ Female ○	○ White ○ Japanese ○ Hawaiian ○ Chinese ○ Korean ○ Negro or Black ○ Filipino ○ Other– Print race ○ Indian (Amer.) Print tribe →	Month ________ Year ________ Age ________	○ Jan.-Mar. ○ Apr.-June ○ July-Sept. ○ Oct.-Dec.	○ 186- ○ 192- ○ 187- ○ 193- ○ 188- ○ 194- ○ 189- ○ 195- ○ 190- ○ 196- ○ 191- ○ 197-	○ 0 ○ 5 ○ 1 ○ 6 ○ 2 ○ 7 ○ 3 ○ 8 ○ 4 ○ 9	○ Now married ○ Widowed ○ Divorced ○ Separated ○ Never married

11. Did you list anyone in Question 1 who is away from home now— for example, on a vacation or in a hospital? ○ Yes ○ No *On page 4, give name(s) and reason person is away.*	12. Did anyone stay here on Tuesday, March 31, who is not already listed? ○ Yes ○ No *On page 4, give name of each visitor for whom there is no one at his home address to report him to a census taker*

INSTRUCTIONS FOR QUESTIONS 1 THROUGH 9

Answer Questions 1 through 9 about the people in your household. **A household may be:**

(a) One family
(b) A person living alone
(c) Two or more families who live and eat together
(d) Any group of persons, related or unrelated, who share living arrangements

Q.1 – List in Question 1:

- Family members living here, including babies still in the hospital
- Relatives living here
- Lodgers or boarders living here
- Servants or hired hands living here
- Other persons living here
- College students who stay here while attending college, even if their parents live elsewhere
- Persons who usually live here but are temporarily away (including children in boarding school below the college level)
- Persons with a home elsewhere but who stay here most of the week

Do not list in Question 1:

- Any person away from here in the Armed Forces
- Any college student who stays somewhere else while attending college
- Any person who usually stays somewhere else most of the week
- Any person away from here in an institution such as a home for the aged or mental hospital
- Any person staying or visiting here who has a usual home elsewhere

NOTE: If everyone here is staying only temporarily and has a usual home elsewhere, please fill this circle ——→ ○ and give their names on page 4 in the space for Question 9. Do not answer any other questions. Mail back the form on Census Day.

Q.2 – If two or more unrelated people live together and share living costs, mark the first one you list **Head.** Mark the rest **Other nonrelative.**

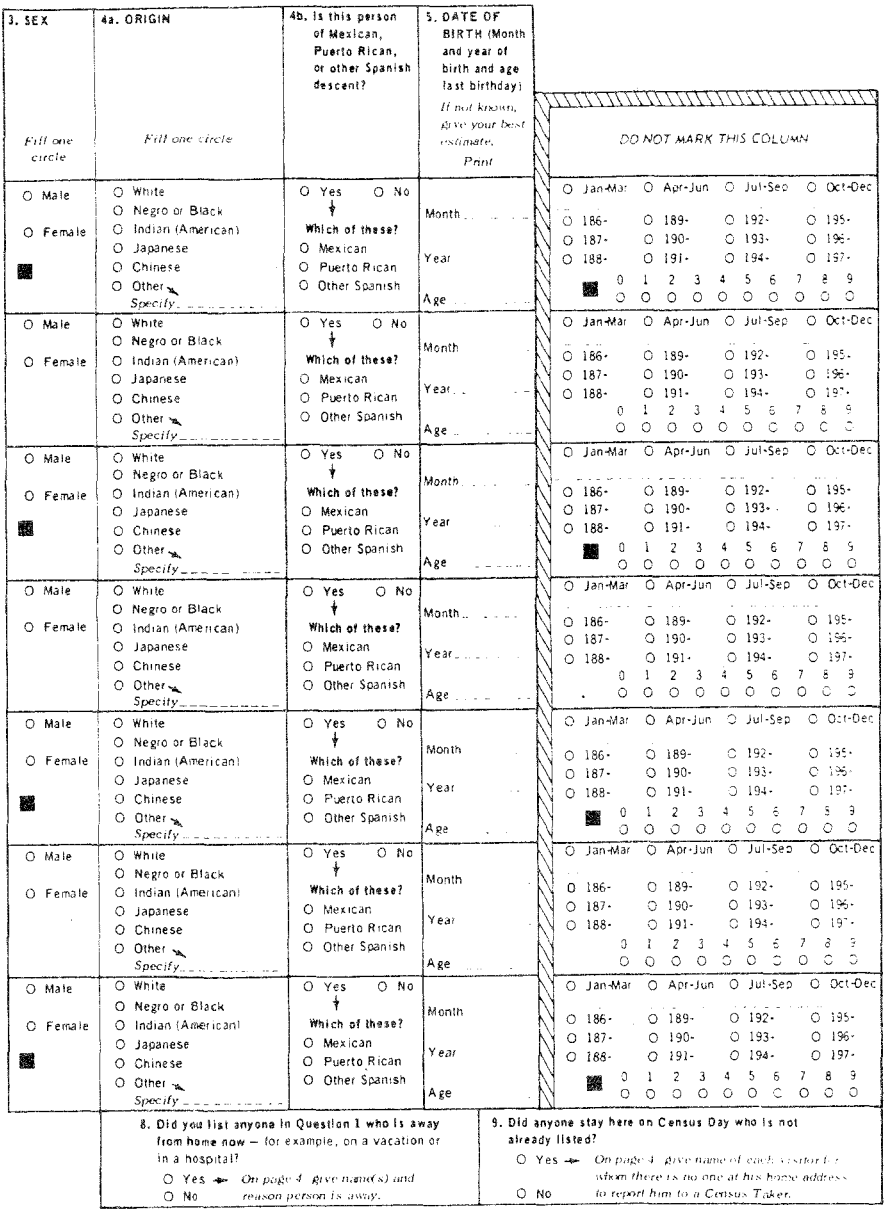
A stepchild or legally adopted child of the head should be marked **Son or daughter.**

