"LAST TIME YOU HAD 78, HOW MANY DO YOU HAVE NOW?"
THE EFFECT OF PROVIDING PREVIOUS REPORTS ON CURRENT REPORTS OF CATTLE INVENTORIES

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Abstract
In surveys where respondents are contacted repeatedly, information from prior interviews may be used during following interviews. An experiment examined the effects of providing ranchers with their previous quarter's reported cattle inventories on current reports of those inventories. Knowledge of prior reports had no overall effect on the reported size of current inventories, but it did affect how individuals answered. Respondents explicitly provided with their previous quarter's data were more likely to re-report that number as their current inventory. However, they were also less likely to change their answers during the interview, less likely to have their answers edited by statisticians after the interview, and more likely to report inventories where the numbers balanced over quarters. A decision to include prior reports in survey interviews must consider the tradeoff between respondents using cognitively easy, but potentially inaccurate, reporting strategies versus decreased respondent burden and increased data consistency.

1. Introduction

For surveys where respondents are contacted more than once, information reported in a previous interview may be used during the current interview. This procedure has been termed dependent interviewing and has been used to reduce false reports of change for some items such as occupation and types of income received (Dibbs, Hale, Loverock, & Michaud, 1995; Rothgeb, Polivka, Creighton, & Cohany, 1991). Being reminded of one's previously reported data (PRD) may reduce some spurious reports of change but it could also affect the accuracy of what gets reported. Respondents may use the PRD information to easily generate a reasonable but potentially inaccurate answer, such as "no change," in lieu of using more cognitively burdensome strategies to provide the most accurate answer. "Satisficing" refers to using a cognitively easy strategy to answer a question (Krosnick, 1991).

The same operation is contacted repeatedly in many surveys conducted by the National Agricultural Statistics Service (NASS) of the United States Department of Agriculture. Therefore, it is often possible to provide respondents with their PRD. One way for a respondent to satisfice would be to simply report one's current inventory to be the same as the PRD. NASS studies have indeed shown that providing PRD can affect current reports of crop acreage (Pafford, 1986, 1988, 1989) and grain stocks and storage capacity (Mergerson & O'Connor, 1992) by reducing the amount of reported change over time.

NASS contacts thousands of ranchers on a quarterly or monthly basis in order to estimate the number of cattle which will be brought to market. Selected respondents remain in the survey sample for at least one year. As a survey sample unit, each rancher represents a larger number of population members, and so precise reporting of individual cattle on feed (COF) inventories is critical. Ranchers seldom have written records or accurate knowledge of their previous answers, and they do not report using prior inventories to estimate current inventories (Stanley & Safer, under review). This paper investigated the effects of providing ranchers with their previous quarter's inventory on current reports of those inventories.

Prior research on reporting strategies for particular items may or may not provide insight into reporting for other items. Items with different characteristics may be reported using different strategies. For example, different reporting strategies have been shown for events which occur more or less frequently (Blair and Burton, 1987). In agricultural surveys, respondents expect crop acreage to be relatively stable throughout the crop year, and grain storage capacity to be quite stable over many years. That perceived stability could explain why knowledge of the PRD led to reduced reported change. In contrast, COF inventory can change dramatically on a daily basis (due to purchases, outshipments, sales, etc.), and is less likely than an item such as grain storage capacity to be the same from one quarter to the next. Ranchers use different cognitive strategies for reporting COF inventories than do farmers for reporting crop inventories (Stanley & Safer, under review), perhaps because of this variability. Hence, while being provided with PRD may lead to satisficing for some relatively stable items, such as planted crop acreage, it may not lead to satisficing for other more variable items such as livestock inventory.

In many agricultural surveys, such as the COF questions, respondents first report a current total inventory and then are asked about the inventory added

("placements") and subtracted ("marketings, shipped to others, returned to grazing, deaths") since their previously reported total (the PRD) if one is available. When the PRD plus inventory additions, minus inventory subtractions is not approximately equal to the current reported total inventory, respondents are informed of the PRD and the imbalance and asked to verify or change their figures. This current operational method of using PRD as an edit check was compared to two methods in which respondents were given their PRD before answering any questions.

