

# THE EFFECT OF A HOUSEHOLD-LEVEL SCREENING QUESTION ON THE PREVALENCE RATE OF AN ITEM

David A. Raglin

Bureau of the Census; Planning, Research and Evaluation Division; Washington, DC 20233

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## INTRODUCTION

The United States Census of Population and Housing, conducted every ten years by the U.S. Bureau of the Census, collects data using a variety of methods. Most of the information is collected via mail, where a respondent completes a form that has been mailed to the household or left there by a Census employee. For a sample of households that do not return the mail form, an enumerator is sent out to collect the information in person. There follows a separate independent survey of a sample of households, called the Integrated Coverage Measurement Survey (ICM), conducted by enumerators using computer-assisted personal interview (CAPI) techniques.

The basic data on the enumerator-administered paper-and-pencil form and the CAPI ICM survey are collected on a topic-by-topic basis. In these applications, the name and sex of each person is collected first, followed by the relationship to the first person for each of the other people in the household, then each person's age, and so on. That is different from the forms that were either mailed or left by a Census employee, which ask all of the information for the first person, then all of the information for the second person, and so on. The topic-based format works well for items that differ for each person, such as date of birth. However, if the question is one for which the answer is often the same for everyone in the household, such as race or Hispanic origin, it can seem redundant and irritating to the respondent to have the enumerator ask the question for each person when both already know what the answer is.

One solution is to introduce a screening question to determine if the question needs to be asked of each person. For Hispanic origin, the screening question would ask if anyone in the household was an Hispanic person. If so, then the question would be asked for each person individually. If not, they would all be assumed to be non-Hispanic. However, there is a concern that the screening question could produce a lower count of Hispanic people since the respondent may answer no because they might forget about a person in the household who is Hispanic without the cue of specifically hearing their name mentioned in the question. This paper will investigate if there is a downward bias in the reporting of Hispanic origin in a questionnaire using a

screening question.

Almost no research could be found on the effects of screening questions on the subsequent responses. The only research that could be found was conducted by the Census Bureau and consisted of some cognitive interviews and some interviews of enumerators who had tested a questionnaire with and without a screening question on Hispanic origin. The cognitive research indicated that "participants appeared to have no substantial problem following the (screener-style) question" (Ciochetto, 1996). Some enumerators state their preference for the screener-style questionnaire since the question did not have to be repeated for each person, but none of the respondents to the non-screening question questionnaire seemed to be bothered by having to answer the Hispanic origin question for each person individually (Bureau of the Census, 1996).

The hypothesis, based on the evidence from the cognitive interviews and the enumerators who tested the form, is that there will be no fewer people recorded of Hispanic origin due to the screening question.

## METHODOLOGY

### Survey Design

The main data set used for this analysis came from the 1996 Community Census, conducted by the Census Bureau to test the procedures for the ICM. ICM is the survey the Census Bureau will be conducting after the initial phase of data collection during Census 2000 to provide independent data which will be used to adjust the data collected in the initial phase. The "initial phase" is what one might think of as the "traditional Census". In the one-number Census, data are collected by mail, and by enumerators for those who do not respond by mail. The difference between the initial phase in Census 2000 and the traditional Census is that data will be collected by enumerators for only a sample of nonrespondents, instead of all nonrespondents. (Bureau of the Census, 1997). To preserve independence from the initial phase, the ICM assembles its own lists of households and the data are collected using different enumerators from those used in the initial phase. The ICM data are collected by a CAPI system.

The 1996 Community Census collected data from three sites; seven Census tracts in the city of Chicago, and two American Indian areas (Pueblo of Acoma, NM, and the Fort Hall Reservation, ID) (Gore, 1996). Only data from Chicago were used in this analysis since there

were few Hispanics in the American Indian areas. The seven tracts in Chicago were chosen for having characteristics of areas that are hard to count in a Census—including a high percentage of people who were foreign born, entered the country recently, or were linguistically isolated (Thompson, 1995). According to the 1990 Census, 41 percent of the people in the seven tracts were of Hispanic origin. That varied greatly by tract—three tracts had under five percent Hispanic people while three other tracts had over 70 percent (Bureau of the Census, 1990a).

In the 1996 Community Census, every household on the Census Bureau's Master Address File in those tracts was mailed a form. Households that did not respond were followed up by an enumerator visit. The independent ICM survey was then conducted; in Census 2000, the ICM survey will be a sample, but for the 1996 Community Census, the ICM was conducted for every household in the Chicago site.

