The Effects of Questionnaire and Content Changes on Responses to Race and Hispanic Origin Items: Results of a Replication of the 1990 Census Short Form in Census 2000[1]

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I. Introduction

In 1997, the Office of Management and Budget (OMB) introduced significant changes in methods for collecting and reporting race data in government surveys and censuses, including allowing respondents to report one or more races. In order to evaluate the effects of the OMB changes and other changes introduced in Census 2000, 1990 questions on race and Hispanic origin were replicated in a national experiment conducted during Census 2000. We compare data from 1990-style and Census 2000 mail questionnaires to address two questions.

1. Does mail response data quality (as measured by item nonresponse) differ between questionnaire versions for race and Hispanic origin items?
2. What are the effects of questionnaire differences on race reporting? Do race and Hispanic origin distributions for mail returns differ between 1990 and 2000 versions of the questionnaire?

II. Changes to Race and Hispanic Origin Items

The most significant change in Census 2000 was to *allow reporting of one or more race*s. The change culminated several years of research and consultations and a large national field test that evaluated alternative question formats (Census Bureau, 1997; Gerber, de la Puente, and Levin, 1998). Based on the research, the instruction was modified. The Census 2000 question is, "What is this person's race? Mark [✗] one or more races to indicate what this person considers himself/herself to be." (The 1990 census had asked, "Race. Fill ONE circle for the race that the person considers himself/herself to be.") The anticipated effect of the change is increased reporting of two or more races, and (possibly) reduced reporting in single race categories.

In 1990, race was followed (two items later) by Hispanic origin. A second major change in Census 2000 was to *reverse the sequence of race and Hispanic origin questions.* (This change is also required by the new OMB guidelines.) Research showed that when race came first, some Hispanic respondents looked for, but did not find, a category to identify themselves in the race question, and so reported "Other race" and wrote in a Hispanic group (see, e.g., Kissam, Herrera, and Nakamoto, 1993). The sequence also affected nonresponse to the Hispanic origin item, which was skipped by many non-Hispanic respondents who apparently thought it was redundant or did not apply to them. (In 1990, most people who skipped Hispanic origin were non-Hispanics; McKenney et al., 1993.) In order to address these problems, the Census Bureau in 1987 began experimenting with reversing the item sequence (Martin, DeMaio, and Campanelli, 1990). Asking Hispanic origin first would reduce the apparent redundancy, and allowing Hispanic respondents to first report their Hispanic identity would reduce the likelihood they would report it in the race item. Several national field tests confirmed that reversing the order and adding an instruction to answer both questions reduced Hispanic item nonresponse by half, on average (Bates et al., 1995; see also Census Bureau, 1996; 1997). The reversed sequence also reduced Hispanics' reporting of "Some other race." In Census 2000, Hispanic origin preceded race and an instruction to "Please answer both questions..." was added.

A third major set of changes involved the *format of the questionnaire*. Extensive developmental work and cognitive testing were conducted to improve the user-friendliness of the mail questionnaire. The matrix format used in 1990 was replaced with a columnar, individual space format, the separate roster of household members was eliminated, and white space and contrasting color background were used to define answer spaces and improve navigation (Jenkins and Dillman, 1997). Respondent friendly design improved response rates in national tests by about 3 percentage points (Dillman, Sinclair, and Clark, 1995). The research did not examine the effects of format changes on race and Hispanic origin data, but improvements in item response rates were expected. Additional graphics design changes (an official Census 2000 logo, icons illustrating census uses, color) were introduced in the hope of boosting response, and the form was shortened by providing space for fewer people per household than in 1990.

Fourth, *race categories were modified*. The OMB split the 1990 "Asian and Pacific Islander" category into "Asian" and "Native Hawaiian or Other Pacific Islander" in 2000. "Hawaiian" was changed to "Native Hawaiian," and "Other Asian" and "Other Pacific Islander" were offered separately rather than as a combined category.

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[1]This paper reports the results of research and analysis undertaken by Census Bureau staff. It has undergone a Census Bureau review more limited in scope than that given to official Census Bureau publications. This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress.