2. Method

Regular NASS trained interviewers completed 371 interviews with South Dakota ranchers during the first two weeks of April as part of the April 1993 Quarterly Cattle on Feed survey. Group 1 (n = 127) followed the current operational survey procedure for COF respondents. They reported their current total inventory first and then the additions and subtractions from their previous quarter's report. They were asked the following questions:

"How many cattle and calves were on feed April 1, that will be shipped from this feedlot to the slaughter market?
    During January, February and March 1993, how many cattle and calves were placed on feed in your feedlot(s)?
    Marketed for slaughter (shipped out of your feedlot(s)?
    Were shipped to someone else's feedlots?
    Were returned to grazing?
    Died?"

They were told their PRD only if an edit check indicated that the PRD plus additions and subtractions was not within an acceptable percentage of their current total inventory. The acceptable limits were ±5% for operations with 500-999 COF and ±10% for operations with 499 or fewer COF. They were then prompted to verify and/or change their figures. All respondents in the other two groups were provided with their PRD in the following statement before being asked any questions.

"Last quarter (January 1) you reported that you had XX cattle and calves on feed."

Respondents in Group 2 (N = 110) then answered the questions in the same order as Group 1. Respondents in Group 3 (N = 134) answered questions about additions and subtractions to their PRD, then reported their current total inventory last. The order in Group 3 attempted to mimic and thus facilitate an "anchor (PRD) and adjustment (inventory additions and subtractions)" strategy which is sometimes used in reporting agriculture inventories (Stanley & Safer, under review). Respondents in these two groups were also asked to verify and/or change their figures if they were not within the acceptable percentage error. Finally, statisticians reviewed, and if necessary edited, the answers from all three groups. (See Table 1.)

Table 1. Data collection procedures for each group

Group 1 (Current Procedure)	Group 2	Group 3
	• *PRD Provided*	• *PRD Provided*
• Current Total Inventory	• Current Total Inventory	• Additions since PRD
• Additions since PRD	• Additions since PRD	• Subtractions since PRD
• Subtractions since PRD	• Subtractions since PRD	• Current Total Inventory
• If imbalance, PRD provided and verification or change requested	• If imbalance, verification or change requested	• If imbalance, verification or change requested
•Post interview (all groups), statistician reviews and verifies or edits		

Thus for each respondent, there were three potentially different answers to each COF question: 1. the respondent's initial answer; 2. the respondent's final answer at the end of the interview, which might differ from the initial answer if he or she had to reconcile an imbalance; and 3. the answer after reviewing and editing by NASS statisticians.

3. Effects of Providing PRD on Current Inventory

Two apriori contrasts were calculated for each dependent measure in all of the following analyses (Marascuilo & Serlin, 1988, p. 374). The more important first contrast compared the operational group, Group 1, to the two PRD groups, and was tested using alpha of .04. The second contrast compared the two PRD groups, and was tested using alpha of .01. Thus there was a total alpha of .05 for each measure. The second contrast will not be reported further because the two PRD groups did not differ on any of the measures.

The mean current total inventory (and standard deviations) reported at the end of the interview for Groups 1, 2, and 3 respectively were: 67.7 (133.3), 94.8 (156.2), and 67.1 (128.5). There were 159 ranchers (43%) who reported at the end of their interview that their current inventory was zero. The percentage with zero current inventory did not differ among the three groups, chi sq (2) = 3.22, p = .20. Because of the large number of zero inventories plus a few very large inventories, we compared the number of respondents in each group who were above or below the overall median. An analysis using the median test for all respondents found no significant difference in reported current inventory for Group 1 versus the two PRD groups, z = -.32, n.s. This contrast was also not significant when the analysis was restricted to just those respondents with nonzero inventories, z = -.96, n.s. Thus there was no evidence to suggest that providing PRD affected group estimates of the reported size of current inventories.

4. Effects of Providing PRD on Data Editing

Although knowledge of prior reports had no overall effect on the group estimates of current inventories, it nonetheless affected whether individuals reported their current inventory to be equal to their previous quarter's inventory. Overall, 175 respondents (47%) reported at the end of the interview a current inventory that was the same number as their previous quarter's inventory. The two PRD groups (Group 2 = 47%, Group 3 = 56%) were significantly more likely to report the same number than was the current operational group (Group 1 = 38%), z = -2.53, p = .01. The increased percentage of "no change" answers in the two PRD groups suggests that some of these respondents used a satisficing strategy.

If, during the interview, a respondent's prior total inventory plus placements, minus marketings, shipments and deaths was not within the acceptable percentage of the current total inventory, as noted above, he or she was asked to verify or change the figures. Respondents were also asked to verify or change their answers if they reported no current inventory but had a previous inventory. The respondent could change any item in the current interview as well as the prior quarter's reported total inventory (the PRD). The interviewer was required to write an explanation if the respondent did not attempt any changes.

