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# Response Comparisons Between Husbands and Wives for Farm Characteristics

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ABSTRACT

Telephone responses were compared between 473 husbands and their wives for the following six farm characteristics: total acres, cropland acres, peak number of beef cattle, peak number of hogs and pigs, farm value and farm debt. The analysis showed that the wives had significantly more missing data and significantly lower answers than their husbands.




CONTENTS

SUMMARY

This study compared the telephone responses between 473 husbands and their wives for six farm characteristics obtained during the 1980 Farm Women's Survey. The six farm characteristics were total acres, cropland acres, peak number of beef cattle, peak number of hogs and pigs, farm value and farm debt. The comparisons showed that:

(1) The wives had significantly more missing data than their husbands.

(2) The responses from the wives for all six farm characteristics were lower than their husbands. The responses were significantly lower for four of the six characteristics, namely, total land, beef cattle, farm value and farm debt.

(3) When the wife was at least occasionally involved in a farm activity related to the farm characteristic of interest, the responses from the couples were then very similar for total acres, cropland acres and hogs. However, the answers were still quite disparate for beef cattle, farm value and farm debt.

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## INTRODUCTION

The National Opinion Research Center (NORC) conducted a nationwide telephone survey in 1980 called the Farm Women's Survey (FWS) through a cooperative agreement with the U.S. Department of Agriculture. As part of this survey, telephone interviews were completed separately with both the husband and wife for a subsample of farm operations in order to compare their opinions on topics such as their satisfaction with farm programs and their role in the farm decisionmaking process. In addition, objective information was obtained for several farm characteristics such as total acres and farm value. A report published by NORC compared the responses between the husbands and wives for many survey items (3). However, this report did not address the response comparisons for the farm characteristics, which are of particular interest to the Statistical Reporting Service (SRS).

SRS currently uses telephone interviewing for many surveys and current plans are to broaden the use of telephone interviewing in the years ahead (1). For SRS surveys, interviewers are instructed to interview the farm operator, who is generally the husband. If the operator is not available, the spouse in many instances will agree to provide the information. The assumption is therefore made that the spouse will provide the same information as the operator. If this assumption is not valid, nonsampling errors can have a detrimental effect on the estimates. The Survey Research Section decided to analyze the responses from the husbands and wives in the FWS in order to shed light on the validity of this assumption.

## SURVEY DESIGN

SRS provided NORC with a sample of 4,060 farm operations,which NORC used to conduct the nationwide survey of farm women. The farm operations in this sample were identified during a national economic survey conducted by SRS in 1979 using a stratified area frame sample of land parcels. NORC selected a systematic subsample of 1,000 operations from this sample and attempted to interview separately both the husband and wife if there was a married couple. Interviews were completed with both the husband and wife in 497 cases. Of these cases, male interviewers completed the interviews with both the husband and wife for 222 households, and female interviewers completed interviews with the couple in 251 households-- for a total of 473 households. In order to reduce the effects of the interviewers on the comparisons, the authors restricted the analysis to these 473 households. These are the same

households used in an earlier SRS staff report which examined the effects that the male and female telephone interviewers had on the responses obtained in the FWS (4).

A review of the geographic location of the 473 households showed that only 63 percent of the land-use strata in the national area frame were included in this sample. Therefore, the survey data was not expanded to national estimates since the sample did not include so many strata. In addition, the sample was treated as a simple random sample for the analysis. This will cause the estimates of the sampling error to be conservative, thereby resulting in conservative statistical tests.

FARM CHARACTERISTICS

This study compared the responses from the husbands and wives for six farm characteristics--total acres, cropland acres, peak number of beef cattle, peak number of hogs and pigs, farm value and farm debt. The questions on the FWS differed from the questions normally asked by SRS. The exact wording of the questions on the FWS were:

(1) Altogether, about how many total acres are there in your (farm/ranch)? Please include acres you own or lease or rent from other people.

(2) Altogether, how many cropland acres are you operating this year? Please include all owned and rented land planted to crops.

(3 & 4) In rough figures, what was the largest number of (KIND OF ANIMAL) you had on hand at any one time last year?