In theory, data were collected for every person in the site two times, once in the initial phase and once in the ICM phase. The initial phase information collected by mail used a self-administered paper person-based form—all of the data were collected for the first person, then all of the data for the second person, and so on. The ICM survey collected data using enumerators with a CAPI system, and the data were collected using a topic-based instrument, where all of the names were collected, then all of the ages, and so on. Only a Census short form was used in this test.

For the Hispanic origin question in the ICM, a flashcard with the five Hispanic origin categories was shown to the respondent (Not Spanish, Hispanic, or Latino; Mexican, Mexican-American, or Chicano; Puerto Rican; Cuban; or Other Spanish, Hispanic, or Latino). The screening question was then asked: "Is anyone listed here/are you) Spanish, Hispanic, or Latino?", with the parenthetical phrase depending on whether there was more than one person in the household. If the answer was no, the enumerator went on to the next question. If the answer was yes, the enumerator asked, "Which of these categories best describes (each person/you)?", depending on who the enumerator was asking about at the time.

Therefore, a comparison of responses to the Hispanic origin question in the initial phase and the ICM phase can be made for people who answered the question in both phases. If there is a significant drop in the percentage of people who were classified as being of Hispanic origin in the ICM compared to the initial phase, the conclusion could be made that difference in how the data were collected, including the screening question,

caused the drop.<sup>1</sup>

However, there are other differences between the traditional Census and the ICM data collections in the 1996 Community Census. The initial phase was a self-administered mail form collected on a person-basis, while the ICM was a CAPI survey collected on a topic-basis. Difference in answers to the Hispanic origin question could be due to any of those factors—mode, person-based versus topic-based, or the screener question.

To help isolate effects due to the screening question, data from the 1995 Census Test were also examined. Only data from the Paterson, NJ site, one of three sites in the 1995 Census Test, were used, since the Paterson site was similar to the Chicago site in that each was 41 percent Hispanic in the 1990 Census (Bureau of the Census, 1990b). The 1995 Census Test was similar to the 1996 Community Census. One difference was that the 1995 Census Test used a person-based instrument in both the initial and the ICM phases. Also, the 1995 Census Test mailed Spanish and English language forms to households in targeted areas that has a large percentage of Spanish-speaking households, while the 1996 Community Census mailed only English forms (Killion, 1995). If no differences are found in the reporting of Hispanic origin between the initial and the ICM phases in the 1995 Census Test, that will be a reason to believe that the mode and differences between CAI and PAPI do not affect answers to the Hispanic origin question.

Even with the 1995 Census Test to control for mode and computer/paper-and-pencil differences, there is still a confounding of person-based for the mail responses in the initial phase of the 1996 Community Census versus a topic-based questionnaire for the ICM phase, as well as the Spanish-language mailout to some 1995 Census test households. In other words, there is no source of data collected on a topic-based basis without a screening question for Hispanic origin. That is one of the pitfalls of doing research on data collected for other purposes.

There has been little research on the effects of a person-based versus topic-based questionnaire. The only known full experimental test of a person- versus topic-based questionnaire was documented by Moore and Moyer (1998). They looked at an experiment using the

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<sup>1</sup> Data for nonresponding households in the initial phase were collected by an enumerator using a topic-based form with the screening question for Hispanic origin. In theory, since both the nonresponse followup and the ICM collected their data using a topic-based form with a screening question for Hispanic origin, an analysis of that data could be a useful control measure. However, there was a problem with the Hispanic origin nonresponse followup data that made the data unusable.

American Community Survey (ACS) conducted by the Census Bureau. ACS asks questions similar to the Decennial Census long form. The interviews were conducted using CATI and were of nonrespondents to the mail form. Despite the differences to the research topic at hand (telephone versus personal interview, length of the questionnaire, and only nonrespondents interviewed in the ACS), the results of this study are useful in assessing the effect of a person- versus topic-based questionnaire on the Hispanic origin question in this study.

Moore and Moyer found that “in general, the topic-based instrument seems to have elicited more reports of rare characteristics—e.g., more Asian/Pacific Islanders, more naturalized citizens and non-citizens, more non-English speakers, etc.” It should be noted that none of those questions were asked with a screening question in the topic-based questionnaire. If these results held true in this study, the expectation would be that there would be more reporting of Hispanic origin with the topic-based questionnaire.