Asian categories were alphabetized. Separate categories for "Eskimo" and "Aleut" were eliminated, and "Alaska Native" was added to the American Indian category. Based on a recommendation of the Census Advisory Committee on the American Indian and Alaska Native Populations, "American Indian" was spelled out rather than abbreviated "Indian (Amer.)" as in 1990. A separate write-in space was added for "Some other race." The effects of category changes are unknown and expected to be slight, assuming specific races can be collapsed to comparable categories in both forms.

Fifth, *question wording changes* were introduced. The race item was rephrased as a question, and the wording of the Hispanic origin item was changed from "Is this person of Spanish/Hispanic origin?" in 1990 to "Is this person Spanish/Hispanic/Latino?" in 2000. In 1990, but not 2000, the form included examples of "other Spanish/Hispanic" groups and "other Asian or Pacific Islander" groups next to the write-in spaces for these entries. The effect of the wording change was expected to be slight; the use of examples may increase reporting of specific groups (this effect is not analyzed here).

Our purpose is to evaluate the combined effect of the changes on responses to race and Hispanic origin items. We do that by administering the 1990 and 2000 forms to samples of randomly selected households during Census 2000. This experiment enables us to attribute differences (within the limits of sampling error) in the race and Hispanic origin responses provided by the two samples to the effects of the questionnaire, and to rule out the effects of population changes between 1990 and 2000 and differences in the way the censuses were conducted. The design of the experiment does not permit us to estimate the separate effects of specific design features, although prior research often sheds light on which design feature accounts for data differences.

III. Method

As part of Census 2000, the Alternative Questionnaire Experiment (AQE) mailed 1990-style short forms to an experimental sample of 10,500 households. The 1990-style form preserves 1990 question wording, categories, order, type size, matrix format, etc. but incorporates some recognizable elements of the 2000 design (color, logo, "Start here" instruction, envelope and letter). Any questions not included in the Census 2000 short form, such as marital status, were dropped. A control panel of 5,250 households was mailed the Census 2000 questionnaire. For respondents in the AQE, the responses provided on the experimental forms were their census data. Telephone Questionnaire Assistance operators were trained to answer questions about the instruction (in the 1990-style form) to select one race category from respondents who wanted to report more than one.

The universe of housing units was allocated into two strata: low coverage areas (LCAs), which included tracts with large numbers of Black and Hispanic households and renters in 1990, and high coverage areas (HCAs), which did not. Households in LCAs were oversampled.

To increase sample size and improve reliability, we supplemented the AQE control panel with mail returns from the control panel for the Response Mode and Incentives Experiment (RMIE) which is a sample of the same universe as the AQE (Guarino, 2001).

Except for the form differences, all experimental cases were administered and processed in the same manner.

All experimental data were keyed and processed separately. (Production Census 2000 data were imaged.) Data for both forms were edited by applying a simplified version of the pre-edits used in Census 2000 production. (A summary of the edits applied to the data is available on request.) A minimum amount of information must be present to count as a valid enumeration of a person (2 of 6 short form items, including name). Analysis is based on 40,723 valid person records on Census 2000 forms and 16,616 persons on 1990-style forms. Race data were coded and pre-edited using a simplified version of Census 2000 procedures (Census Bureau, 2000). Write-in responses were coded to determine whether they represent a valid race (and if so, which race or races) or are redundant, erroneous (e.g., a person's name is occasionally written in), fictitious or uncodable (e.g., "human") answers. In general, a write-in takes precedence over a checked box when it is inconsistent with the box, but both write-ins and marked boxes are used to classify race. Similarly, write-in responses in the Hispanic origin item were coded and used along with the check-boxes to classify Hispanic origin. Missing data were not imputed or allocated, as they would be in fully edited census data. In 1990, but not 2000, a content edit followup operation was conducted to obtain more complete responses in households which provided insufficient data. Different edits were used in 1990 and 2000 censuses. Differences in editing and processing may result in differences between results reported here and 1990 or 2000 census data.

Results are weighted to reflect differential sampling probabilities by stratum, and are nationally representative of areas in the mail universe. Standard errors and t-statistics are computed using VPLX's stratified jackknife replication method (Fay, 1998) to take account of the stratified design and the clustering of people within households. We use $\alpha = .05$, but also indicate differences significant at the .10 level, the Census Bureau's standard. Standard errors are given in parentheses in the tables.

