

An Item Nonresponse and Log-Linear Analysis of the Spanish Language Forms Availability Test

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INTRODUCTION

In 1993 the Census Bureau implemented the Spanish Forms Availability Test (SFAT). The SFAT was part of a research and development program by the Census Bureau designed to assist in formulating policy and design options for the Year 2000 Census of Population and Housing. The purpose of the test was to determine the effect of the availability of mailing Spanish forms to targeted areas with high concentrations of persons who speak Spanish and who do not speak English well or at all. Specifically, the test sought to determine whether making Spanish forms available would increase response rates in target areas, the reaction of non-Hispanics living in those areas to receiving Spanish forms and the effect on item nonresponse. The test consisted of two strata divided into three panels: a control panel in which an English language form was mailed to each household; a dual forms panel that included an English and a Spanish language form and a bilingual panel in which each household received a bilingual booklet questionnaire with English and Spanish questions back-to-back.

This study reports some of the results from the test, including item non-response effects and the distribution of responses for the Spanish and English forms within and across panels. Using log linear analysis the demographic characteristics of persons choosing a Spanish or English language questionnaire by treatment and by language of form returned is examined.

BACKGROUND

The Spanish Forms Availability Test (also known as the 1993 National Census Test III) was designed to determine, among other things, if making Spanish language census forms available by mail will increase response rates and improve data quality in areas with high concentrations of persons who speak Spanish and who do not speak English well or at all. The sample for this test was selected from the 1990 Address Control File (ACF) for mailout/mailback areas. The test universe was divided into two sampling strata. The first stratum consisted of block groups containing between 15% to 30% linguistically isolated (LI) households and the second stratum contained block groups where 30% or more of the households were LI.

An LI household is a household where no household member 14 years of age or older speaks English or does not speak English very well. The test targeted LI households where Spanish is spoken based on 1990 census data.¹ The targeted number of housing units in the SFAT sample design was 24,000. The sample was allocated equally across strata and three panels. This resulted in six samples with a target sample size of 4,000 housing units each per stratum per panel.

The first panel, the control panel, was an English language census form. The second panel, the dual forms panel, contained an English language census form identical to the one in the first panel and a Spanish language census form. And the third panel, the bilingual forms panel, contained forms identical to those in the second panel but the English and Spanish forms were converted into a back to back version.² All panels received the "full implementation strategy" which consisted of a pre-notice letter, an initial questionnaire, and a reminder postcard. The item nonresponse analysis contained in this paper is based upon data captured from 7,695 English language census forms and 1,780 Spanish language forms. These forms represent a total of 28,222 persons. Thus, 81.2 percent of the returned forms were English language forms and the remaining 18.8 percent were Spanish language forms.³

Comparisons of completion rates for the SFAT and of other earlier tests cited here should be based on results from their control panels, which used the same booklet census form. Though comparisons of the completion rates of "high linguistically isolated areas" in the SFAT sample and those of "low response areas" (areas with 64 percent or more combined Black and/or Hispanic population) are appropriate, the results should be carefully considered because of differences in respondent characteristics.

For the SFAT, the completion rate in high linguistically isolated areas was 38 percent, somewhat less than for other tests. In the Mail and Telephone Mode Test (MTMT) the completion rate in low response areas was 54.9 percent (West, 1993). For the Appeals and Long Form Experiment (ALFE), the completion rate was 52.3 percent in low response areas (Treat, 1993). The completion rate in the Simplified Questionnaire Test (SQT) in low response areas was 45.2 percent (Dillman, 1993).⁴

In the analysis, average item nonresponse is defined as the average of cases where a question which should

have been answered was left unanswered.⁵ All estimates are accompanied by standard errors in parentheses. The overall national estimates were generated by CPLX (Fay, 1989) and item-by-item estimates were produced by VPLX (FAY, 1990); these are computer estimation program packages designed to adjust for SFAT's clustered sample design. Log-linear analyses were conducted using CPLX. VPLX allows for weighted pairwise t-tests between panels and estimates variances adjusting for clustering in the sample. All significant differences reflect a confidence interval of 90 percent, the Bureau standard.

ANALYSIS

There are four parts to this analysis. The first examines the effect of panel assignment on item nonresponse rates. The second looks at the effect of Hispanic origin on item nonresponse while controlling for panel assignment. In part three we reintroduce form language and examine how this feature affects item nonresponse for Hispanics. We use the information contained in parts one through three of our analysis to develop and fit log-linear models to the SFAT sample. We then conclude with a discussion of results from log-linear analysis followed by our recommendations.

