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A Comparison of Full and Quasi Filters for Autobiographical Questions

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Abstract

Some survey questions do not apply to all respondents. How to design these questions for both eligible and ineligible respondents is unclear. This article compares full filter (FF) and quasi filter (QF) designs for autobiographical questions in mail surveys. Using data from National Health, Wellbeing, and Perspectives Study, we examine the effect of type of filter on item nonresponse rates, response errors, and response distributions. We find that QF questions are more confusing to respondents, resulting in higher rates of item nonresponse and response errors than FF questions. Additionally, FF questions more successfully identify ineligible respondents, bringing estimates closer to national benchmarks. We recommend that survey designers use FF designs rather than QF designs for autobiographical questions in mail surveys.

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Introduction

Surveys often ask questions that do not apply to all respondents, using two common designs. In a *full filter (FF) design*, a contingency or feeder question is asked first to determine whether the respondent is eligible to answer the subsequent question(s). Ineligible respondents skip inapplicable questions. In a *quasi filter (QF) design*, the question is asked of all respondents, but an extra response option (e.g., “Don’t know,” “No Opinion,” “Not applicable”) is added for those for whom the question does not apply (Schaeffer and Presser 2003). Understanding the strengths and weaknesses of FF versus QF designs is especially important in mail surveys where there is no interviewer or computerization to help respondents. This article will compare these two formats for two important demographic topics (dependents and military service) in a mail survey.

By avoiding responses from ineligible respondents, full filtering is hypothesized to increase data quality, although there is no clear evidence that this occurs (Krosnick et al. 2002; McClendon and Alwin 1993; Schaeffer and Presser 2003), and to reduce burden on respondents (Knauper and Turner 2003). Answering a simple yes/no question in a FF design is thought to be easier than processing a more difficult question about a construct that does not apply. But FF questions also have weaknesses that may reduce data quality such as increased item nonresponse and response errors (e.g., Krosnick et al. 2002; Messmer and Seymour 1982; Poe et al. 1988). In mail surveys, in particular, where branching is considered particularly complex, difficult, and burdensome for respondents, branching instructions often lead to response errors (Dillman et al. 2014; Messmer and Seymour 1982). Respondents either incorrectly skip the follow-up questions to which they should have provided answers (“an error of omission”) or incorrectly answer the follow-up questions that they should have skipped (“an error of commission”; e.g., Redline and Dillman 2002). Additionally, respondents sometimes engage in “motivated underreporting” in which they purposefully answer a filter question in such a way as to avoid potentially burdensome follow-up questions (e.g., Eckman et al. 2014; Kreuter et al. 2011; Redline and Dillman 2002). On sensitive questions, filter questions may change the respondent’s interpretation of the severity of the behavior in question (e.g., Knauper 1998).

Finally, because FF designs require an additional filter question, they take up more space in mail surveys, which can increase survey costs as longer questionnaires often require more printing and extra postage.

In contrast, QF questions allow ineligible respondents to be screened out by adding response options instead of a whole question, thus using less space in the survey. Because lengthy mail surveys tend to decrease response rates (Bogen 1996) while increasing mailing cost, this is a considerable strength, especially for mail surveys in which space in the questionnaire is already tight.

Space-saving QFs can be designed in several ways, depending on the information sought. For example, attitude questions often include a single filter response option such as “no opinion.” In behavioral frequency and demographic questions about autobiographical information, such as those examined here, respondents are instructed to answer 0 for behaviors or characteristics that do not apply to them or select a “does not apply” or “Never experienced” response option. Both of these methods are commonly used, including national federal surveys. For example, in the Early Childhood Longitudinal Survey-Kindergarten, teachers are asked to indicate how many years they have taught a long list of grades and programs, with the instruction to “write ‘o’ if you have never taught the grade or program listed” (National Center for Education Statistics 1999). The Survey of Doctorate Recipients conducted by the National Center for Science and Engineering Statistics adds “Not applicable: no rank designated at this institution” and “Not applicable: no rank designated for my position” to a question asking for one’s faculty rank. In addition, the mail version of the Survey of Earned Doctorates (National Science Foundation 2015) has an instruction for respondents to “Mark (X) if none” next to a check box in a question where respondents report the number of their dependents.