The first analysis excluded 155 respondents who initially reported zero inventory at the beginning of their interview, because all of them were required to verify or change their answers. Of respondents who initially reported current, nonzero COF inventories, 48% of those in Group 1 were asked to verify or change their answers because of an unacceptable imbalance compared to 27% and 35% in the two PRD groups, z = 2.44, p = .01. Thus providing PRD before the questions reduced the number of respondents with COF inventory who were asked to verify or change their answers.

Similarly, the percentage of all respondents, including those with zero inventory, who actually made changes to either a currently reported data item or their PRD was significantly greater in Group 1 (39%) than in Groups 2 and 3 (22% and 28% respectively), z = 2.92, p < .01. Interestingly, it was the PRD, and not any one currently reported item, which was the single item most often changed in all groups. The group contrast was not significant for the percentage of respondents who changed just the PRD (z = .73, p > .05) or the percentage who changed just current data (z = 1.40, p > .05). However 13 respondents in Group 1 (10%) changed both the PRD and current data in contrast to only 4 respondents in Group 2 (4%) and 4 in Group 3 (3%), z = 3.24, p < .001. Thus respondents in Group 1 were more likely to make multiple changes in attempting to reconcile imbalanced data.

After the interview, NASS statisticians, who were unaware of the respondent's group, reviewed the data and edited any numbers which seemed suspicious. Statisticians edited 8 cases (6.30%) in Group 1 versus only 1 case (.91%) in Group 2 and 2 cases (1.49%) in Group 3. Thus the current operational group required more post-interview editing than the two PRD groups, z = 2.74, p < .01.

NASS statisticians do not attempt to balance the data precisely, such that the PRD plus additions and subtractions exactly equal the current total inventory. Imbalances within the acceptable limits, as noted above,

are allowed to remain in the data used for estimating population inventories. In addition, although respondents are asked to verify and change their responses if they do not balance, they are not required to make changes. Respondents may indicate that they do not know how to correct an imbalance, or they may provide an explanation but make no corrections. We compared the percentage of cases across the groups with imbalanced data that remained after editing by both respondents and statisticians. The percentage of imbalanced cases was significantly greater in Group 1 (38%) than in the two PRD groups (24% and 21% respectively), $z = 3.17$, $p < .01$.

5. Discussion

Being provided up-front with one's previous quarter's report had no overall effect on the group estimates of current inventories, but it did increase significantly the number of respondents who reported current inventory equal to their previous inventory ("no change"). Thus up-front knowledge encouraged satisficing. Given the potential for day-to-day variability in COF, respondents may be overestimating the stability of their inventories. However, even in Group 1, which did not receive PRD up-front, 38% of respondents reported "no change" in their inventory. This may indicate that while the potential for movement in livestock inventories is higher than for crop acres these COF inventories may in fact be quite stable. Unfortunately, there was no external measure of the accuracy of the respondents' answers available.

One advantage of providing PRD up-front is that it can reduce the burden on respondents who are contacted repeatedly. There were a number of results which indicated an increased burden for the respondents in Group 1. They were significantly more likely than respondents in the two PRD up-front groups to be asked to verify or change their answers. Group 1 respondents were also more likely to actually change answers and to make changes to both previously and currently reported data in order to reconcile imbalanced data. The Group 1 answers also needed more editing by statisticians after the interview, and that may require additional follow-up calls. Finally, the respondents in Group 1 were more likely to have inventory data which never balanced from the previous to the current quarter, and an imbalance could conceivably increase the need to verify and change answers in the next round of interviews.

Respondents in Group 3 were provided PRD up-front, then asked for additions and subtractions to inventory, and finally asked for current total inventory. This order should mirror and thus facilitate an anchor and adjustment strategy. If respondents naturally use such a strategy, there should be almost no need for changes or imbalances in the Group 3 data. However, the number of changes and imbalances was not significantly different from those in Group 2, the other PRD up-front group whose questions were not ordered to facilitate an anchor and adjustment strategy. This result seems consistent with verbal protocols in which most ranchers claim to know their current COF inventory directly, without consciously using strategies like anchor and adjustment (Stanley & Safer, under review.)