For the most part, comparisons of average item nonresponse rates for stratum 1 vs. stratum 2 vs. the overall sample yields similar patterns. Thus, stratum differences are not discussed.

The Effect of Panel Assignment on Average Item Nonresponse Rates⁶

Table II displays overall estimates of average item nonresponse and standard errors for the population and housing questions by panel. Very little difference in population question average item nonresponse rates by panel were found. For the housing questions however, significant differences exist between the experimental and control panels. Among the housing questions, average item non-response rates in both experimental panels were higher than in the control panel. No significant differences for the housing questions were found between the dual and bilingual panels.

The Effect of Hispanic Origin and Panel on Average Item Nonresponse Rates

Table III displays national estimates of overall average item nonresponse for Hispanics and non-Hispanics by panel. The Hispanic origin classification was derived from the Hispanic origin question (item 5) on the questionnaire. This item was left blank, overall, in 1342 cases (4.8 percent), in stratum one, 801 cases (5.6 percent) and in stratum two, 541 cases (3.9 percent).

Among Hispanics, significant differences in average item nonresponse by panel exist for both population and housing questions. The experimental panels for both types of questions out performed the control panel.

Among non-Hispanics, however, significant differences between the control and experimental panels were not found.

Looking at within panel differences, significant differences are also present for both population and housing questions between Hispanics and non-Hispanics. Within each of the three panels the average item non-response rates for Hispanics was significantly greater than for non-Hispanics.

The Effect of Form Language on Average Item Nonresponse

For the next step of our analysis we examined the extent to which census form language (English or Spanish) affects average item nonresponse rates for the Hispanic portion of our sample.⁷ The results are shown in Table IV. Among Hispanics, differences in average item nonresponse for population questions by language are significant as are the differences for housing questions. In both cases, average item nonresponse rates in the Spanish forms are higher than those for the English forms.

We believe that this occurred because persons who would have not otherwise responded to the census did so because they were offered a choice between an English language and a Spanish language census form. Completion rate results provides support for this supposition. In stratum 2, the difference in completion rates between the dual forms panel and the control forms panel was 4.6 percentage points and the difference in completion rates between the bilingual panel and the control forms panel was 3.7 percentage points. These differences are statistically significant. No significant differences in completion rates were found in stratum 1 (Corteville 1994).

Results From Log-Linear Analysis

Since we found that panel assignment and language of census form were among the key variables to influence average item nonresponse we fitted log-linear models to determine the significance of the interaction between panel assignment and language of census form with average item nonresponse for each of the demographic and housing questions on the census form.

Reported in Table V are the results for the population questions and in Table VI for the housing questions. There are four models in all with the demographic or housing variables as response variables. The response variables were coded zero if the demographic or housing item under consideration had no response (nonresponse) or coded one if the demographic or housing item under consideration had a response (response). Other variables were panel assignment denoted in the chart by "T" and language of the census form returned to the Census Bureau, denoted by an "L".⁸

Shown in the tables are p-values which indicate

whether the model fits the data. P-values greater than .05 indicate a model fits the data, meaning that expected cell frequencies do not significantly differ from the observed cell frequencies.

Our approach was to fit models by introducing distinctive interaction terms between the response variable (R), panel assignment (T) and form language (L). Through this process we were able to eliminate models that did not fit the data while identifying the most parsimonious models that did.

Demographic Census Items: Results Presented in Table V

Model 1 includes the interaction between the response variable and panel assignment {RT}, panel assignment and language of census form {TL} and the response variable and language of census form {RL} for population questions.

As shown in Table V, model 2 is similar to model 1, however it excludes the interaction response by panel assignment term {RT}. This model does not provide a fit of the data for the marital status and date of birth variables. In model three the interaction term response by language of census form {RL} is omitted. This model only fits the data for two of the six demographic census items (date of birth and relationship). Finally, the results for model 4 are shown which are virtually the same as for model 3.

Thus we conclude that item nonresponse does not differ by panel assignment jointly with language of census form.

Housing Census Items: Results Presented in Table VI

Using the same rationale, four similar models were estimated for the housing data. The results are shown in Table VI. The p-values for model 1 indicate that it fits the data for most of the housing variables.

Model 2 is more parsimonious than model 1 because it excludes the interaction term response by panel assignment {RT}. Models 3 and 4 are a poor fit of the data for all the variables except rent and property value.

Thus we conclude that a three-way interaction of response by panel assignment and language of census form and a two way interaction of response by panel assignment is insignificant.