Line No.	1. WHAT IS THE NAME OF EACH PERSON who was living here on Census Day or who was staying or visiting here and had no other home? Print names in this order: Head of the household; Spouse of head; Unmarried children, oldest first; Married children and their families; Other relatives of the head; Persons not related to the head	2. HOW IS EACH PERSON RELATED TO THE HEAD OF THIS HOUSEHOLD? Fill one circle
①	Last name First name Middle initial	○ Head ○ Wife or husband ○ Son or daughter of head ○ Other relative of head ○ Roomer, boarder, lodger ○ Patient or inmate ○ Other nonrelative
②	Last name First name Middle initial	○ Head ○ Wife or husband ○ Son or daughter of head ○ Other relative of head ○ Roomer, boarder, lodger ○ Patient or inmate ○ Other nonrelative
③	Last name First name Middle initial	○ Head ○ Wife or husband ○ Son or daughter of head ○ Other relative of head ○ Roomer, boarder, lodger ○ Patient or inmate ○ Other nonrelative
④	Last name First name Middle initial	○ Head ○ Wife or husband ○ Son or daughter of head ○ Other relative of head ○ Roomer, boarder, lodger ○ Patient or inmate ○ Other nonrelative
⑤	Last name First name Middle initial	○ Head ○ Wife or husband ○ Son or daughter of head ○ Other relative of head ○ Roomer, boarder, lodger ○ Patient or inmate ○ Other nonrelative
⑥	Last name First name Middle initial	○ Head ○ Wife or husband ○ Son or daughter of head ○ Other relative of head ○ Roomer, boarder, lodger ○ Patient or inmate ○ Other nonrelative
⑦	Last name First name Middle initial	○ Head ○ Wife or husband ○ Son or daughter of head ○ Other relative of head ○ Roomer, boarder, lodger ○ Patient or inmate ○ Other nonrelative

6. *If [illegible]* **Are there any other persons in this household?**
○ Yes → *On page 4 give the name(s) of the others, we will call to get the information.*
○ No

7. **Did you leave anyone out of Question 1 because you were not sure if he should be listed** – for example, a new baby still in the hospital, or a lodger who also has another home?
○ Yes → *On page 4 give name(s) and reason left out.*
○ No

Fig. 3. Reproduction of a portion of an experimental variant used for laboratory testing. Note instructions in left column. Words printed in red are underlined. The alternative wording and format for the ethnic origins question appear on this form. Also note that position marking of age information is not requested.



The household coverage check questions are at the bottom of the page where they were in 1970. The experimental position, however, is on the next page which is not illustrated.

check completeness of the household roster.

iv) Addition of a Spanish ethnicity item to the basic or short 1980 form.

v) Combination of three separate questions about plumbing facilities into a single question.

A request for age information in machine readable form was a feature of the 1970 Census questionnaire. At the time of the Census we observed that it created more difficulty for respondents than other tasks involved in filling a machine readable census questionnaire but that observation was not systematic. Therefore, we also designed a form on which respondents were not requested to repeat information about ages of household members in machine readable form. And, finally, we designed an alternative question to the one then recommended for obtaining information about Spanish ethnicity, an item to be added to the 1980 Census short form. Fig. 3 shows a portion of the initial variant which had the most experimental features. (Underlining in Fig. 3 shows where red rather than black print was used.)

Having in mind a study of interactions among the variables as part of the initial experiments, 16 different forms were designed. They permitted separate study of three variables; namely, placement of instructions, color, and the request for machine readable information about age. A single variant, however, included the alternative wording of the ethnic origins and plumbing questions and alternative placement of the household roster questions designed to check completeness of coverage because interactions between or among these features were not anticipated.

The plan for conducting the two kinds of studies was described in the initial report for the series, as follows:

"Series A. Experiments: 50 or more persons (the number was reduced when fewer variants were studied in single experiments) fill forms under controlled conditions, including supervision by monitors, followed by statistical analysis of results.

The objective is to compare particular questionnaire variants.

Series B. Observation: One observer watches and listens to one subject as he or she fills a form, helps when necessary and discusses the form afterwards.

The objective is to learn how people fill forms, what difficulties and misunderstandings they have and what are the reasons for any difficulties or misunderstandings." (See Rothwell (1983).)

We planned to and did find participants for the studies through the Community Services Program, a program we had proposed and had developed a prototype for during the 1960s. Its purpose is to assist in the conduct of the census in predominantly minority neighborhoods where analysis of earlier census results showed deficient coverage and where it had been difficult to recruit and keep staff and gain local cooperation. The position of Community Services staff members was developed to assist and promote census taking in their communities. Questionnaire research was an ideal assignment for them. If they did their jobs well they had many volunteers to participate in tests. The assignments also provided opportunities for the kinds of discussions about the census which they sought. *Following* an observation session or an experiment, they could defend and explain the purpose of the information collected on the questionnaire participants had filled. It thus became the assignment of the Community Services Representative to find small groups of four to eight people suitable for observation sessions and groups of 10 to 50 (depending on the number of different forms to be tested) for experiments.

Nineteen hundred and eighteen people participated in 44 experimental groups and six observation sessions. Although, by choice, each group tended to be homogeneous, they

varied greatly from people with very little education to graduate students and lawyers, from young to old and they included many ethnic and racial groups.