In each of these QF designs, respondents are provided less opportunity to incorrectly “opt out” of the question or answer inapplicable questions than in a FF design, eliminating potential errors of omission and commission. Yet respondents may encounter other problems in answering these items. First, respondents who do not experience an event or engage in a behavior can easily find “no” in a FF question but have to search through a potentially complex list of response options or instructions in the QF question. Because of the complexity of

this search task, they may choose to skip the item or subitems within a question altogether. Second, QF questions might be more confusing than FF questions because they implicitly ask hidden questions by introducing a separate response dimension (e.g., whether respondents have ever engaged in a certain behavior *and* characteristics about that behavior; Tourangeau et al. 2004; Turner et al. 1992). Third, QFs may become even more confusing with a series of related questions on a topic (Messmer and Seymour 1982; Turner et al. 1992), leading to inconsistent responses, especially when there are multiple response options that appear to fit their experience. For instance, a respondent who provides an answer of “Never served in the military” to a QF question may then answer follow-up questions about military service with a substantive “no” rather than the continued QF of “Never served.” Fourth, respondents may fail to answer all parts of questions with QFs, for example, answering a subpart of a question that *does* apply to them (e.g., children in the household aged 6–10) but failing to answer zero in the subparts that *do not* apply to them (e.g., children of any other age groups).

These reporting errors in a QF design may inadvertently affect the proportion of respondents identified to have (or not have) the characteristic of interest. The existing literature on QFs for factual or autobiographical questions is limited, with the few studies simultaneously changing other parts of the question (e.g., Turner et al. 1992) or examining simple skip patterns in student samples without reporting survey estimates (e.g., Gendall and Ramsay 2001). Thus, this study compares data quality indicators and response distributions on two autobiographical topics from an experiment conducted in a national survey of U.S. adults with random assignment of sample members to either FF or QF designs. We also compare response distributions to national benchmark data to assess validity of reports. We examine three research questions:

1. Do QFs have higher item nonresponse rates than FF questions?
2. Do QFs have higher response error rates, including errors of omission and commission and inconsistent responses, than FF questions?
3. Do QFs produce different response distributions than FFs?

Data and Methods

The National Health, Well-being, and Perspectives Study (NHWPS) was a 12-page English-language mail survey conducted by the Bureau of Sociological Research at the University of Nebraska–Lincoln between April and August 2015. A simple random sample of 6,000 addresses for housing units across the United States was obtained from Survey Sampling International, with 1,002 completed surveys (AAPOR Response Rate (RR) 1 = 16.7%). The respondents are adults aged 18 or older who had the next birthday within each household. Overall, 57.8% of the respondents are female, 70.8% are white, non-Hispanic, 88.2% read English very well, 43.8% have a bachelor's degree or higher, and 28.5% are aged 65 or older.

Two versions of the NHWPS questionnaire were randomly assigned to the sampled households—one with FF questions (AAPOR RR1 = 17.4%, $n = 522$) and one with QF questions (AAPOR RR1 = 16.0%, $n = 488$). The questionnaire contained questions about attitudes toward current events, mental health, prosocial activities, victimization, household tasks, and demographics. There are no statistically significant differences across the two experimental conditions in sex, race, English-speaking ability, education, and age.

Questions with two different topics were used for the FF versus QF experiment—military experience and dependents. Respondents were asked when they served in the military, and if they served in a combat zone, and, for dependents, how many dependents they had in each of five age-groups ranging from under 1 to 18 and older (**Figure 1**). In the FF version, yes/no filter questions were used to establish whether respondents ever served in the military and whether they had any dependents, allowing ineligible respondents to skip past the follow-up questions. In the QF version, the response option “Never served in the military” was added to each military question, and respondents were instructed to enter 0 for each age category where they had no dependents.