III. Limitations

Results of the experiment are generalizable only to the Census 2000 mail back universe. Excluded are mail nonrespondents enumerated in nonresponse followup, and segments of the population enumerated in other operations (such as American Indians on reservations and Alaska Natives).

The design of the experiment does not permit estimation of separate effects of specific design features.

The sample size is relatively small, so statistical inferences about small differences between forms, or small population groups (such as detailed Asian and Pacific Islander groups and American Indian and Alaska Native tribes) may not be reliable.

The data differ from production census data as described above. Thus, we can draw conclusions about differences between 2000 and 1990-style mail questionnaires in the *quality and content of response data* they produce, but cannot draw conclusions about differences in *final data quality* between 1990 and 2000 censuses based on these results.

IV. Results

A. Mail Return Rates

Of the 10,500 1990-style questionnaires mailed out, 72.6% were returned, while 73.1% of the 5,250 households in the AQE control panel and 71.7% of the 19,639 households in the RMIE control panel returned Census 2000 questionnaires. The rates in Table 1 are weighted and exclude undeliverable addresses and blank and duplicate forms (Dajani and Scaggs, 2001).

Table 1. Weighted return rates for experimental panels, by stratum

Panel	N of responding households	All areas	Stratum	
			HCA	LCA
1990-style (AQE)	6,357	72.6%	76.1%	57.6%
Census 2000 (AQE)	3,253	73.1%	75.9%	60.8%
Census 2000 (RMIE)	12,769	71.7%	74.8%	58.2%

Return rates do not differ between the 1990-style and Census 2000 panels for the AQE overall or in the HCA stratum, but they do in the LCA stratum. The Census 2000 panel had a higher return rate (by 3.2 percentage points, $p<.05$) than the 1990-style panel. However, there are no significant differences between return rates for Census 2000 (RMIE) panel and the 1990-style (AQE) panel, overall or within stratum. We conclude that return rates for the 1990-style and Census 2000 forms differ slightly, if at all, and should not bias panel comparisons.

Census 2000 AQE and RMIE panels are combined for analysis.

B. Reporting of Hispanic Origin

Table 2 presents the distribution of Hispanic origin by form, after "editing," and including missing data. Data are missing if no box is checked, and no codable write-in entry is present.

The third row shows that the rate of missing data in Census 2000 forms is one quarter of the rate in 1990-style forms. The difference is very large, and was expected based on previous tests of the effects of item sequence and an added instruction.

Despite a large difference in item nonresponse, nearly the same fraction (11.1%) report as Hispanic in both forms. A much larger fraction report as non-Hispanic in Census 2000 forms than in 1990-style forms. It appears that many non-Hispanics who would have left the item blank in a 1990-style questionnaire completed it in a Census 2000 questionnaire. In past censuses, most people for whom origin is missing have been non-Hispanic. Under this assumption, the results suggest the Census 2000 questionnaire did not affect reporting as Hispanic, except to reduce item nonresponse. However, the distributional effect ultimately would depend on editing and imputing of missing data.

Table 2. Hispanic origin by form type ("edited" data)[2]

	2000	1990	$t_{2000-1990}$
TOTAL	100.00%	100.00%	
Hispanic	11.17 (.2928)	11.14 (.4510)	.05
Non-Hispanic	85.50 (.3153)	74.39 (.6217)	15.8**
Missing	3.33 (.1396)	14.46 (.4891)	-21.9**

**p<.05

[2]We refer to "edited" data to remind the reader that the data have been coded and pre-edited using our simplified version of census procedures, but are not fully edited, allocated, or imputed.

C. Race Reporting

The first row of Table 3 shows that, overall, race is missing at a lower rate in Census 2000 forms than in 1990-style forms. (Race is missing if no box is checked and no codable write-in entry is present.)

Table 3. Race nonresponse rates by form type and Hispanic origin ("edited" race data)

	% of people missing data on race		
	2000	1990	$t_{2000-1990}$
Total population	3.27% (.1590)	5.95% (.3265)	-7.34**
Hispanics	20.79% (1.1361)	30.53% (1.8871)	-4.42**
Non-Hispanics	.60% (.0580)	1.53% (.1756)	-5.03**
Hisp. origin missing	13.18% (1.3853)	9.72 (1.0462)	2.00**

**p<.05

More complete response to the race item in the Census 2000 form is unexpected. Bates et al. (1995) found the order reversal and added instruction did not affect the race nonresponse rate.