Initially, Community Services staff recruited the groups and introduced the studies, following prepared scripts and directed by Statistical Research Division staff members. Subsequent studies, started in 1977, were conducted by Community Services staff members after training and indoctrination by experienced persons from the Statistical Research Division. Kits of instructions, materials, and scripts were prepared for them.

5.1.2. The initial findings from laboratory studies

It is possible in a review paper like this to present only a few highlights among the results. Here are the first three finding from a report to the Bureau of the Census (see Rothwell and Rustemeyer (1979)).

First most people who had less than eight years of school and were included in test groups could not start to fill a census-like form.

Within the literate majority of the population (people with at least some high school), better-educated people filled census forms more completely and correctly than less well-educated

BUT

they made the same kinds of mistakes, just fewer of them.

THUS,

improvements made in forms for the sake of less well-educated people who have trouble filling them will also improve the performance of the better-educated.

Second carryover effect of a difficult task (or one which seems unreasonable) in completing a self-enumeration form can adversely affect response rate to subsequent items.

For example, the request to report year of birth in machine readable position markings resulted in lower response rate to the items which followed.

Third a limited item position effect was observed.

Two different item placement tests showed that the response rate to three questions designed to be sure that the household roster was complete, was affected by their placement at the bottom of a page or in the body of the form.

YET

efforts to improve response rate to a question about ethnic origins by shifting its position within the body of the form were not rewarded with increased response to it.

Although the initial experiment was designed to measure interactions among the variables studied, none were observed. This design feature was dropped in most of the subsequent experiments but the initial more conservative design is clearly preferable.

Since classroom groups were not samples selected from a population, findings based on the studies were considered hypotheses to be tested in field studies based on population samples. One check of the findings was a comparison of results obtained in 1971 classroom tests with those obtained from a sample drawn from the 1970 Census (see Rothwell (1983) and Rothwell and Rustemeyer (1979)). That comparison added support, particularly for the third finding about position effect. Another check was a far looser comparison with the results of an Adult Proficiency Level Study conducted by a private research organization using a national sample (see University of Texas at Austin (1977)). That study added support for the first finding by showing that people who had little education were often unable to fill much easier forms than the census questionnaires. And, finally, as will be

described in Section 5.4 below, an experiment was conducted in the context of the 1980 Census, comparing responses to the official census questionnaire with those to two alternatives.

In addition to learning how people filled census-like forms, both the experiments and observations obtained information about opinions and attitudes of the participants. As a participant in an experimental group completed and turned in the form, a monitor sealed it and gave the person an envelope containing a duplicate of the variant the person filled. Attached to it was a brief evaluation questionnaire which the participant was asked to fill. It included such questions as: how difficult the census form appeared at first; how difficult filling it proved to be; which questions were difficult and which seemed intrusive; whether the instructions were clear; whether the print was large and dark enough; and so on.

Analysis included the opinions expressed on the evaluation form. In the observation sessions, observers' notes described participants' attitudes as well as their performance.

5.2. Knowledge, Attitudes, Practices Surveys (KAP) and Awareness and Practices Surveys

5.2.1. How KAP Surveys were planned and conducted

These surveys were undertaken in 1977 and 1978 for the Census Bureau's Public Information Office. They were done initially in two communities in which pretests for the 1980 Census were conducted (Camden, New Jersey and Oakland, California). They were based on probability samples. Some of the attitudinal questions asked were the same as those used in the classroom studies and provided confirmation that the classroom responses to the questions were not atypical.

The KAP studies conducted during the pretests became pretests themselves for a national KAP survey conducted in conjunction with the 1980 Census on contract with a private firm[4].

Because we were familiar with survey findings of over-reported socially acceptable behavior in surveys, the KAP Survey included a check of the reply to a question about whether the respondent had mailed back his or her census questionnaire against the record which showed which sampled respondents had actually mailed back their questionnaires.

The design for the national KAP Survey conducted in 1980 was more sophisticated than that for the two pretest surveys. It was a two-stage study. Phase I interviews were conducted two months before the Census, prior to most of the public information campaign. Phase II interviews were conducted at the peak of the campaign, just before April 1, Census Day. The purpose of the two phase survey was to reduce any recall bias about how and when people learned about the census and what their opinions of it had been before the public information campaign.

5.2.2. The KAP findings

The check of replies to the survey question against the records permitted a conclusion that respondents did not overreport cooperation with the request to mail back their questionnaires. Although the survey estimate of mail-back was higher than the observed rates, mail-back of census forms was not overreported. Survey nonrespondents (about 15 % of the sample selected in Camden) were far less likely than respondents to have mailed back their forms. Thus, most of the higher estimate of mail-back provided by the survey

[4] We thought that it would be inappropriate for a Census Bureau interviewer to ask people at the time of the Census whether, for example, they believed the Bureau's promise of confidentiality. Moreover, we feared that their replies about usefulness of census statistics might be more polite than frank if the interviewer was a Bureau representative.

could be attributed to nonresponse rather than response bias (see Bernstein (1979)). There was also a small measured effect of having been interviewed on respondent mail-back behavior. That is, a few survey respondents mailed back their forms on the day of or day after the interview.

The two phase study conducted in 1980 made possible a firmer conclusion that the campaign had been successful in gaining the public's attention, particularly among the poor, and the Hispanic and Black minority groups. (See Moore (1982).)