We first examine item nonresponse rates. Item nonrespondents are those who did not answer a question for which they are eligible. In the QF version, this includes anyone who fully skipped the questions on military service and dependents. In the FF version, item nonrespondents include all respondents for the filter questions, but for

Full Filter	Quasi Filter
<p>64. Are you a veteran or currently serving in the military?</p> <p><input type="radio"/> Yes <input type="radio"/> No → Go to Question 65</p> <p>64a. When did you serve? Please check all that apply.</p> <p><input type="checkbox"/> September 2001 or later <input type="checkbox"/> August 1990 to August 2001 <input type="checkbox"/> May 1975 to July 1990 <input type="checkbox"/> August 1964 to April 1975 <input type="checkbox"/> February 1955 to July 1964 <input type="checkbox"/> July 1950 to January 1955 <input type="checkbox"/> January 1947 to June 1950 <input type="checkbox"/> December 1941 to December 1946 <input type="checkbox"/> November 1941 or earlier</p> <p>64b. Did you serve in a combat zone?</p> <p><input type="radio"/> Yes <input type="radio"/> No</p>	<p>64. When did you serve in the military? Please check all that apply.</p> <p><input type="checkbox"/> September 2001 to present <input type="checkbox"/> August 1990 to August 2001 <input type="checkbox"/> May 1975 to July 1990 <input type="checkbox"/> August 1964 to April 1975 <input type="checkbox"/> February 1955 to July 1964 <input type="checkbox"/> July 1950 to January 1955 <input type="checkbox"/> January 1947 to June 1950 <input type="checkbox"/> December 1941 to December 1946 <input type="checkbox"/> November 1941 or earlier <input type="checkbox"/> Never served in the military</p> <p>64a. Did you serve in a combat zone?</p> <p><input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Never served in the military</p>
<p>69. Not including yourself or your spouse/partner, do you have any dependents (children or adults) currently living with you? That is, are you living with any others who receive at least one half of their financial support from you?</p> <p><input type="radio"/> Yes <input type="radio"/> No → Go to Question 70</p> <p>69a. How many of these dependents living with you are...</p> <p>Under age 1 <input type="text"/></p> <p>Aged 1-5 <input type="text"/></p> <p>Aged 6-11 <input type="text"/></p> <p>Aged 12-17 <input type="text"/></p> <p>Aged 18 or older <input type="text"/></p>	<p>69. Not including yourself or your spouse/partner, how many dependents (children or adults) are currently living with you? That is, how many others receive at least one half of their financial support from you? If no dependents in a category, enter "0".</p> <p>Under age 1 <input type="text"/></p> <p>Aged 1-5 <input type="text"/></p> <p>Aged 6-11 <input type="text"/></p> <p>Aged 12-17 <input type="text"/></p> <p>Aged 18 or older <input type="text"/></p>

Figure 1. Questions about military experience and dependents by format.

the follow-up questions, it only includes those who answered “yes” to the filter questions (i.e., not skipped past the follow-ups). For the dependents question, eligible respondents who skipped all five dependent age-group subitems were coded as item nonrespondents, while those who provided an answer to at least one subitem were item respondents. For the military service dates question, eligible respondents who failed to endorse any of the dates of service were coded as item nonrespondents. Because these rates compare different groups of respondents for each question in the FF version, we create two combined variables that allow us to include all respondents in the analyses. First, we evaluate whether there was a missing value on *either* the filter question or the branched question in the FF version (i.e., any item nonresponse) and compare that with nonresponse to the QF

question. This is the maximum item nonresponse rate that could result in a series of questions, assuming that any missing information results in missingness for an analytic variable. Second, we evaluate whether the respondent failed to answer *all* of the items in the FF version and compare that with nonresponse to the QF question. This analysis provides a measure of the minimum set of respondents for which *no* information is provided in the set of questions.

Next, we examine response errors, looking both at error rates and types of errors across versions. Because the possible types of response errors vary across versions, we define and discuss specific types of errors in the Results section. To examine overall error rates, we use a dichotomous indicator coded 0 if the respondent fully and successfully followed the instructions they received, answering as the design of the question intended, and 1 if they failed to follow the instructions. We compare error rates across versions and then predict errors using a logistic regression model where we control for respondents' education and age as proxies for cognitive ability, sex and race to account for known differences in family size and military status, and English-language ability because the questionnaire was only provided in English (Knauper 1999; Narayan and Krosnick 1996; U.S. Census Bureau 2015a, 2015b).

