

The Effects of Item and Unit Nonresponse on Estimates of Labor Force Participation.

John Dixon, Bureau of Labor Statistics, Room 1950, 2 Massachusetts Ave., NE,
Washington, DC 20212-0001

Dixon_J@bls.gov

Keywords: "Survey nonresponse, Item nonresponse"

Introduction

Recent studies of the Current Population Survey by Tucker and Kojetin (1997) and Dixon (2001) showed that unemployment rates were related to unit nonresponse in the CPS. Since households are in sample for 8 months in the CPS (over a 16-month period), there is an opportunity for households to leave or return to the sample. However, the number of "converts", (households that agree to an interview after a refusal in a previous interview) do not completely balance the number of "attriters" (those households that drop out of the sample after participating), so their relative effect may not be offset. Moreover, these groups may differ on important characteristics, e.g.; race, age, or gender. The current study examines the nature of item nonresponse and the relationship with subsequent unit nonresponse and the effect on estimates of labor force participation.

Item nonresponse

Item nonresponse is often considered a source of nonsampling error. Mason, Lesser and Traugott (2002) point to several surveys which have found bias due to item nonresponse. Item nonresponse may increase with reductions in unit nonresponse if respondents who are reluctant to participate decline to answer sensitive questions.

Item nonresponse can be a sensitive predictor of unit nonresponse. Loosveldt, G., Rickery, J., and Billet, J. (1999) found that increases in item nonresponse were related to higher refusal probability (unit nonresponse) in subsequent panels of a survey. Item characteristics were hypothesized to relate to bias. If the refusal is related to the survey topic, then bias is highly likely. Threatening or sensitive items also are likely to produce bias. Income items are a common example, where response may be related to the survey sponsor and the survey topic. Other item characteristics which may produce refusal are: difficulty, memory demand, access to information (such as financial records), response complexity, and question format.

Item and respondent characteristics can interact to produce item nonresponse. Murata and Gwartney (1999) used a theoretical grouping

of items and expert rating of items to explore their characteristics. For respondent characteristics they found more education to be related to higher item nonresponse, especially for women and Hispanics, although the effect was confounded with age. For question characteristics more "important" questions had less nonresponse, and more salient questions usually produced lower item nonresponse. Question vagueness, difficulty, multiple tasks, multiple concepts, and question length were all related to higher item nonresponse. Question characteristics seemed to have a stronger effect than person characteristics, but their survey had an unusual variety of questions. In contrast, Borgers and Hox (2001) found person characteristics more predictive of item nonresponse than question characteristics.

The impact of item nonresponse on error may vary considerably by survey. Mason, Lesser and Traugott (2002) found more callbacks and refusal conversions didn't improve estimates in the surveys they reviewed. Benchmarking to external sources revealed some potential bias in some surveys. They suggested that item nonresponse may be more of a problem than unit nonresponse. Where unit nonresponse is a problem item nonresponse is often also a problem. Efforts to convert refusals often produced higher item nonresponse in the surveys they studied, making the efforts less effective in terms of the estimates.

Design

The CPS is the monthly household labor force survey for the United States conducted by the U.S. Census Bureau for the Bureau of Labor Statistics. Approximately 48,000 eligible households are sampled each month in a two-stage clustered design. For the current analysis households were matched for the years 1996 through 1999. Persons in the household who were not eligible for the labor force (e.g. under 16 years old) were excluded.

Method

Thirty-three items were selected because they had some refusals. Using factor analysis of the refusal pattern and the items relationship to

subsequent refusal and current employment status 6 items were used. Two factors were just defined by 3 items each. Other factors were also possible, but they weren't explored in this study.

The Work scale consisted of Family Income, Age, and for those not employed: "Do you want a job?". The Personal scale consisted of "National Origin or Descent", "Were you ever in the armed forces?", and "Are you a U.S. Citizen?".

The resulting scales and items were used in regressions predicting subsequent refusal (during any of the remaining 7 months in sample) and unemployment status (to detect possible bias).