Very small percentages of people either in the pretest surveys, the January Phase I, or the April Phase II of the 1980 KAP Survey, expressed unfavorable opinions about the value or usefulness of a census. Criticism in classroom studies had varied by group but, with the exception of one small group of 17 people, attitudes about the importance or usefulness of censuses and performance in filling the questionnaire were not found to be related. It would, of course, have been wrong to suggest relevance of such a classroom finding to the real world of census-taking and, for many, the finding was counter-intuitive. But the KAP studies provided some confirmation of this result by showing that critical survey respondents were as likely as non-critical ones to mail back their census questionnaires.

5.2.3. How the Awareness and Practices Studies were conducted

Like the KAP survey, the first *Awareness and Practices Survey,* was undertaken in connection with a census pretest for the Public Information Office. That test was in Richmond, Virginia in 1978, and a study like it was also conducted in 1980. Its principal purpose was to monitor the effectiveness of the public information program in making people aware of the approaching census and then to track awareness and the response to the mail-back campaign. But, like the KAP again, it also included some attitudinal questions.

The probability sample for the survey was divided into daily portions and, for the pretest, included a personal visit and telephone component to learn whether the telephone sample would give biased results. The 1980 Census survey was based on a national random digit telephone dialing sample and was conducted by computer-assisted interviewing, making it possible to provide daily reports about awareness and reported mail-back of census questionnaires.

In the pretest, Census Bureau staff members acted as interviewers and in the Census the work was performed on contract.

5.2.4. The findings of the Awareness and Practices Surveys

First, the telephone and personal interview portions of the Richmond survey produced the same results, which is why the Decennial Census survey was conducted by telephone only.

Second, responses to the attitude questions were overwhelmingly favorable as they were in the KAP studies, both when the Census Bureau staff conducted the pretests and when a contractor did the survey at the time of the 1980 Census.

Another finding common to both the Awareness and Practices surveys and the two-stage KAP was the absence of any trend in attitudes and opinions as they were measured over time. Respondents were uncritical from the start, giving little room to show improved attitudes. Yet, even the limited possibility for increasing favorable ratings from before the census period or during it, was not observed, while public awareness was increasing greatly (see Moore (1982)).

5.3. *Applied Behavior Analysis Surveys (ABAS)*

5.3.1. How and why the surveys were conducted

In describing developments during the 1970s, I mentioned questions of interest outside of the scope of the classroom studies. Those questions and two findings of the KAP surveys led to our proposal to undertake what became known as the ABAS.

The first KAP survey finding was the evidence of accurate reporting of mail-back by survey respondents. Second was our inability to observe consistent connection between attitudes and behavior in the KAP surveys, despite efforts to sharpen and expand the focus of the attitude questions. The classroom research, which also failed to show any consistent relationship between attitude and behavior, provided information about ability, but none about other variables associated with mail-back.

The ABAS was designed to learn about the effectiveness of the mail-out in reaching respondents; about receipt of the census envelope; whether the envelope was opened; whether anyone started to fill out the form; whether it was completed and put in the mail. The survey provided answers to all of those questions through interviews with the household member who was responsible for taking or not taking each step in the chain of events leading to mail-back. That necessitated occasional switching of respondents during an interview.

The first ABAS was conducted in connection with a rehearsal for the Census in New York City in 1978 and the second during the 1980 Census shortly after Census Day, by personal visits to a sample of households. A survey requirement to show the respondent a copy of the form he or she had been designated to receive necessitated the personal rather than a telephone interview.

5.3.2. The ABAS findings

Estimates from the ABAS showed a nearly identical mail-back rate to the one measured for the Census (84 % vs. 83.3 %). Moreover, the differentials among ethnic, racial and income groups in reporting mail-back coincided with expected but never before directly measured differences among these groups in mail response to the Census. Lastly, the ABAS estimate of similarity in mail-back rates between recipients of short and long or sample questionnaires was consistent with census results.

Confidence in ABAS estimates for information which could be evaluated contributed to credibility of the "uncheckable" replies about whether people received forms in the mail and what they did with the forms they received. Replies indicated that more of the decline in response, starting with presumed mail-out, could be attributed to what preceded seeing and trying to fill the form than to anything about the form itself (see DeMaio (1983)); non-receipt (5 %) and not having opened the envelope (2 %) were causes of nonresponse which could not be attributed to the content, design or length of the form.

The survey also showed that perceptions of how difficult the census questionnaire was to fill were similar to those measured in many classroom studies. About 7 % of the recipients of the short form who opened the envelope and saw it said it was very hard to fill. About 8 % of those who thought the form looked very hard and 1 % of those who didn't think it looked very hard, reported that they had not even tried to start filling it.

Only about 3 % of those who said they started, reported that they did not finish filling the questionnaire. They, however, were more likely than the large majority to rate the form as very hard, to report that filling it would take more than a half hour, or to have large households (which actually increased the amount of work involved).

Thus, the ABAS identified a small group of people who did not start or finish their census forms for reasons attributable to the forms themselves. The unanswered question, of course, is how much easier or easier appearing would a form have to be to prevent that discouragement.

5.4. A Questionnaire experiment conducted in the context of the 1980 Census

5.4.1. How and why the experiment was planned

The last outgrowth of the research program which I will describe was the experiment designed to learn whether results observed in the classroom experiments would be found in the Census.

To return briefly to the laboratory studies, one of the consistent results over a number of experiments conducted late in the decade was that the format employed in the design of the 1970 Census form produced more completely and quickly filled questionnaires than that developed for the 1980 Census. The 1970 Census format can be described as linear; that is, names of household members were to be listed one under the other in the stub of the form and the items or questions were printed on the top. (See Fig. 2 on pages 142-143.) The 1980 format can be described as columnar. Names of household members were to be listed across the top of the form and the questions were in the stub. (Compare Fig. 4 on the next page with Fig. 2.)