--Beef cattle (include calves, feeder cattle and finished cattle)
--Hogs, pigs

(5) In rough figures, what is the total value of your (farm/ranch) operation today? Please include the value of all land, animals, machinery and other assets. (PROBE FOR BEST ESTIMATE. ROUND TO NEAREST THOUSAND DOLLARS.)

(6) And what is the total debt for your operation today, including all mortgages for farm or ranch property, and other loans for machinery, animals or other things? (PROBE FOR BEST ESTIMATE. ROUND TO NEAREST THOUSAND DOLLARS.)

Even if national estimates were possible from the FWS, the conceptual and wording differences in questions between the FWS and a typical SRS survey, prevent definitive comparisons of the levels of the estimates from the FWS and SRS surveys. However, because of the similarity in the nature of the questions, comparisons of the responses from the husbands and wives on the FWS should enlighten SRS about responses to its own surveys.

## ANALYSIS

Four factors were evaluated when comparing the responses between the husbands and their wives. First, the amount of missing data was compared for each of the six farm characteristics to determine if either the husbands or wives had more difficulty providing the information. Second, the responses were compared for all households where both the husband and wife responded to ascertain if the couples were statistically reporting the same data. Next, the data from the couples were compared separately for male and female telephone interviewers to see if the response differences were generally caused by either the male or female interviewers. Finally, the responses were compared between the couples from households where the wife was not involved in a farm activity related to the farm characteristic and from households where the wife was at least occasionally involved in an activity related to the farm characteristic. This analysis was performed in order to determine if the responses were more similar within each household when the wife was involved in a related farm task. These households were of particular interest since the wives in these households should be more likely to volunteer to provide the data if the husband (usually the operator) is not available.

Table 1 shows the percentage of times that the response was missing from the husbands and the wives for each characteristic. Also shown in this table is the significance level from each McNemar test (2) that was used to determine if there was a significant difference in the amount of missing data between the husbands and wives. A description of this test is given in the Appendix.

Table 1: The percentage of the 473 responses that were missing for the husbands and wives and the significance level from the McNemar test for each farm characteristic.

| Farm Characteristic | Percentage Missing | | Significance Level |
|---|---|---|---|
| | Husbands | Wives | |
| Total Acres | 0.8 | 3.4 | <.01 * |
| Cropland Acres | 1.3 | 5.9 | <.01 * |
| Beef Cattle | 0.4 | 2.5 | .01 * |
| Hogs and Pigs | 0.4 | 1.9 | .06 |
| Farm Value | 12.7 | 40.2 | <.01 * |
| Farm Debt | 7.2 | 25.4 | <.01 * |

* denotes a significant difference at the .05 significance level.

The results displayed in Table 1 show that the wives had more missing responses than their husbands for each of the six characteristics. For five of the six characteristics, the wives had significantly more missing data at the .01 significance level. Therefore, it appears that the wives either were not as informed about the various farm characteristics or were less willing to provide the information. Both the husbands and wives had much more missing data for the economic questions than for the acreage and livestock questions.

The percentage of husbands and wives who reported the same value for each farm characteristic is given in Table 2. The percentages ranged from 20.6 percent for farm value to 80.5 percent for hogs and pigs using all interviews where both the husband and wife responded. The husbands and wives gave the same answer more often for livestock items than for the acreage and economic items. However, fewer couples reported having livestock than the other characteristics. Therefore, many of the identical responses for livestock merely reflect the ability of the couples to agree that they had no beef cattle or hogs. Table 2 also shows the percentage of times the couples reported the same value for each characteristic when either the husband or the wife reported a positive value for the characteristic. Notice that the percentage of the couples giving the same answer was then lowest for the livestock questions.

Also shown in Table 2 for each farm characteristic is the percentage of times the wife reported a value within 10 percent of her husband's response. These percentages were generated to determine whether the responses, which have been shown to be different, were only marginally different. Surprisingly, a large percentage of the wives' responses were not even within 10 percent of the answers from their husbands, illustrating that the response discrepancies were certainly not trivial.