Results

Tables 1a and 1b in the appendix show the results of regressions predicting subsequent unit refusal from the first month's item refusal. Tables 2a and 2b show the relationship between item refusal and unemployment status.

Predicting Unit Nonresponse

Table 1a shows the odds-ratios and probabilities for 4 logistic models. The scale of the total of the items showed a higher probability of subsequent refusal related to the number of items refused in the first panel (61.74, $p < .0001$).

The two subscales (Work, Personal) also showed higher probability of subsequent refusal. The Work scale was relatively lower when modeled by itself (15.49) compared to the Personal scale (24.59), but its' unique contribution was higher (11.43) compared to Personal (3.65) when modeled together.

The items that make up the Work scale were associated with higher subsequent refusal both separately and in combination with the other 5 items: (Income; 2.92, 2.43, Age; 4.49, 1.78, Want job; 8.45, 2.57). Their unique contributions to the prediction after adjusting for the other items was higher than the items in the Personal scale.

The items from the Personal scale showed a similar relationship with odds ratios from the separate regressions and in combination: (Origin; 5.44, 1.48, Armed forces; 6.17, 1.95, Citizen; 6.75, 1.59).

Labor Force Status

Table 2a shows the 4 models relating the scales to unemployment status. The Total scale shows more refusal related to lower unemployment probability (.205, $p < .0001$).

The Work subscale showed a stronger effect (.412) than the Personal subscale (.227). In the multivariate model the Work subscale was significant, even after adjusting for the Personal subscale. This indicates that the unique

contribution of the Work subscale added more to the model, while the relationship of the Personal subscale to unemployment could be modeled by the Work subscale.

In Table 2b the items Income and Age from the Work subscale had the strongest relationship to unemployment. However, only Income remained significant with the addition of the other variables in the multivariate model. The "Do you want a job?" item was difficult to estimate because it would only be asked of those without jobs, both unemployed and not-in-workforce respondents. The direction and significance of the other coefficients didn't change with deleting the item.

Education

No relationship was found between education and subsequent refusal, but a lower probability of unemployment was associated with higher education, so education was examined as a covariate in those models.

Table 3a shows that adjusting for education the Total scale relates to a lower probability of unemployment. This was similar for the Work scale, and most of the individual items (Table 3b).

Age

There was a slight relationship between higher age and lower subsequent refusal and lower unemployment. None of the results of the models were changed by adding age as a covariate, so the results aren't presented here.

Discussion

Previous research has found higher unemployment associated with unit refusals. This study found the interesting effect that item refusals were associated with subsequent unit nonresponse, as well as with lower unemployment. This is likely due to attrition refusals being related to lower unemployment which is consistent with the item refusals related to lower current unemployment, but predictive of future unit nonresponse.

The relatively strong relationship of the Work scale to labor force measures is understandable in terms of why respondents might refuse. If they have privacy or confidentiality concerns, but have agreed with the purpose of the survey, they may not respond to items that they don't perceive as relevant, such as the Personal scale items. In contrast, those who are willing to respond to the survey, but not to finance and work related items beyond labor force participation are likely to be different from the other respondents. In this case they were less

likely to be unemployed. This agrees with the Loosveldt et.al. study.

The effects of education disagreed with the literature (Murata and Gwartney) finding higher education not strongly related to higher nonresponse for the total population. It was slightly related to lower unemployment. It enhanced the relationship between item refusal measures and unemployment, indicating that education is related to unemployment in a different way than item refusal. The difference between this study and the Murata and Gwartney study may be in the nature of the surveys. They

dealt with opinion research and this study dealt with economic reporting.

Limitations and Future Research

A larger sample size would allow study of interactions. The effect of skip patterns didn't show any effect for the items selected in this research (except "want job"), but some other items would be expected to lead to differences. The factor space examined in constructing the scales was quite complex; suggesting there may be subgroups for whom the scales wouldn't work. Further explorations may reveal these relationships.