Moore and Moyer also looked at the consistency of reporting within a household for a given item. The person- versus topic-based questionnaires could produce different levels of consistency because in the former, the questions on a given topic for different people are spread out while in the latter, they are grouped together. They found “it (was) impossible to draw from these findings any general conclusions about instrument differences in the tendency to elicit spurious uniformity, or spurious nonuniformity” in responses.

Previously, Moyer (1995) found in a literature review nothing in the survey methodology literature that advocates either a person-based or a topic-based format, mainly because of a lack of test done to examine the formats. Moore (1996) reported that most papers and references on questionnaire design focus on individual questions and not the flow of the questionnaire as a whole. Based on the laboratory study that Moore performed, he concluded that “the results generally support the notion that a topic-based CAI instrument...may yield real benefit over a person-based sequence.” Ciochetto (1996) found that enumerators felt the topic-based format was more natural—some improvised the topic-based format incorrectly in a paper-and-pencil grid-designed form.

The research on person- versus topic-based questionnaires is not extensive, but with one exception, nothing has been found to indicate any reason to believe that that issue should affect the responses to the Hispanic origin question. The finding by Moore and Moyer that there seems to be more reporting of rare characteristics in the topic-based questionnaire would, if anything, lead one away from the hypothesis of this paper—that there

should be less reporting of Hispanic origin in the topic-based questionnaire with the screening question.

## Measures

This paper measures the prevalence rate of Hispanic origin. The prevalence rate is defined as the percentage of people who respond that they are of Hispanic origin, or the number of people who had a response as being of Hispanic origin divided by the number of people who had a response to the Hispanic origin question. No editing or imputation of the data was performed.

The data analysis will be conducted primarily using two statistics. The net difference rate (NDR) is the difference in the proportions reporting Hispanic origin in the ICM phase compared to the initial phase. The gross difference rate (GDR) is the proportion of people for whom there were different answers in the initial and ICM phases (Biemer and Forsman, 1992). One of the advantages of these statistics is that they do not assume that the data from one of the phases is better than the other (Biemer, 1997).

The NDR and GDR will be computed individually for the 1996 Community Census and the 1995 Census Test and the differences in the NDR and GDR between the two surveys will be compared. The below explanation shows that the net difference rate is important because it is a function of the biases of the surveys.

Define the percentage of people who were Hispanic in test  $i$ , phase  $j$ , as  $p_{ij}$ , where  $i = 1995, 1996$ , and  $j = \text{initial phase, ICM phase}$ . The expected value of their percentage of Hispanic people in test  $i$  and phase  $j$  is defined as  $E(p_{ij}) = P_{ij} + B_{ij}$ , where  $P_{ij}$  is the true percentage of Hispanic persons in test  $i$  and phase  $j$  and  $B_{ij}$  is the bias in the estimate of the true percentage (Biemer and Forsman, 1992).

The expected net difference rate,  $E(p_{96ICM}) - E(p_{96ini})$ , is therefore  $(P_{96ICM} - B_{96ICM}) - (P_{96ini} - B_{96ini})$ . But, since the initial and ICM phases are collecting data for the same place,  $P_{96ICM} = P_{96ini}$ , so the NDR reduces to a difference in the biases,  $B_{96ini} - B_{96ICM}$ . The 1995 NDR similarly reduces to  $B_{95ini} - B_{95ICM}$ . Therefore, the difference in the NDRs,  $NDR_{96} - NDR_{95}$ , is  $(B_{96ini} - B_{96ICM}) - (B_{95ini} - B_{95ICM})$ . The 1995 and 1996 initial phases were conducted in a similar manner—person-based questionnaire administered by mail—with a similar questionnaire except for the language difference. If it is assumed that the bias in the two initial phase surveys would be the same, the difference in the net difference rates reduces to  $B_{95ICM} - B_{96ICM}$ . The difference in the net difference rates is just the negative of the differences in the biases in the 1995 and 1996 ICM phases. The difference in the net difference rate can therefore show if the 1996 ICM has a larger downward bias in the

reporting of Hispanic origin than the 1995 ICM, a bias that may be attributable to the screening question.

The difference in the gross difference rates does not reduce to a function of quantities of interest like bias or simple response variance without making several strong assumptions, so a significant difference in the gross difference rates only will tell that one of the surveys has a larger gross difference rate.