Table 2: The percentage of times the wife reported the same value as her husband or a value within 10 percent of his response for each farm characteristic using all respondents and all positive respondents.

| Farm Characteristic | All Respondents | | | All Positive Respondents | | |
|---|---|---|---|---|---|---|
| | Number of Respondents | The Same | Within 10 Percent | Number of Positive Respondents | The Same | Withing 10 Percent |
| | | (%) | | | (%) | |
| Total Acres | 455 | 40.9 | 64.8 | 455 | 40.9 | 64.8 |
| Cropland Acres | 441 | 29.3 | 44.9 | 409 | 23.7 | 40.3 |
| Beef Cattle | 459 | 57.5 | 63.0 | 225 | 13.3 | 24.4 |
| Hogs and Pigs | 462 | 80.5 | 81.6 | 108 | 16.7 | 21.3 |
| Farm Value | 262 | 20.6 | 26.7 | 262 | 20.6 | 26.7 |
| Farm Debt | 337 | 43.0 | 50.1 | 242 | 20.7 | 30.6 |

The next step in the analysis was to determine whether there was a significant difference in the responses from the husbands and wives for each farm characteristic. This analysis will show either that the response differences between the husbands and wives tend to cancel out or that the wives report higher or lower values than their husbands.

The relative difference between the responses from the husbands and wives and the significance levels from the Wilcoxon Signed Ranks tests (2) are given in Table 3 for each farm characteristic. The relative difference, expressed as a percentage, was defined throughout this report as the average response from the wives minus the average response from the husbands divided by the average response from the husbands. A description of the Wilcoxon test is given in the Appendix.

An outlier was removed from the analysis for total acres as well as an outlier for hogs and pigs because of the large impact each outlier had on the relative differences. Excluding the outlier, the relative difference between the responses for total acreage was changed from -14.6 to -5.1 percent. The relative difference for hogs and pigs was also drastically reduced by removing an outlier (-18.9 to -12.8 percent).

The responses from the wives were lower than the husbands for each of the six characteristics. The response differences were the largest for the economic items and smallest for acreage items. The responses from the husbands and wives were the closest for cropland acres. For four of the six characteristics--total acres, beef cattle, farm value and farm debt--the wives' answers were significantly lower than the responses from their husbands at the .01 significance level. Although the responses were not significantly different for hogs and pigs, the large relative difference (-12.8 percent) was alarming.

Table 3: The relative difference between the responses from the husbands and wives and the significance level from the Wilcoxon test for each farm characteristic.

| Farm Characteristic | Number of Respondents | Relative Difference | Significance Level |
|---|---|---|---|
| Total Acres | 454 | - 5.1 | <.01 * |
| Cropland Acres | 441 | - 3.2 | .17 |
| Beef Cattle | 459 | -12.5 | <.01 * |
| Hogs and Pigs | 461 | -12.8 | .19 |
| Farm Value | 262 | -20.5 | <.01 * |
| Farm Debt | 337 | -25.9 | <.01 * |

* denotes a significant difference at the .05 significance level.
Relative Difference = 100* (Wives - Husbands) / Husbands

The responses from the husbands and wives were compared separately for the male and female telephone interviewers to determine if the response discrepancies were caused mainly by either the male or female interviewers. The relative differences in the responses and the corresponding significance levels from the Wilcoxon tests are given in Tables 4 and 5 for the male and female interviewers, respectively.

Table 4: The relative difference between the responses from the husbands and wives and the significance level from the Wilcoxon test for each farm characteristic using only male interviewers.

| Farm Characteristic | Number of Respondents | Relative Difference | Significance Level |
|---|---|---|---|
| Total Acres | 211 | - 4.4 | < .01 * |
| Cropland Acres | 207 | 2.7 | .43 |
| Beef Cattle | 212 | - 1.5 | .06 |
| Hogs and Pigs | 216 | -16.7 | .22 |
| Farm Value | 120 | -10.7 | .07 |
| Farm Debt | 155 | -29.8 | < .01 * |

* denotes a significant difference at the .05 significance level
Relative Difference = 100 * (Wives - Husbands) / Husbands

Table 5: The relative difference between the responses from the husbands and wives and the significance level from the Wilcoxon test for each farm characteristic using only female interviewers.

| Farm Characteristic | Number of Respondents | Relative Difference | Significance Level |
|---|---|---|---|
| Total Acres | 243 | - 6.0 | <.01 * |
| Cropland Acres | 234 | - 6.1 | .01 * |
| Beef Cattle | 247 | -23.4 | <.01 * |
| Hogs and Pigs | 245 | - 8.5 | .52 |
| Farm Value | 142 | -26.2 | <.01 * |
| Farm Debt | 182 | -23.0 | <.01 * |

* denotes a significant difference at the .05 significance level
Relative Difference = 100* (Wives - Husbands) / Husbands

The answers from the wives were almost always lower than their husbands regardless of whether the interviewer was male or female. The responses for total acres and farm debt were highly significantly different between the husbands and wives for both the male and female interviewers. The answers from the couples for cropland acres, beef cattle and farm value were more dissimilar for female interviewers. Overall, the response differences tended to be associated more with the female interviewers. This is an important result since telephone interviewers in SRS are generally female.