In both forms, race nonresponse rates are very high for Hispanics, who are far more likely to leave the item blank than non-Hispanics. Item nonresponse is lower in the Census 2000 form for both Hispanics and non-Hispanics. About 21% of Hispanics leave race blank in Census 2000 forms, compared to 31% in 1990-style forms. The already low missing rate of 1.5% for non-Hispanics is still lower in the Census 2000 form (.6%). Finally, race nonresponse is higher in Census 2000 forms for people whose Hispanic origin is not ascertained. (There are many such fewer people in Census 2000 forms, as shown in Table 2.)

Table 4 presents distributions by form of the five major race groups—White, Black, American Indian and Alaska Native (AIAN), Asian, and Native Hawaiian and Other Pacific Islander (NHOPI)—and Some other race (SOR). Multiple responses are combined in a "Two or more races" category. (Multiple responses within a major category, such as Vietnamese and Chinese, are classified as single race reports.)

Missing or uncodable responses are excluded from Tables 4-6. These distributions thus approximate distributions that would be obtained were missing data imputed.

Table 4. Race by form type ("edited" data)

	2000	1990	$t_{2000-1990}$
TOTAL	100.00%	100.00%	
White	78.21 (.3719)	78.93 (.5893)	-1.018
Black	11.35 (.2847)	11.22 (.4231)	.250
AIAN	.48 (.0549)	.50 (.0776)	-.230
Asian	4.04 (.1884)	4.06 (.3282)	-.033
NHOPI	.17 (.0428)	.05 (.0246)	2.33**
Some other race	3.72 (.1871)	4.42 (.2992)	-1.97**
Two or more races	2.03 (.1131)	.82 (.1045)	7.87**

**p<.05

Table 4 shows three statistically significant form effects. First, as expected, reports of two or more races are more numerous in Census 2000 questionnaires, due to the new "one or more" instruction. (Nearly 1% report two or more races in the 1990-style form, however, despite the instruction to report one. In the 1990 census, multiple reports would have been edited to a single race category.)

Second, the Native Hawaiian and Other Pacific Islander category, while tiny, is larger in the Census 2000 form than in the 1990 form. This may be artifactual. The combined "Other Asian and Pacific Islander" category used in the 1990 form was split into two in the Census 2000 form. People who marked "Other API" in the 1990-style form with no write-in entry are counted in Table 4 as Asians, but some may be Pacific Islanders.

Third, contrary to what might have been expected, there is little or no evidence that the "one or more" option reduced single race reporting in the five major categories. There is a very slight, statistically insignificant reduction in the percentage reported as White. The percentages identifying with the major race groups are nearly the same or higher in the Census 2000 questionnaire. However, the percentage reported as "Some other race" is lower in Census 2000 forms, consistent with research on effects of item sequence and adding an instruction.

Tables 5 and 6 show that negligible distributional differences at the aggregate level mask some larger effects for Hispanics and non-Hispanics.

Table 5. Race by form type: Hispanics ("edited" data)

	2000	1990	$t_{2000-1990}$
TOTAL	100.00%	100.00%	
White	48.98 (1.5656)	39.88 (2.3463)	3.23**
Black	2.07 (.3719)	2.32 (.6003)	-.34
AIAN	1.48 (.3767)	.72 (.2900)	1.61
Asian	.58 (.2219)	.88 (.4309)	-.60
NHOPI	.01 (.0072)	.15 (.1212)	-1.14
Some other race	39.03 (1.5565)	51.47 (2.4192)	-4.32**
Two or more races	7.84 (.7311)	4.59 (.8595)	2.88**

**p<.05

Table 5 shows that almost 50% of Hispanics are reported as White in Census 2000 forms, compared with 40% in 1990-style forms. By about the same fraction, reports of Some other race are lower, 39% versus 51%. These large differences are probably due to the effects of reversing the order of Hispanic and race items, as well as the "one or more" option. These results are consistent with earlier research showing that reversing the sequence of race and Hispanic origin increased Hispanic reporting in White race and reduced reporting in Some other race.