If the 1996 net difference rate is significantly less than zero and the 1996 rate is significantly more negative than the 1995 one, there is an indication that the screening question may be causing a bias in the answer to the Hispanic origin question in the direction of underreporting Hispanic origin in the 1996 ICM phase. If the 1996 gross difference rate is significantly larger than the 1995 one, there is evidence that respondents' answers changed more in the 1996 test.

It needs to be noted that both tests were purposive samples, but standard errors were calculated as if the sample was a probability sample from a larger population<sup>2</sup>. The standard errors were calculated with WesVar, using a jackknife variance estimation technique with different clustering of the data based on geography as well as if the sample was a simple random sample, and what was determined to be significant was similar no matter the method of clustering or not clustering. The significance of all differences was calculated based on one-tailed paired t-tests with  $\alpha = .05$ . However, since this is not a probability sample, the results from any significance tests on this data should be interpreted very cautiously.

Two other concepts will be used in the analysis. If the screening question in the 1996 Community Census was answered "yes", then the enumerator asked the Hispanic origin of each person in the household individually. If the screening question was answered "no", then the enumerator went on to the race question and did not ask the Hispanic origin of each person. Therefore, the households that were presumably affected by the screening question in the 1996 test would be ones where everybody in household was non-Hispanic in the ICM phase. People in those households will be referred to as "non-Hispanic ICM households".

The other concept is a "mixed" household-- in either the initial or ICM phases, there was a mix of people with

and without Hispanic origin. Mixed households are of interest because one might expect a household with a mix of Hispanic and non-Hispanic people to have more problems answering the Hispanic origin question with a screener than a homogeneous household.

## RESULTS

### Comparison of 1996 Community Census and 1995 Census Test Data

Below are the results to the Hispanic origin question from the 1996 Community Census and the 1995 Census Test. Only people who answered the Hispanic origin question in both the initial and ICM phases were included in the analysis.

**Table 1: Hispanic Origin, 1995/1996 Census Tests**

1996 Community Census--Chicago			
ICM--Topic w/ Screener			
Initial Phase	Hisp	N-Hisp	Total
Hispanic	1310	68	1378
Non-Hispanic	30	3195	3225
Total	1340	3263	4603

1995 Census Test--Paterson, NJ			
ICM--Person w/o Screener			
Initial Phase	Hisp	N-Hisp	Total
Hispanic	1999	76	2075
Non-Hispanic	93	3637	3730
Total	2092	3713	5805

Statistics		
	1996	1995
% Hisp. Origin, ICM	29.1	36.0
% Hisp. Origin, Initial Phase	29.9	35.8
Net Difference Rate (NDR)	-0.8*	0.3
Gross Difference Rate (GDR)	2.1	2.9

\* - Significantly different from zero at  $\alpha = .05$ . The difference in the NDRs between 1996 and 1995 is also significantly different from zero.

The significance tests indicate a difference in the net difference rates for the 1996 test but not for the 1995 one. There is also the indication of a significant difference between the differences in the 1996 and 1995 net difference rates. The direction of the differences shows a significant decline in the reporting of Hispanic origin in the ICM phase of the 1996 Community Census where a topic-based form with the screening question was used, but no such decline for the person-based 1995 Census Test ICM phase. Therefore, there is reason to believe there is a larger downward bias in the reporting of

<sup>2</sup> The ICM phase of the 1995 Census Test, unlike for the 1996 Community Census, was a sample of the areas of Paterson that were covered in the initial phase. However, since Paterson itself was purposively sampled, a sample from a purposive sample should still be considered a purposive sample. Therefore, no sampling variances were calculated for the Paterson data, and the data presented here is unweighted.

Hispanic origin in the 1996 Community Census ICM phase than in the 1996 initial phase or the 1995 Census Test ICM phase. No evidence was found that the gross difference rates or their differences were significant.

Overall, the results are consistent with the concern that the screening question causes a decrease in the reporting of Hispanic origin. That is not necessarily the reason for the drop, though. Remember there is a confounding of the screening question, the person- versus topic-based questionnaire format, and the language(s) the mailed forms used. How can the effects of each (and other effects) be sorted out?