The final step of the analysis compared the responses between the husbands and wives for two kinds of households. The first kind included households where the wife reported that she was "not" involved in a farm activity related to the farm characteristic of interest. The second kind of household included only those wives who indicated that they were "at least occasionally" involved in a farm task related to the farm characteristic. This analysis was performed to determine if the response disparities between the husbands and wives decreased when comparisons were restricted to operations where the wife was involved in a related farm activity. These households were of particular interest since a wife who is involved in farm activities should be more likely to volunteer to provide the data if her husband (usually the operator) is not available.

Three farm activities were selected that are related to the farm characteristics. These activities were: (1) plowing, planting, disking or cultivating, applying fertilizers, herbicides or insecticides, or harvesting, (2) caring for farm animals, and (3) bookkeeping. The first activity was used for response comparisons between the husbands and wives for total acres and cropland acres. The second activity was used for the two livestock characteristics while the third activity--bookkeeping--was used for farm value and farm debt. For example, the responses from the couples for farm value were compared between households where the wife was not involved in bookkeeping and households where the wife was at least occasionally involved in bookkeeping.

One problem with drawing inferences from this part of the analysis is that it is not known how related the farm activity is to the farm characteristic. For example, when a wife said that she regularly cared for farm animals, she may have only been referring to dairy cattle and not to beef cattle or hogs. Therefore, one would not necessarily expect her to be more knowledgable about hog numbers. On the other hand, one would expect the respondent to be more knowledgable about the number of cropland acres if she is involved in planting activities.

The relative difference between the responses from the husbands and wives is given in Table 6 for each characteristic for the households where the wife was not involved in the related farm task and for households where the wife was

occasionally or regularly involved. The responses from the husbands and wives were very similar for total acres, cropland acres, and hogs when the wife was involved in the related farm activity. Surprisingly, for the other three characteristics--beef cattle, farm value and farm debt--the differences in the responses between the husbands and wives were still very large even when the wives were involved in the farm tasks.

Table 6: The relative difference between the responses from the husbands and wives for couples where the wife is not involved or is at least occasionally involved in the farm activity related to the farm characteristic.

| Farm Characteristic | Not Involved | | At Least Occasionally Involved | |
|---|---|---|---|---|
| | Number of Respondents | Relative Difference | Number of Respondents | Relative Difference |
| Total Acres | 203 | -8.6 | 251 | -2.4 |
| Cropland Acres | 195 | -8.9 | 246 | 2.9 |
| Beef Cattle | 229 | -6.9 | 230 | -15.2 |
| Hogs and Pigs | 229 | -31.6 | 232 | -1.5 |
| Farm Value | 54 | -20.3 | 208 | -20.5 |
| Farm Debt | 71 | -55.3 | 266 | -14.9 |

Relative Difference = 100* (Wives - Husbands) / Husbands

The analysis summarized in Table 6 treated the acreage, livestock and economic items separately based on the three farm activities. For multipurpose surveys conducted by SRS such as the June Enumerative Survey (JES), the wife may be willing to respond if she is involved in any aspect of the operation. For example, if the wife is involved in planting activities and agrees to provide acreage information on the JES, she may also provide livestock and economic data for the JES even though she is not familiar with these items. Therefore, the response differences between the operator and spouse would probably be greater in a multipurpose survey than in a single purpose survey.

## CONCLUSIONS

The responses were compared between 473 husbands and their wives from the 1980 Farm Women's Survey (FWS) in order to determine if the couples statistically provide the same answers for the following farm characteristics: total acres, cropland acres, peak number of beef cattle, peak number of hogs and pigs, farm value and farm debt. This analysis was of particular interest to SRS because the spouse often provides data for SRS's surveys if the operator is not available. SRS assumes that the husband and wife will provide the same data.