Log-Linear Analysis: Conclusion

The log-linear analysis just presented reveals that, for both demographic and housing items, no three-way interaction of response by panel assignment by language of census form was detected. The response by treatment effect was insignificant for all housing and most demographic variables. Consequently, item nonresponse does not differ by panel assignment jointly with language of census form. This finding supports our average item nonresponse analysis which revealed that there are no significant differences in item nonresponse between the

dual and bilingual panels but there are significant differences in item nonresponse between the Spanish and English language census forms. The English language census forms had lower item nonresponse rates than the Spanish language census form regardless of panel assignment. The implication of our finding for the Census Bureau is that, in terms of item nonresponse, it does not matter if the Census Bureau mails out a dual or bilingual census form, what does matter, however, is the language of the census form.

CONCLUSIONS AND RECOMMENDATIONS

Findings from similar earlier tests that included an item nonresponse analysis suggest that the item nonresponse rates from the SFAT are not unusual since the population targeted is hard to reach with a high rate of illiteracy.

Although our findings may lead some to the seemingly simple and obvious conclusion that, mailing out Spanish language census forms to areas that have a sizeable number of Hispanics who speak little or no English produces relatively poor quality data, the implication of our work must be examined in light of other information available to the Census Bureau.

It is likely that many Hispanics who responded using a Spanish language census form would have not responded at all if they had only received an English language census form. And in fact, the inclusion of a Spanish language census form in addition to the English form significantly improved the completion rate in stratum 2 by two to six percentage points (Corteville, 1994).

It is very likely that Hispanics who filled out the Spanish language census form not only have little or no knowledge of English but are also semi literate in Spanish. In fact, two qualitative studies commissioned by the Census Bureau indicate that one of the reasons why Hispanics find the Spanish language census form difficult to understand is because they have low or no literacy in Spanish (Kissam et al. 1993; Elias-Olivares and Farr 1992).

Given our results, we offer the following recommendations for consideration. Most of our recommendations are currently being implemented while others are under consideration.

Mailout/mailback techniques alone will not provide the Census Bureau with good quality data from Hispanics living in areas where Spanish is the dominant language. Although it has been established that, in the SFAT sample, mailing out Spanish language census forms in addition to English language census forms significantly improves the completion rate by about 2 to 6 percent in stratum 2, our analysis shows that Hispanics who fill out the Spanish language census form and return it by mail omit a significant amount of information compared to

Hispanics who fill out the English language census form or non-Hispanics. We believe, and have evidence that show, that Hispanics who do not know English or know very little English are also likely to be less literate in Spanish. We therefore recommend that the Census Bureau target areas with high concentrations of linguistically isolated Spanish speaking households for enumeration that entails face-to-face interviews with Spanish speaking interviewers or assistance provided by community based organizations with bilingual staff.

Implementation of the aforementioned recommendation can be costly and therefore feasible only in carefully selected areas. However, mailout/mailback may result in better quality data if the difficulties with the current Spanish language census form are addressed. We have evidence from Census Bureau sponsored research that the current Spanish language census form provides an often insurmountable challenge for some Hispanics, especially those with no or little knowledge of English and with less than high school education. We recommend that the Census Bureau develop a Spanish language census form that will be easily understandable to most Hispanics, even those with little education. Non-Census Bureau surveys have been successfully translated from English into Spanish using proven translation techniques supported by in-depth or cognitive interviews. We believe that the same results can be achieved with the census forms.

Regarding which of the two Spanish/English census forms (dual forms or bilingual forms) provide better data, our findings indicate that there is no statistically meaningful difference between the two. What is important, however, is the language of the form. As noted above, item nonresponse rates are generally significantly higher on the Spanish language form than on the English language form.

NOTES

1. The test universe excludes any state with less than 3,000 LI households. About one third of the total U.S. Hispanic population is in the test universe.
2. In the dual forms panel (panel two) 25 households returned both the English language and the Spanish language census forms. In the bilingual forms panel (panel three) 80 households provided information on both the English language and the Spanish language census forms. Since these households provided information on two census forms they are considered duplicate households. For both the dual forms panel and the bilingual forms panel, data entered on the English census forms were used in the analysis.
3. The number and proportion of data captured English and Spanish language census forms by panel are as follows. Control panel: English forms = 3,004 (99.1%) and Spanish forms = 26 (.9%); Dual panel: English

forms = 2,296 (70.5%) and Spanish forms = 961 (29.5%); Bilingual panel: English forms = 2,395 (75.1%) and Spanish forms 793 (24.9%).