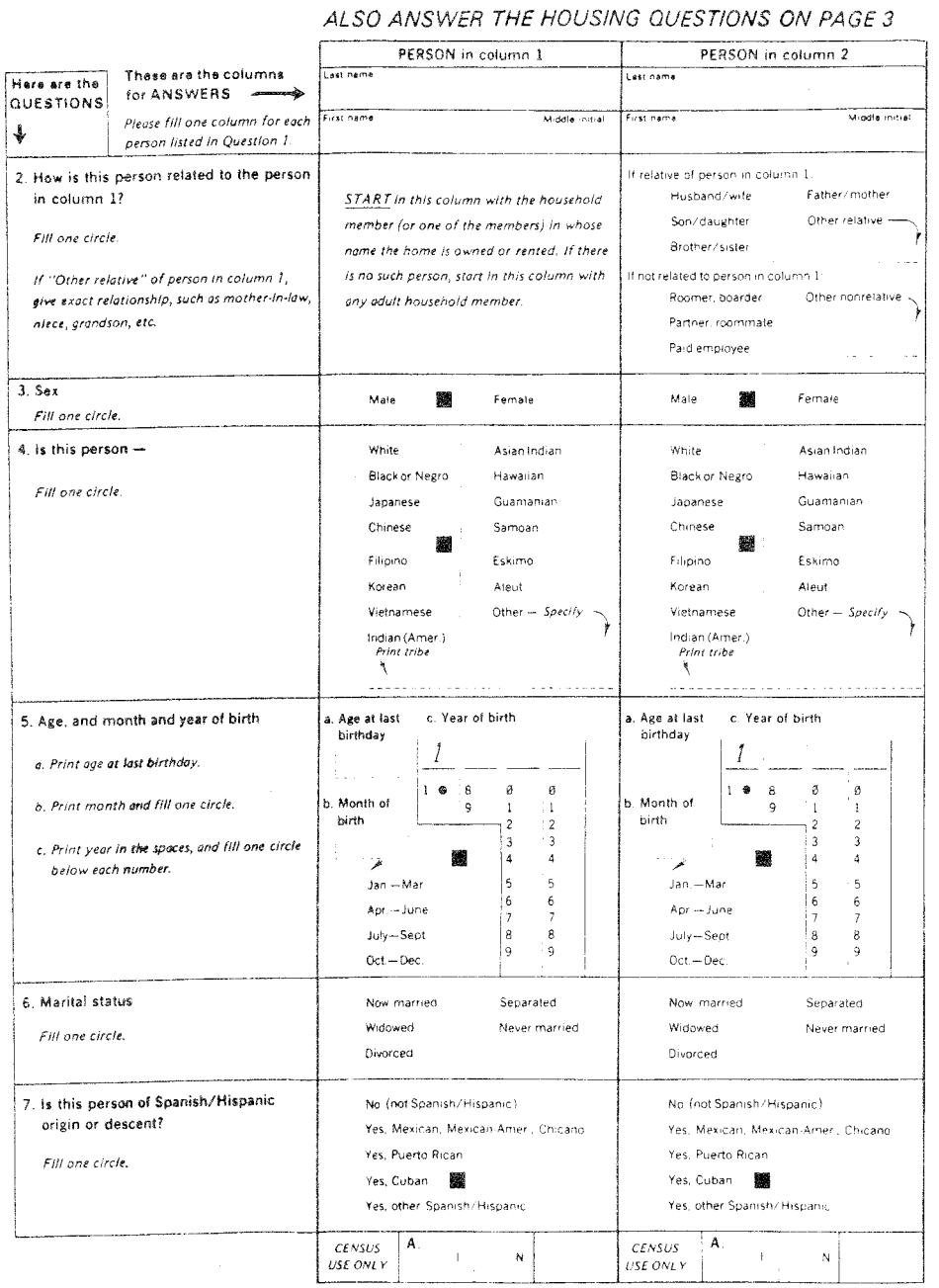
Justifications for conducting a questionnaire experiment during the Census were provided by classroom research results, by reading about other research, and by concern about anticipated declines in mail-back rates. By the end of the decade, I had been introduced to the work of Patricia Wright and others in the previously unfamiliar field of document design. Finding that research was a valuable outcome of our work, which, until then, we had considered unique. Wright (1980) described an experiment which I believed generalized a finding that a linear form like that shown in Fig. 2 would be easier, faster and better filled than a columnar form like that shown in Fig. 4[5]. Moreover, mail return rates which had been more than 80 % in the 1970 Census had dropped to as low as 50 % in pretests conducted during the 1970s. Although the drop was attributed largely to a less cooperative public[6], there was some concern that changes in questionnaire design might have contributed to it. One purpose of the experiment was to test that hypothesis.

The experiment was conducted in conjunction with the Census Logistical Early Warning Sample Study (CLEWS). It was designed to measure the mail-back rates and the effect of office editing on census data. A national probability sample of 6,000 addresses was selected for the study. The return envelope which accompanied the mailed census form for sampled addresses was directed to the central processing office before being forwarded to the local census office. By tripling the sample, and selecting three instead of one address at sampled points, it became possible to use the CLEWS sample as the control group for a questionnaire experiment.

By the late 1970's, there was another kind of form which the Census Bureau Director wished to have tested; namely, a non-machine readable form. Criticism of the machine readable forms (shown in Fig. 2 and Fig. 4) led to

[5] Observations not tested experimentally have been omitted from this report. One such observation is that any matrix form is more difficult to fill than a simple form in which, for example, information about each person is requested in a separate block. – Wright has reported such a finding reached experimentally.