The Census 2000 form also elicits more reports of American Indian among Hispanics, although the difference is not (quite) statistically significant at the .10 level. (The difference is statistically significant for the LCA stratum; this result is not shown.) The difference, if reliable, may be due to South and Central American Indians more readily identifying with "American Indian" than with the less clear "Indian (Amer.)" in the 1990-style form.

Finally, Table 6 shows a different pattern of form differences for non-Hispanics and those whose origin is not ascertained. Reports of White race are slightly but significantly (p<.10) lower in Census 2000 forms, apparently due to the option of reporting more than one race. The percentages reporting as Black, Asian, or Some other race do not differ between forms. A larger fraction report as Native Hawaiian and Other Pacific Islander in Census 2000 forms. A slightly smaller fraction report as American Indian and Alaska Native in Census 2000 forms, but the difference is insignificant, perhaps due to the small sample size for this group.

Table 6. Race by form type: Non-Hispanics or Hispanic Origin not ascertained ("edited" data)

	2000	1990	$t_{2000-1990}$
TOTAL	100.00%	100.00%	
White	81.15 (.3669)	82.43 (.5682)	-1.87*
Black	12.28 (.3066)	12.02 (.4539)	.47
AIAN	.38 (.0461)	.48 (.0805)	-1.12
Asian	4.39 (.2052)	4.34 (.3542)	.12
NHOPI	.18 (.0471)	.04 (.0195)	2.74**
Some other race	.17 (.0304)	.20 (.0581)	-.52
Two or more races	1.45 (.0980)	.48 (.0819)	7.56**

*p<.10 **p<.05

V. Conclusions

Census 2000 questionnaire changes substantially improved the completeness of race and Hispanic origin reporting in mail questionnaires. In addition, the Census 2000 questionnaire affected race reporting. Reports of two or more races more than doubled in response to the "mark one or more" instruction. There were more reports of Native Hawaiian and Other Pacific Islander race, and fewer reports of Some other race.

We find surprisingly little evidence that allowing respondents to report more than one race reduced single race reporting in the 5 major categories. The exception is a reduction in reporting of White by non-Hispanics. This conclusion holds up within each stratum as well. (Stratum results not shown.)

For some race groups, an absence of form differences at the aggregate level masks differential effects for Hispanics and non-Hispanics. Census 2000 forms elicit more reports of White race among Hispanics (the probable effect of the reversed item sequence), and fewer among non-Hispanics (probably due to the "one or more" option), resulting in no overall form difference in the fraction reported as White. The data hint at increased reporting as AIAN by Hispanics and reduced reporting by non-Hispanics in Census 2000 forms, but samples are too small to be sure. There is also the suggestion of reduced reporting as NHOPI by Hispanics and increased reporting by non-Hispanics in Census 2000 forms, but only the latter

difference is statistically significant.

The effects of questionnaire changes on Hispanic race reporting were fairly dramatic. Reporting as White increased 10 percentage points, and reporting as "Some Other Race" decreased by the same amount, in Census 2000 forms. This result reflects the "one or more" option and the reversal in item sequence, and is consistent with prior research. The results confirm the vulnerability of Hispanics' race reporting to question order and context effects. Research is needed to develop more robust measurement methods.

Despite the reversed sequence of Hispanic origin and race and question wording differences, the percentage reporting as Hispanic appears to be identical in the two forms. This result implies that changes from 1990 to 2000 in the fraction of the population identifying as Hispanic are not due to changes in design of the mail questionnaire.

Comparisons of 1990 and 2000 census data must take into account the confounding effects of questionnaire changes on race reporting. For example, the changes in the design of the mail questionnaire would result in an increase in Hispanics' reporting of White race from 1990 to 2000, *in the absence of any true changes in racial composition or identifications of the population*. These questionnaire effects may mask true population changes, or may masquerade as change when none has occurred.

Finally, we caution again that our analysis is based on data which were "edited" using a simplified version of the Census 2000 pre-edits and coding procedures, and that results may differ for fully edited and imputed data.

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