Finally, we examine response distributions, evaluating whether estimates of the proportion of adults with military service and dependents differ across the two filter formats. We do this among all respondents, including those with unknown eligibility, and among those where a definite determination of eligibility could be made. In the FF version, we use the filter question to create these estimates. In the QF version, we use a report of served in any time period versus "Never served" for estimating any military service; for dependents, respondents with any nonzero report of dependents are identified as having dependents and those who reported zero to all age categories are without dependents. We do not have records available for these respondents to evaluate the accuracy of their reports. Thus, we turn to an external source to evaluate whether one version yields estimates closer to a known population value. We compare these sample estimates to national benchmark estimates from the 2015 Current Population Survey (CPS) for the U.S. adult population. Sample estimates that are closer to the national benchmark are considered more accurate.

All analyses have been weighted to account for nonresponse and standard errors estimated using Taylor Series Linearization with the svy commands in Stata (version 14.2).

Results

Item Nonresponse

Table 1 shows the item nonresponse rates across the two filter formats. Item nonresponse rates in the QF version were about double those in the FF version (7.95% QF vs. 3.50% FF for periods of military service, 6.62% QF vs. 3.69% FF for service in a combat zone, and 9.41% QF vs. 5.90% FF for the number of dependents, $p < .05$ for all comparisons). When we examine our combined indicator for whether respondents were missing on either the filter or follow-up question for the period of military service, the QF version still has a statistically higher ($p < .05$) item nonresponse rate. This difference disappears for the combat zone and number of dependents questions at traditional $p < .05$ levels. If we instead look at whether information was missing on *all* of the items in the series, the QF version has a significantly higher missing data rate than the FF version for both the military (5.49% QF

Table 1. Item Nonresponse Rates by Filter Format.

Question	<i>Full Filter</i> (<i>n</i> = 522; %)	<i>Quasi Filter</i> (<i>n</i> = 480; %)	<i>Design-based F</i>
Military service			
Experience in the military (filter question)	3.67	—	
Period of military service	3.50	7.95	9.75**
Service in a combat zone	3.69	6.62	3.84*
Missing on either experience or period of military service	4.02	7.95	6.33*
Missing on either experience or service in a combat zone	3.86	6.62	3.67†
Missing all items	2.98	5.49	4.02*
Dependents			
Presence of dependents (filter question)	5.82	—	
Number of dependents	5.90	9.41	3.89*
Missing on either presence or number of dependents	7.31	9.41	1.27
Missing all items	4.41	9.41	8.84**

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$; **** $p < .0001$

vs. 2.98% FF, $p < .05$) and dependents items (9.41% QF vs. 4.41% FF, $p < .01$). Thus, our item nonresponse analysis suggests that quasi filtering increases item nonresponse rates over full filtering but that the cumulative effects of full filtering across multiple questions on item nonresponse rates are only modestly lower than that produced by the more complex QF question.

Response Errors

Next, we examine response errors. Among the respondents who received the FF version and did not skip the whole section related to the military, 9.41% made some kind of response error. Among those who responded to the QF version, the response error rate more than doubled to 21.08% ($F = 17.23$, $p < .0001$). The questions about dependents show a similar pattern. The error rate was 5.23% in the FF version but 30.89% in the QF version, a large and statistically significant difference ($F = 90.86$, $p < .0001$).

These patterns of fewer response errors in the FF format compared to the QF format hold in logistic regression models controlling for respondents' age, education, sex, race, and English-language ability (results available from authors). We also examined whether there were any interaction effect between the filter format and demographic characteristics. We found none for the dependents question but found one for the military question; respondents with higher self-reported English-language ability made fewer errors with the FF format but had the same error rate as those with lower English-language ability in the QF format (results available from the authors). Overall, response errors are more likely to happen with quasi filtering than with full filtering regardless of question topic and across demographic groups.