[6] I don't know whether the public was perceived as less cooperative in general because of changing behavior or whether the lowered cooperation was attributed to the fact that a test rather than a complete and mandated census was being conducted.


ALSO ANSWER THE HOUSING QUESTIONS ON PAGE 3

Here are the QUESTIONS ↓

These are the columns for ANSWERS →

Please fill one column for each person listed in Question 1

	PERSON in column 1	PERSON in column 2
	Last name First name — Middle initial	Last name First name — Middle initial
2. How is this person related to the person in column 1? *Fill one circle.* *If "Other relative" of person in column 1, give exact relationship, such as mother-in-law, niece, grandson, etc.*	*START in this column with the household member (or one of the members) in whose name the home is owned or rented. If there is no such person, start in this column with any adult household member.*	If relative of person in column 1: Husband/wife — Father/mother Son/daughter — Other relative Brother/sister If not related to person in column 1: Roomer, boarder — Other nonrelative Partner, roommate Paid employee
3. Sex *Fill one circle.*	Male ■ Female	Male ■ Female
4. Is this person — *Fill one circle.*	White — Asian Indian Black or Negro — Hawaiian Japanese — Guamanian Chinese — Samoan ■ Filipino — Eskimo Korean — Aleut Vietnamese — Other — *Specify* Indian (Amer.) *Print tribe*	White — Asian Indian Black or Negro — Hawaiian Japanese — Guamanian Chinese — Samoan ■ Filipino — Eskimo Korean — Aleut Vietnamese — Other — *Specify* Indian (Amer.) *Print tribe*
5. Age, and month and year of birth *a. Print age at last birthday.* *b. Print month and fill one circle.* *c. Print year in the spaces, and fill one circle below each number.*	a. Age at last birthday — c. Year of birth 1 1 ● 8 Ø Ø 9 1 1 2 2 3 3 b. Month of birth — 4 4 ■ Jan.—Mar. — 5 5 Apr.—June — 6 6 July—Sept. — 7 7 Oct.—Dec. — 8 8 9 9	a. Age at last birthday — c. Year of birth 1 1 ● 8 Ø Ø 9 1 1 2 2 3 3 b. Month of birth — 4 4 ■ Jan.—Mar. — 5 5 Apr.—June — 6 6 July—Sept. — 7 7 Oct.—Dec. — 8 8 9 9
6. Marital status *Fill one circle.*	Now married — Separated Widowed — Never married Divorced	Now married — Separated Widowed — Never married Divorced
7. Is this person of Spanish/Hispanic origin or descent? *Fill one circle.*	No (not Spanish/Hispanic) Yes, Mexican, Mexican-Amer., Chicano Yes, Puerto Rican Yes, Cuban ■ Yes, other Spanish/Hispanic	No (not Spanish/Hispanic) Yes, Mexican, Mexican-Amer., Chicano Yes, Puerto Rican Yes, Cuban ■ Yes, other Spanish/Hispanic
CENSUS USE ONLY	A. I N	*CENSUS USE ONLY* A. I N

Fig. 4. Reproduction of a portion of the 1980 DECENNIAL CENSUS short form showing the columnar format for supplying information about household members. It is a multiple fold form designed to be machine readable. This portion contains two columns only while the original form has seven.

the suggestion that a form be tested which was designed primarily from the point of view of respondents without regard to ease of machine processing. Although we had designed a non-machine readable form, we had not tested it and agreed with critics that commercial firms which were constantly concerned primarily with public acceptance might provide fresh perspective. Competitive bids were won by a firm which developed an attrachtive three-color alternative form in about six or eight weeks. (Fig. 5 on the following pages does not do justice to it because its features include booklet instead of fold-out format, more attractive looking paper and print than was used for the standard census questionnaire, and systematic use of black, blue and red print.) The commercially produced form was mailed to one sample, the linear form went to another, while the standard or control form was addressed to the third sample.

At the start of this paper I described historical problems in conducting field experiments and those encountered in the conduct of the 1980 questionnaire experiment were not exceptional.

First, there was a mix-up in mailing which required that 20 % of the sample be eliminated. Elimination was designed to affect all forms equally and, therefore, should not have affected comparisons.

Second, the estimated mail-back of all forms, both experimental and control, was lower than that reported for the Census as a whole; 77 % as compared with 83 %.

Third, as compared with a laboratory study, the three kinds of questionnaires could not be treated uniformly. The standard form was featured prominently in a number of television advertisements showing athletes, entertainers and other public figures holding it and filling it out. In addition, all of the assistance centers were geared toward helping people with the standard form. While the linear form resembled the standard, the third non-machine readable form was very different in appearance and could have been rejected as unofficial by observant television viewers.

Based on results of classroom tests and Dr. Wright's research, we hypothesized that the linear form would be mailed back at a higher rate than the standard form and would be more completely and consistently filled. The alternative non-machine-readable form had been designed for public acceptance but there were differences of opinion among Census Bureau staff members about how successful it would be and, since it had never been tested, no agreement about how it would be received.

5.4.2. The findings from the Census experiment

The three kinds of forms were compared in three ways: mail-back response, form completion, and data comparisons.