4. See Table 1 for completion rates by panel and by stratum.
5. Unless otherwise stated, the item nonresponse rate was determined by dividing the number of cases where a questionnaire item was left blank by the total number of cases eligible to respond to the item under consideration multiplied by 100. A response of "don't know" or "refused" was considered a nonresponse.
6. A more detailed discussion of results presented in this paper is found in de la Puente and Wobus (1994a). Because of space limitations we present overall average item nonresponse rates by panel for demographic and housing items. Tables for our discussion of item nonresponse for stratum 1 and stratum 2 by panel can be found in de la Puente and Wobus (1994a).
7. Throughout the paper form language refers to the language of the census form mailed by the respondent to the Census Bureau.

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Table I

Spanish Form Availability Test (SFAT) Final Completion Rates

Treatment	National	Stratum 1 (Low LI Areas)	Stratum 2 (High LI Areas)
Control	40.4 (.59)	41.6 (.80)	38.0 (.79)
Dual	42.9 (.60)	43.0 (.80)	42.6 (.80)
Bilingual	42.2 (.59)	42.4 (.80)	41.7 (.80)

Mail and Telephone Mode Test (MTMT) Final Completion Rates

Treatment	National	1990 LRA Stratum	1990 HRA Stratum
Control	70.6 (.9)	54.9 (1.1)	72.7 (1.0)

Appeals and Long Form Experiment (ALFE) Final Completion Rates

Treatment	Overall	1990 LRA Stratum	1990 HRA Stratum
1990 Short Form	67.2	52.3	69.2

Simplified Questionnaire Test (SQT) Final Completion Rates

Treatment	Overall	1990 LRA Stratum	1990 HRA Stratum
Booklet	66.8	52.7	68.7

LRA = Low Response Area
HRA = High Response Area

Table II

Overall Average Percent Item Nonresponse
by Panel: Demographic and Housing Characteristics
(Standard Errors in Parenthesis)

	Control Panel	Dual Panel	Bilingual Panel
Population Questions	3.4 (.002)	3.6 (.002)	4.0 (.002)
Housing Questions	12.5 (.005)	15.7 (.006)	15.1 (.006)

Table III

Overall Average Percent Item Nonresponse
by Panel for Hispanics and non-Hispanics: Demographic and Housing Characteristics
(Standard Errors in Parenthesis)

	Control Panel	Dual Panel	Bilingual Panel
Hispanics			
Population Questions	2.7 (.002)	3.2 (.002)	3.4 (.002)
Housing Questions	11.7 (.007)	16.7 (.008)	15.3 (.007)
Non-Hispanics			
Population Questions	.92 (.001)	.76 (.001)	1.2 (.002)
Housing Questions	7.2 (.006)	7.6 (.007)	8.5 (.007)

Table IV

Overall Average Percent Item Nonresponse
by Form Language - Hispanics: Demographic and Housing Characteristics
(Standard Errors in Parenthesis)

	English	Spanish
Population Questions	2.8 (.001)	3.9 (.002)
Housing Questions	11.8 (.005)	21.6 (.009)

TABLE V

Results of Log-Linear Analysis
For Demographic Census Questions

(p-values)*

Model	Sex	Marital Status	DOB	Relation-ship	Hispanic Origin	Race
1 {RT}{TL}{RL}	.32	.21	>.5	.48	>.5	.5
2 {TL}{RL}	.18	.04	.03	>.5	>.5	>.5
3 {RT}{TL}	.02	.00	>.5	.2	.00	.00
4 {R} {TL}	.03	.00	.04	.2	.00	.00

* = P-values greater than .05 means that the model fits the data.

R = The "response variable", that is, the housing variable indicated by the columns in the table.

T = The "treatment", that is, the dual forms or bilingual forms panel.

L = Language (Spanish or English) of the census form returned to the Census Bureau.

TABLE VII
Results of Log-Linear Analysis
For Housing Census Questions

(p-values)*

Housing Response Variables

Model	Structure	Acres	Commercial Property	Rooms	Tenure	Rent	Meals	Property Value
1 {RT}{TL}{RL}	>.5	.41	>.5	>.5	>.5	.36	>.5	.28
2 {TL}{RL}	>.5	.50	>.5	>.5	>.5	>.32	>.5	>.5
3 {RT}{TL}	.00	.00	.00	.00	.00	.2	.00	.10
4 {R} {TL}	.00	.00	.00	.00	.00	.45	.00	.38

* = P-values greater than .05 means that the model fits the data.

R = The "response variable", that is, the housing variable indicated by the columns in the table.

T = The "treatment", that is, the dual forms or bilingual forms panel.

L = Language (Spanish or English) of the census form returned to the Census Bureau.