Turning to the types of response errors that were made, in the FF version, 7.97% of respondents committed an error of commission (mistakenly answered a follow-up question) on the military experience questions and 1.49% did so on the dependents questions. On the military question, respondents reporting no military experience skipped only the first follow-up question and mistakenly answered the second. Others in the FF version committed errors of omission in which they mistakenly skipped follow-up questions (0.35% for the military experience questions and 1.49% for the dependents

questions). Yet others skipped the filter question but answered the follow-up questions (0.69% for the military experience questions and 1.41% for the dependents questions). Additionally, less than 1% of respondents entered nonnumeric values (e.g., “P”) in the dependents question answer boxes, and one respondent wrote “No” for all of the response options for the periods of military service question instead of checking applicable response options.

For the QF questions on military experience, the most common response error occurred when the respondent chose “Never served in the military” for the first question about periods of military service and then chose “No” rather than the “Never served” option (or both, although they were instructed to select one) for the second question about service in a combat zone (16.33%). Also, 1.13% of respondents chose the “Never served” option for the service period question but skipped the combat zone question, and 2.46% of respondents skipped the service period question but chose “No,” “Never served,” or both for the combat zone question. It is clear from these error patterns that the “Never served” option in the QF version’s questions confused many respondents.

For the QF question on dependents, respondents were asked to enter 0 when there was no dependent in the age category. The modal type of response error (24.23% of responses) occurred when the respondent answered one age-group subitem with a nonzero number but did not complete the other items (e.g., entered 1 for “under age 1” and left the other age groups blank); 2.89% of respondents provided only one zero and no other entries (e.g., entered 0 for “under age 1” and left the other age groups blank). Although it is possible that the respondents interpreted blank boxes as indicating that they did not have any dependents in the age category, for our analyses, all blank boxes were interpreted as missing responses (and thus considered response errors) as would typically be done when data entering a mail survey. Moreover, 0.26% of respondents entered a nonnumeric value in an answer box. Thus, QF questions lead to higher rates of, and different types of, response errors than FF questions.

Identification of Ineligible Respondents

Finally, we examined whether FF and QF questions produced similar estimates of the percentage of respondents who served in the military

Table 2. Proportion of Respondents with Military Experience and Dependents.

Question	Including Unknown Status			Excluding Unknown Status			CPS (%)
	Full Filter (%)	Quasi Filter (%)	χ^2	Full Filter (%)	Quasi Filter (%)	χ^2	
Military experience							
Veteran/currently serving	11.04	11.96	3.89*	11.46	12.99	0.44	9.6
Never served	85.29	80.09		88.54	87.01		
Unknown	3.67	7.95					
Dependents							
With dependents	28.90	36.74	9.61****	31.01	42.31	9.47****	31.6
No dependents	64.29	50.10		68.99	57.69		
Unknown	6.81	13.16					

Current Population Survey (CPS) benchmark for military experience excludes current military. CPS benchmark for dependents is percentage of households with at least one member under the age of 18.

* $p < .05$; ** $p < .01$; *** $p < .001$; **** $p < .0001$

or have dependents living with them (**Table 2**). Respondents for whom these statuses could not be determined because of missing responses were categorized as “Unknown.”

Overall, the distribution of respondents across the three categories for military experience was significantly different between the FF and QF versions ($F = 3.89$, $p < .05$). However, roughly the same percentage of respondents were identified as having military experience in each version (FF: 11.04%; QF: 11.96%). The significant difference across the versions occurs because the rate of unknown military service in the QF format (7.95%) was more than double that of the FF format (3.7%), and there were fewer respondents without any military experience in the QF version (80.09%) than the FF version (85.29%). When those with unknown status are excluded through list-wise deletion and the percentage with military service is recalculated, the distributions did not vary significantly. In the FF version, 11.46% of the respondents had military service, compared to 12.99% in the QF version ($F = 0.44$, ns). According to the CPS, 9.6% of the civilian adult population (18 and older) were veterans as of May 2015 (Bureau of Labor Statistics 2015; our questions also include active duty military, but this difference from the benchmark should not disproportionately disadvantage either of the experimental versions). The difference

between our survey estimates and the CPS estimate is larger in the QF version than the FF version, suggesting that the FF was more successful at identifying veterans and excluding nonveterans. Even taking into account the difference caused by our inclusion of people on active duty, quasi filtering did not effectively distinguish between respondents with and without any military experience.