Small measured statistical differences showed that the commercially produced form had a slightly higher mail-back rate, (78 %), than the standard form, (75 %)[7]. There was no difference between the commercially produced form and the linear form nor between the linear and standard form which would have led to a conclusion that the change in questionnaire design played a role in the small decline from 1970 to 1980 in the mail-back rate (from 85.6 % to 83.3 %). By comparison with these trivial differences, there were large differences in mail-back according to area. "Centralized areas" included city neighborhoods with high population densities and areas identified as difficult to enumerate. The mail-back rate from those areas was considerably lower than from "decentralized areas" in small cities, suburbs

[7] Estimates made before the Census was conducted were that two million dollars would be saved for each percentage point of increase in mail-back. In that perspective, small differences are worth measuring.

Part 2. Questions about household members

Please answer the following questions for the first 7 people listed in Part 1, Who is in your household. If there are more than 7 people, a census taker will call for information about the others.

Your last name First name Middle name	Consider yourself to be Person 1 The next household member is Person 2, etc. Part 1, Who is in your household is Person 1 The next household member is Person 2, etc.		You are ☐ male ☐ female	Your age at last birthday Year of birth Month of birth
Person 2's last name First name Middle name	Person 2 is ☐ my husband or wife ☐ my son or daughter ☐ my brother or sister ☐ my mother or father ☐ other related person *(print below)*	☐ roomer, boarder or foster child ☐ roommate or partner ☐ paid employee ☐ other non-related person *(print below)*	Person 2 is ☐ male ☐ female	Person 2's age at last birthday Year of birth Month of birth
Person 3's last name First name Middle name	Person 3 is ☐ my husband or wife ☐ my son or daughter ☐ my brother or sister ☐ my mother or father ☐ other related person *(print below)*	☐ roomer, boarder or foster child ☐ roommate or partner ☐ paid employee ☐ other non-related person *(print below)*	Person 3 is ☐ male ☐ female	Person 3's age at last birthday Year of birth Month of birth
Person 4's last name First name Middle name	Person 4 is ☐ my husband or wife ☐ my son or daughter ☐ my brother or sister ☐ my mother or father ☐ other related person *(print below)*	☐ roomer, boarder or foster child ☐ roommate or partner ☐ paid employee ☐ other non-related person *(print below)*	Person 4 is ☐ male ☐ female	Person 4's age at last birthday Year of birth Month of birth
Person 5's last name First name Middle name	Person 5 is ☐ my husband or wife ☐ my son or daughter ☐ my brother or sister ☐ my mother or father ☐ other related person *(print below)*	☐ roomer, boarder or foster child ☐ roommate or partner ☐ paid employee ☐ other non-related person *(print below)*	Person 5 is ☐ male ☐ female	Person 5's age at last birthday Year of birth Month of birth
Person 6's last name First name Middle name	Person 6 is ☐ my husband or wife ☐ my son or daughter ☐ my brother or sister ☐ my mother or father ☐ other related person *(print below)*	☐ roomer, boarder or foster child ☐ roommate or partner ☐ paid employee ☐ other non-related person *(print below)*	Person 6 is ☐ male ☐ female	Person 6's age at last birthday Year of birth Month of birth
Person 7's last name First name Middle name	Person 7 is ☐ my husband or wife ☐ my son or daughter ☐ my brother or sister ☐ my mother or father ☐ other related person *(print below)*	☐ roomer, boarder or foster child ☐ roommate or partner ☐ paid employee ☐ other non-related person *(print below)*	Person 7 is ☐ male ☐ female	Person 7's age at last birthday Year of birth Month of birth

Fig. 5. Reproduction of a portion of the experimental form produced commercially and used in the 1980 Census experiment. It is a booklet which is not designed to be machine readable. The questions are printed in black, the instructions in blue, and explanations about confidentiality, uses made of census statistics and other matters not directly related to the items themselves, are introduced in red print.

After you complete the information for the first person in your household, go on to the next page.

You are *(check one)*

☐ White
☐ Black or Negro
☐ Japanese
☐ Chinese
☐ Indian (Amer.) *(print tribe below)*

☐ Filipino
☐ Korean
☐ Vietnamese
☐ Asian Indian
☐ Hawaiian

☐ Guamanian
☐ Samoan
☐ Eskimo
☐ Aleut
☐ Other *(print below)*

Your current marital status is *(check one)*

☐ now married
☐ widowed
☐ divorced
☐ separated
☐ never married

You are *(check one)*

☐ not Spanish/Hispanic
☐ Mexican, Mexican-Amer., Chicano
☐ Puerto Rican
☐ Cuban
☐ Other Spanish/Hispanic

Person 2 is *(check one)*

☐ White
☐ Black or Negro
☐ Japanese
☐ Chinese
☐ Indian (Amer.) *(print tribe below)*

☐ Filipino
☐ Korean
☐ Vietnamese
☐ Asian Indian
☐ Hawaiian

☐ Guamanian
☐ Samoan
☐ Eskimo
☐ Aleut
☐ Other *(print below)*

Person 2's current marital status is *(check one)*

☐ now married
☐ widowed
☐ divorced
☐ separated
☐ never married

Person 2 is *(check one)*

☐ not Spanish/Hispanic
☐ Mexican, Mexican-Amer., Chicano
☐ Puerto Rican
☐ Cuban
☐ Other Spanish/Hispanic

Person 3 is *(check one)*

☐ White
☐ Black or Negro
☐ Japanese
☐ Chinese
☐ Indian (Amer.) *(print tribe below)*

☐ Filipino
☐ Korean
☐ Vietnamese
☐ Asian Indian
☐ Hawaiian

☐ Guamanian
☐ Samoan
☐ Eskimo
☐ Aleut
☐ Other *(print below)*

Person 3's current marital status is *(check one)*

☐ now married
☐ widowed
☐ divorced
☐ separated
☐ never married

Person 3 is *(check one)*

☐ not Spanish/Hispanic
☐ Mexican, Mexican-Amer., Chicano
☐ Puerto Rican
☐ Cuban
☐ Other Spanish/Hispanic