When prompted to verify or change responses due to unacceptable imbalances, respondents in all three groups tended to change their previous total inventory more often than any other figure. Other NASS research has also shown that respondents prefer to reconcile differences in reported data by changing PRD rather than current data (Bailey, 1994; Hood, 1992; Tolomeo and McClung, 1991). In contrast, NASS statisticians generally edit current figures for additions and subtractions to inventory, and almost never change the report of total (current or previous) inventory which they believe to be more memorable and accurate. It is cognitively much easier for respondents to claim that the previous total was wrong, rather than have to reestimate and recompute additions and subtractions to the current inventory. Perhaps even more importantly, changing the previous total allows respondents to imply that they are reporting accurately in the current interview.

In conclusion, when respondents are surveyed repeatedly, the researcher must decide whether to provide up-front previously reported data. An informed decision should weigh the potential disadvantage of answers produced by satisficing strategies versus the advantages of decreased burden to the respondent and the researcher, as well as increased internal consistency of the data. There are also statistical considerations. Inventory reports produced using the PRD with satisficing strategies may perpetuate the direction of previous reporting errors or response bias, whereas reports without PRD up-front will likely contain increased random response error. More generally, statistical procedures such as time series analysis or ratio estimation require calculations using the PRD. Interview procedures which lead to frequent revising of the PRD may affect the validity of these calculations.

A relatively large percentage of respondents in all groups reported inventories which required editing during the interview and which contained imbalances even after editing. There are many potential reasons why respondents have difficulty reporting COF inventories. These include inconsistent definitions of terms, such as "marketing", "calf", or "on feed", imprecise dating of when changes occur in inventories, and subtle comprehension problems indicating that survey

researchers and ranchers think differently about how to count inventories (Stanley and Safer, under review). Further research should attempt to understand and minimize cognitive difficulties in answering survey questions, as well as inform decisions about whether and how to use PRD.

6. References

Bailey, J. (1994). Results of the December 1993 Acreage Reconciliation Study. SRB Research Report Number SRB-94-07, U.S. Department of Agriculture, National Agricultural Statistics Service.

Blair, E and Burton, S. (1987) Cognitive processes used by survey respondents to answer behavioral frequency questions. Journal of Consumer Research, 14, 280-288.

Dibbs, R., Hale, A., Loverock, R. and Michaud, S. (1995). Some effects of computer-assisted interviewing on the data quality of the survey of labour and income dynamics. Proceedings of the International conference on Survey measurement and Process Quality, Bristol, United Kingdom.

Hood, R. (1992). Analysis of response bias in the January 1992 cattle on feed reinterview pilot study and the July 1992 cattle on feed reinterview study. SRB Research Report Number SRB-92-09, U.S. Department of Agriculture, National Agricultural Statistics Service.

Krosnick, J. (1991). Response strategies for coping with the cognitive demands of attitude measures in surveys. Applied Cognitive Psychology, 5, 213-236.

Marascuilo, L.A. and Serlin, R. C. (1988). Statistical Methods for the Social and Behavioral Sciences. New York: Freeman.

Mergerson, J. and O'Connor, T. (1992). The effect of using historical data in CATI grain stocks enumeration in the March 1988 Agricultural Survey. SRB Research Report Number SRB-92-01, U.S. Department of Agriculture, National Agricultural Statistics Service.

Pafford, B. (1989). Use of reinterview techniques for quality assurance:The measurement of response bias in the collection of December 1987 Quarterly Grain Stocks Data using CATI. SRB Research Report Number SRB-89-08, U.S. Department of Agriculture, National Agricultural Statistics Service.

Pafford, B. V. (1988). The influence of using previous survey data in the 1986 April ISP Grain Stocks Survey. NASS Research Report Number SRB-88-01, U.S. Department of Agriculture, National Agricultural Statistics Service.

Pafford, B. V. (1986). Response errors in NASS surveys:The effect of using previous survey data in the 1985 California Fall Acreage and Production Survey. NASS Staff Report Number SF&SRB-86-99, U.S. Department of Agriculture, National Agricultural Statistics Service.

Rothgeb, J., Polivka, A., Creighton, K. and Cohany, S. (1991). Development of the proposed revised Current Population Survey. Proceedings of the ASA section on Survey Methods Research, American Statistical Association, 56-65.

Stanley and Safer (under review). Counting heads and bushels: Cognitive processes in reporting agricultural inventories.

Tolomeo, V. And McClung, G. (1991). Analysis of response errors in the December 1988 and December 1989 Quarterly Agricultural Survey data. SRB Research Report Number SRB-91-03, U.S. Department of Agriculture, National Agricultural Statistics Service.