For the presence of dependents, the distribution of respondents across the three categories of dependents, no dependents, and unknown was significantly different across the two filter formats ($F = 9.61, p < .0001$). There is an almost eight-point difference in the percentage of respondents with any dependents between the FF (28.90%) and QF (36.74%) versions. Similar to military experience, the QF yielded a higher percentage of unknowns (13.16%) and a lower percentage of respondents with no dependents (50.10%) than the FF (6.81% unknown; 64.29% no dependent). When those with unknown dependent status are excluded, the percentage of households with dependents is 31.01% for the FF and 42.31% for the QF question, still a significant difference. According to the CPS, about 32% of households in the United States in 2015 had members under the age of 18 (U.S. Census Bureau 2015a). The CPS data differ from the NHWPS data because NHWPS specifically asked about both children and adult dependents “who receive at least one half of their financial support from you.” Nevertheless, the estimate obtained from the FF question was much closer to the CPS benchmark value than the estimate from the QF question.

Discussion and Conclusion

This study compared QF and FF designs on two autobiographical questions in a mail survey. Although FF designs take up more space, the results provide a strong recommendation for implementing FFs over QFs for autobiographical questions.

First, the QF design had higher item nonresponse rates than the FF design. The increased complexity in the response options and response instructions in the QF was more confusing to respondents than following a skip pattern, leading to fewer respondents answering autobiographical questions with QFs than with FFs.

Second, response errors occurred at significantly higher rates with QFs than FFs, even though errors of commission and omission were not formally possible in the QF format and the FFs contain the complex task of following a skip pattern. Additionally, the types of errors differed depending on how the QF was implemented. In the military questions, an extra “Never served in the military” response option was added. For the second follow-up question on serving in a combat zone, respondents without any military experience confused this option with the “no” option. In addition, this design raises questions about where the QF response option should be located. In this study, its placement at the bottom of a long list of response options potentially caused it to be overlooked. The instructions to the QFs also may have affected data quality. The dependents question contained an additional instruction to “enter zero” in the QF version, creating additional burden or confusion (Turner et al. 1992). The military service questions did not include instructions asking nonveterans to endorse the “Never served in the military” response option. Future research should explore how layout and instructions on QF questions affect responses and whether different designs could improve their performance.

Third, the QF questions were less successful at identifying ineligible respondents than the FF questions. Although the concepts measured in the national benchmarks deviate slightly from our questions, they deviate in the same way across both of our questionnaire versions. We observed larger differences between the estimates from the QF questions and the benchmarks than the FF questions, and the QF consistently overestimated the benchmark. Our results suggest that people who possess the characteristic of interest are more likely to answer the QF question, whereas ineligible respondents are more likely to skip the question when an explicit filter is not present. This makes sense—it is easier to say “no” when there is an explicit filter question compared to the QF. Additionally, ineligible respondents can easily indicate that the follow-up questions are irrelevant in a FF, but the QF requires searching for that response option.

This study limited its focus to two nonsensitive topics (military experience and dependents) and confounded question topic and QF format. Future research should explore a wider range of autobiographical questions with alternative designs to better understand the effects of QF design and the joint role of question topic and format. For instance,

the item nonresponse rate may be reduced by changing the spacing between the “Never” option and the other substantive response options (Tourangeau et al. 2004). Likewise, errors related to failing to enter 0 for inapplicable categories may be reduced by instead asking respondents to check a box to indicate “zero.”

We encourage survey designers to avoid QFs for behavioral and autobiographical questions and instead use FFs with explicit skip patterns in mail surveys. This is consistent with general questionnaire design recommendations to avoid questions with presuppositions (e.g., Schaeffer and Presser 2003). Although errors are still incurred with a FF, error rates are substantially lower and survey estimates are closer to benchmarks.

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