The analysis showed that the wives not only had significantly more missing data than their husbands, but also reported significantly smaller values than their husbands. The response differences were more pronounced for female rather than male telephone interviewers. When the analysis was restricted to households where the wives were involved in a farm activity related to the farm characteristic of interest, the responses were still quite disparate between the husbands and wives for three of the six farm characteristics -- beef cattle, farm value and farm debt.

Although there were definitional and wording differences between the questions asked during the 1980 FWS and typical SRS surveys, the response inconsistencies within the households illustrate the danger of accepting data from the spouse of the operator. SRS should continually stress to the personal and telephone interviewers the importance of obtaining the survey data from the operator. If interviewers readily accept the information from other people associated with the operation who may not be thoroughly informed about the survey items, nonsampling errors may have a serious effect on the level of the estimates.

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APPENDIX

Two procedures were used in this study to test for significant differences between the data from the husbands and wives. The McNemar test was used to test for differences in the amount of missing data between the husbands and wives. The Wilcoxon Signed Ranks test was selected to compare the responses obtained from the husbands and wives. The hypotheses tested, the test statistic and the decision rule will now be described for the McNemar and Wilcoxon tests.

(A) McNemar Test: The data consists of n bivariate observations $(H_1,W_1)$, $(H_2,W_2)$,..., $(H_n,W_n)$ where H represents the husband and W the wife. The possible values for $H_i$ and $W_i$ are "0" or "1". That is, $H_i$ or $W_i$ takes on the value "1" if the response was missing and "0" if the response was not missing.

(1) HYPOTHESES: $H_o$: $P(H_i = 1) = P(W_i = 1)$ for all i

$H_a$: $P(H_j = 1) \neq P(W_i = 1)$ for all i

(2) TEST STATISTIC: When $b+c>20$, the test statistic is written as $T_1 = \frac{(b-c)^2}{b+c}$ where b = the number of times $H_i=1$ and $W_i=0$ and c=the number of times $W_i=1$ and $H_i=0$. When $b+c\leq 20$, the statistic is $T_2=b$.

(3) DECISION RULE: If $b+c>20$, reject Ho at the level of significance $\alpha$ if $T_1$ exceeds the $(1-\alpha)$ quantile of a chi-square random variable with one degree of freedom. Otherwise, accept Ho. If $b+c\leq 20$, reject Ho if $b+c-t \leq T_2 \leq t$ at the level of significance $\alpha$ where t is obtained from a table of the binomal distribution with p=.5. Otherwise, accept Ho.

(B) Wilcoxon Signed Ranks Test: The data consists of n bivariate observations $(H_1,W_1)$, $(H_2,W_2)$,..., $(H_n,W_n)$ where H represents the husband and W the wife. The absolute differences (without regard to sign) are given by:

$$|D_i| = |H_i-W_i| \quad ; \; i=1,2,\ldots,n.$$

Omit from further consideration all couples with a difference of zero. The number of couples remaining will then be m where $m \leq n$. Ranks 1 to m are then assigned to the m couples according to the relative size of the absolute difference. Rank 1 is given to the smallest $|D_i|$, rank 2 to the second smallest $|D_i|$, and so on, with rank m being assigned to the couple with the largest absolute difference.

(1) HYPOTHESES: Ho: $E(H) = E(W)$

Ha: $E(H) \neq E(W)$

(2) TEST STATISTIC: The test statistic, T, equals the sum of the ranks assigned to couples where $H_i$ exceeds $W_i$. That is, let $R_i = \begin{cases} \text{the rank assigned to couple i if } D_i > 0, \\ 0 \text{ if } D_i < 0. \end{cases}$

Then the test statistic is : $T = \sum_{i=1}^{m} R_i$.

(3) DECISION RULE: Reject Ho at the level of significance $\alpha$ if $x_{1-\alpha/2} < T < x_{\alpha/2}$ where $x_{\alpha/2}$ is equal to $[m(m+1)/4] + Z_{\alpha/2}\sqrt{m(m+1)(2m+1)/24}$ where $Z_{\alpha/2}$ is the $\frac{\alpha}{2}$ quantile of a standard normal random variable. Otherwise, accept Ho.