Person 4 is *(check one)*

☐ White
☐ Black or Negro
☐ Japanese
☐ Chinese
☐ Indian (Amer.) *(print tribe below)*

☐ Filipino
☐ Korean
☐ Vietnamese
☐ Asian Indian
☐ Hawaiian

☐ Guamanian
☐ Samoan
☐ Eskimo
☐ Aleut
☐ Other *(print below)*

Person 4's current marital status is *(check one)*

☐ now married
☐ widowed
☐ divorced
☐ separated
☐ never married

Person 4 is *(check one)*

☐ not Spanish/Hispanic
☐ Mexican, Mexican-Amer., Chicano
☐ Puerto Rican
☐ Cuban
☐ Other Spanish/Hispanic

Person 5 is *(check one)*

☐ White
☐ Black or Negro
☐ Japanese
☐ Chinese
☐ Indian (Amer.) *(print tribe below)*

☐ Filipino
☐ Korean
☐ Vietnamese
☐ Asian Indian
☐ Hawaiian

☐ Guamanian
☐ Samoan
☐ Eskimo
☐ Aleut
☐ Other *(print below)*

Person 5's current marital status is *(check one)*

☐ now married
☐ widowed
☐ divorced
☐ separated
☐ never married

Person 5 is *(check one)*

☐ not Spanish/Hispanic
☐ Mexican, Mexican-Amer., Chicano
☐ Puerto Rican
☐ Cuban
☐ Other Spanish/Hispanic

Person 6 is *(check one)*

☐ White
☐ Black or Negro
☐ Japanese
☐ Chinese
☐ Indian (Amer.) *(print tribe below)*

☐ Filipino
☐ Korean
☐ Vietnamese
☐ Asian Indian
☐ Hawaiian

☐ Guamanian
☐ Samoan
☐ Eskimo
☐ Aleut
☐ Other *(print below)*

Person 6's current marital status is *(check one)*

☐ now married
☐ widowed
☐ divorced
☐ separated
☐ never married

Person 6 is *(check one)*

☐ not Spanish/Hispanic
☐ Mexican, Mexican-Amer., Chicano
☐ Puerto Rican
☐ Cuban
☐ Other Spanish/Hispanic

Person 7 is *(check one)*

☐ White
☐ Black or Negro
☐ Japanese
☐ Chinese
☐ Indian (Amer.) *(print tribe below)*

☐ Filipino
☐ Korean
☐ Vietnamese
☐ Asian Indian
☐ Hawaiian

☐ Guamanian
☐ Samoan
☐ Eskimo
☐ Aleut
☐ Other *(print below)*

Person 7's current marital status is *(check one)*

☐ now married
☐ widowed
☐ divorced
☐ separated
☐ never married

Person 7 is *(check one)*

☐ not Spanish/Hispanic
☐ Mexican, Mexican-Amer., Chicano
☐ Puerto Rican
☐ Cuban
☐ Other Spanish/Hispanic

and rural areas. The small differential mail-back among forms was more pronounced in the centralized than decentralized areas, indicating that the machine-readable forms were more likely to discourage inner city residents than other people (see Fansler et al. (1981)).

The census experiment did not yield the same clear differences in item response rates as the classroom studies did. Differences in item response rates tended to be small with notable exceptions of the item asking for Hispanic ancestry and items designed to check completeness of the household roster. The non-response rates for these items were much larger for the commercially designed form than for the other forms. Since the commercially prepared form had never been tested in any way, it should not be surprising that two of its innovations resulted in poorer response rates than either of the tested forms. What is surprising is that the untested and very different form worked as well as it did in comparison with forms which had been thoroughly pretested.

The hypothesis about the linear form being better filled than the standard columnar form was not supported. Neither the matrix configuration (linear versus columnar) nor the anticipated carry-over effect of eliminating an instruction to provide redundant age information in machine-readable form by doing position marking, contributed to improved response rates for the linear forms in the Census.

The third kind of analysis of the experiment was more complex and has more ambiguities than the two which have already been described (mail-back and item nonresponse rates). It was a comparison of data obtained on alternative questionnaires for items selected as worded or positioned differently or having different response styles – for example, precoded versus open-ended questions (see Mockovak (1983), (1984)). The ambiguity was due to multiple rather than single differences between questions, requiring conjectures about which difference might be creating any observed effect. In fact, however, most of the multiple and obvious differences had little or no effect on the distributions of responses.

These experimental results suggest the possibility of incorporating a questionnaire experiment like the one conducted in 1980 in future censuses for another purpose; namely, to obtain different measures of validity than those produced by post-enumeration surveys. The effect of time, which is always problematical in post-enumeration surveys, is eliminated when a different way of asking the question is employed in a matched sample at the time of the census.

6. Conclusion

More of the questions with which we started might now be answered if we had been able to conduct experiments and observations throughout the decade. On the other hand, the surveys undertaken for the Public Information Office not only met the principal objectives for which they were designed but also contributed more evidence than countless classrooms could have, that attitudes of participants and survey respondents would not predict performance in a census. The Applied Behavior Analysis Survey, which was a descriptive study developed from the surveys done for the Public Information Program, gave the Census Bureau information it had never before had about what went on between the time the questionnaires were mailed to householders and the time they were returned or not returned.

The field experiment conducted during the 1980 Census suggested that the differences studied in the laboratory might have been too small to show up in a real-world situation and that future laboratory studies should include a wider range of differences among variants.

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