### Mixed Households

It is not surprising that mixed households have significantly more discrepancies in reporting Hispanic origin than non-mixed households. If everyone in the household in actuality has the same ethnicity, answering an ethnicity question should not be difficult. Table 2 gives data for mixed households in a format similar to Table 1, and it shows that mixed households had an especially difficult time answering the Hispanic origin question. Mixed households were defined as households that had a mix of Hispanics and non-Hispanics in either the initial or ICM phases.

**Table 2: Hispanic Origin, 1995/1996 Census Tests Only Mixed Households**

1996 Community Census--Chicago			
ICM--Topic w/ Screener			
Initial Phase	Hisp	N-Hisp	Total
Hispanic	104	36	140
Non-Hispanic	17	74	91
Total	121	110	231

1995 Census Test--Paterson, NJ			
ICM--Person w/o Screener			
Initial Phase	Hisp	N-Hisp	Total
Hispanic	191	46	237
Non-Hispanic	56	102	158
Total	247	148	395

Statistics		
	1996	1995
% Hisp. Origin, ICM	52.4	62.5
% Hisp. Origin, Initial Phase	60.6	60.0
Net Difference Rate (NDR)	-8.2*	2.5
Gross Difference Rate (GDR)	22.9	25.8

\* - Significantly different from zero at  $\alpha = .05$ . The difference in the NDRs between 1996 and 1995 is also significantly different from zero.

Although only about five percent of households in the 1996 Community Census were mixed, they had over half of the discrepancies between the initial and ICM phases; similar results were found for the 1995 Census Test. That can be seen in the much larger gross difference rates than in Table 1. The net difference rate for the 1996 Community Census, and the difference in the net difference rates between 1996 and 1995 were significantly different from zero, same as in the tables before.

### Other Research

The evidence in Tables 1 and 2 is consistent with the concern that the screening question is causing less reporting of the item of question. However, other research was conducted that seems to indicate that there was some decreased reporting of Hispanic origin that cannot be accounted for by the screening question.

Table 1 shows there were 68 people that were reported as Hispanic in the initial phase of the 1996 Community Census and non-Hispanic in the ICM, compared to 30 going the other way. This difference was the basis of the significant findings in Table 1. However, of the 98 total discrepancies, 20 of them went from Hispanic to non-Hispanic in non-mixed households with more than one person while only three went the other way. That is surprising since a whole-Hispanic household (which is what the initial phase results indicate) should not be affected by the lack of cues caused by the screening question. In fact, the only time there were nominally more people switching from non-Hispanic to Hispanic was when the initial phase household was mixed and the ICM one was not, which is the opposite of one's intuition.

### CONCLUSIONS

There is evidence to believe that the ICM questionnaire used in the 1996 Community Census helped precipitate a decrease in the reporting of Hispanic origin. The 1996 Community Census had less reporting of Hispanic origin in the ICM, when a topic-based questionnaire with a screening question was used, than in the initial phase. A similar effect was not found in the 1995 Census Test, where the ICM data were collected on a person-basis with no screening question. This effect was magnified in households with a mix of Hispanics and non-Hispanics.

It must be noted that differences between the 1996 initial and ICM phase questionnaires in mode and computer/paper-and pencil administration were controlled for as best as possible by the 1995 Census Test data. Despite those efforts, there were still differences in person-based versus topic-based questionnaire format as well as with the screening question that was the object

of interest for this paper. However, research by Moore and Moyer (1998) did not indicate any reason that the person- versus topic-based questionnaire issue should adversely affect the results of this analysis—the only possible effect would indicate more reporting of Hispanic origin with a topic-based questionnaire, not less.

There are reasons to believe that some of the decrease is due to other effects, though, than the screening question. The most common situation was where a whole household said they were Hispanic in the initial phase but non-Hispanic in the ICM phase. There was not a large number of households where it seems that the respondent forgot about a person of Hispanic origin while answering the screening question, which was a great concern.

The effects of screening questions on an enumerator-administered topic-based questionnaire is one that needs further research, too, along with the issue of person-based versus topic-based questionnaires. Only the Moore and Moyer experiment could be found on the former, and little was available on the latter. In particular, an experiment in the field—going beyond small-scale cognitive interviews—of the screening question issue should be performed. This paper is a good example of the limitations of analyzing data that were not collected for the purposes of the study in question. There were effects that were confounded. This paper advances the knowledge of the field, but leaves almost as many questions as answers. However, it also blazes a trail for further work which will give more concrete answers to the effects of screening questions.

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