References:

- Borgers, N. and Hox, J., "Item Nonresponse in Questionnaire Research With Children", Journal of Official Statistics, Volume 17.2, 2001, pp. 321-335.
- Dixon, J., "Relationship Between Household Nonresponse, Demographics, and Unemployment Rate in the Current Population Survey", Paper presented at the Joint Statistical Meetings, Atlanta, Georgia, 2001.
- Dolton, P., Lindeboom, M., and Van den Berg, G.J., "Survey attrition: A taxonomy and the search for valid instruments to correct for biases", in Statistical Policy Working Paper 30, 1999 Federal Committee on Statistical Methodology Research Conference.
- Fletcher, J., and Schmidt, D., "Measuring Response Bias in Survey Research: An Analysis of Age Characteristics of Early Respondents and Resisters", Paper presented at AAPOR, 2001.
- Groves, R., and Couper, M., Nonresponse in Household Interview Surveys, Wiley, New York, 1998.
- Loosveldt, G., Pickery, J., and Billet, J., "Item non-response as a predictor of unit non-response in a panel survey", Paper presented at the International Conference on Survey Non-response, Portland, Oregon, October 28-31, 1999.
- Mason, R., Lesser, V., and Traugott, M., "Effect of Item Nonresponse on Nonresponse Error and Inference, In Groves, R., Dillman, D., Eltinge, J., and Little, R., Survey Nonresponse, Wiley, New York, pages 149-162, 2002.
- Murata, T., and Gwartney, P., "Question Saliency, Question Difficulty and Item Nonresponse in Survey Research", Paper presented at the International Conference on Survey Non-response, Portland, Oregon, October 28-31, 1999.
- Tucker, C., and Dixon, J., "Predicting Interviewer Nonresponse Rates from Household and Regional Characteristics", Paper presented at AAPOR, 2000.
- Tucker, C., and Kojetin, B., "The Impact of Nonresponse on the Unemployment Rate in the Current Population Survey", Paper presented at the International Workshop on Household Survey Nonresponse, 1997.

Appendix A:

Table 1-Predicting Unit Refusals

a) Scales

	Single models		Multivariate models	
	OR	Prob.	OR	Prob.
Total	61.74	.0001		
work	15.49	.0001	11.43	.0001
Personal	24.59	.0001	3.65	.0001

b) Items

	Single models		Multivariate model	
	OR	Prob.	OR	Prob.
Income	2.92	.0001	2.43	.0001
Origin	5.44	.0001	1.48	.0011
Age	4.49	.0001	1.78	.0001
Armed F.	6.17	.0001	1.95	.0008
Citizen	6.75	.0001	1.59	.0003
want job	8.45	.0001	2.57	.0001

Table 2 - Unemployment.

a) Scales

	Single models		Multivariate model	
	OR	Prob.	OR	Prob.
Total	0.205	.0001		
work	0.412	.0001	0.456	.0005
Personal	0.227	.0143	0.436	.1813

b) Items

	Single models		Multivariate model	
	OR	Prob.	OR	Prob.
Income	0.75	.0004	0.81	.0106
Origin	0.58	.0716	1.02	.9552
Age	0.48	.0038	0.62	.0795
Armed F.	0.46	.2722	0.65	.5656
Citizen	0.36	.0232	0.62	.3154
want job	*	.9077	*	.9401

Table 3-Unemployment/Education.

a) Scales

	Multivariate models		Models with education	
	OR	Prob.	OR	Prob.
Educ			0.898	.0001
Total	0.205	.0001	0.151	.0001
work	0.456	.0005	0.379	.0001
Personal	0.436	.1813	0.435	.1734

b) Items

	Multivariate model		Model with education	
	OR	Prob.	OR	Prob.
Income	0.81	.0106	0.69	.0001
Origin	1.02	.9552	0.56	.0564
Age	0.62	.0795	0.47	.0031
Armed F.	0.65	.5656	0.35	.1364
Citizen	0.62	.3154	0.76	.0105
want job	*	.9401	*	.9291