

A New Approach to Collecting Farm Accident Data

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Since the early 1940s, newspaper clippings and personal interview surveys have been the primary methods for collecting agricultural accident data. Accident data forms and survey procedures were standardized during the late 1960s, and many statewide surveys were conducted throughout the 1970s. In recent years, the implementation of the standardized survey procedure has become difficult and appears to no longer be viable. A personalized mail survey approach was recently tested in Pennsylvania with excellent results. The personalized mail survey research procedures may become an efficient, long-term method of agricultural accident data collection.

Farm safety has been a formalized concern of safety and health professionals since at least 1937, when the National Safety Council organized a separate farm safety program during its National Safety Congress (Burke, 1987). Prompting this concern was statistical evidence gathered on farm accidents in the late 1920s and early 1930s. Then as now, the prevention of farm accidents was the driving force behind efforts to collect detailed information about farm accidents (Bureau of Agricultural Economics, 1942).

A variety of reports were published on farm accidents throughout the 1940s and 1950s. Many of these reports were published

by state agencies and the federal government. For example, the Pennsylvania Department of Public Instruction issued a farm fatality report in 1952, and the Kansas State Board of Health issued a 25-year farm fatality report in 1956. The United States Department of Agriculture issued a 5 year fatality report in 1957 (Rush, 1957). The information in these reports came from death certificates.

During the same time period, other statewide surveys were conducted to collect more detailed information about fatal accidents than was provided on death certificates and to collect data about nonfatal accidents. These early surveys were usually accomplished as a cooperative effort by groups of vocational agricultural teachers and Future Farmer of America (FFA) students (Roy, 1957), or state cooperative extension services and farm bureau organizations (Adams, 1957; Baker & Stuckey, 1958).

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These early statewide studies varied in the definitions of what types of incidents should be recorded and in the variables surrounding each incident that should be recorded. The studies were thus not comparable, and using them to formulate comprehensive preventive strategies was difficult at best (Rush, 1962). To help solve this problem, farm safety leaders at Ohio State University and Michigan State University collaborated during the 1960s to develop a standardized method of collecting farm accident data (Hofmeister & Pfister, 1968; Phillips & Stuckey, 1968).

Three key elements resulted from this collaboration: (a) common methods for determination of sample size and selection of sample farms; (b) standardized accident reporting forms; and (c) common definitions of important terms such as "accident." Based on this work, the National Safety Council undertook a national effort to have each state conduct a standardized statewide farm accident survey (National Safety Council, 1971).

STANDARDIZED FARM ACCIDENT SURVEY PROCEDURES

For the purpose of these surveys, an accident was defined as an event resulting in injuries requiring professional medical care or in the loss of one half day or more from usual activities (National Safety Council, 1971). All farm work and leisure-time accidents that occurred to any family member, hired farm worker, contractor, or guest were to be included.

A three-step process was used to select the sample counties to participate in the survey.

1. The percentage of each type of farming operation in each county was established. Counties with small numbers of farms were joined together and treated as one county unit.

2. The counties were then randomly assigned to a group.

3. The county (county unit) from each group of counties that best typified the types of farming in the state was selected to be in the survey.

This procedure provided a stratified random sample based upon the percentages of each type of farming operation in the state. A sample of 3% to 5% of all farms was usually included in the year-long study. Selection of individual farms is explained below.

Use of Volunteer Interviewers

The heart of the standardized farm accident survey procedure was the use of volunteer interviewers to monitor accidents involving farm and rural residents over a 12-month period. State agricultural safety leaders recruited and trained the volunteer interviewers. The statewide leader was often a member of the state's cooperative extension service or of the state's farm bureau organization. Hundreds of volunteer interviewers were needed in some states to implement the surveys (Erisman, 1971; Jenson, 1972). A leader for each county was recruited to coordinate survey activities and to act as a liaison between volunteer interviewers and the state survey leader.

Volunteer interviewers were each asked to recruit 10 to 12 nearby farms to participate in the study. If a farm operator agreed to participate, an interview was conducted during which descriptive data were gathered about the farm operation, including type of farm, size of farm, hours of farm labor, general health status of family members, and so on. These data were recorded on standard forms. Also provided was a tractor and machinery operator educational information form to be completed by each tractor operator on the farm.

During the initial and subsequent visits, the farm's accident history for the previous 3 months was also recorded. If a farm had a recordable accident during that time, the interviewer was to complete an accident and illness report form. Supplemental forms providing data on specific types of accidents (e.g. tractor accidents) or on medical and accident costs were also to be completed. However, not all states used all supplemental forms.

The volunteer interviewers were to visit or call each of their cooperating farms quarterly. Thus, counting the initial visit, each farm was to be visited or contacted four times each year. Contact report forms, even

if there were no accidents during the preceding 3 months, were to be filled out by the interviewer and returned to the county leader at the end of each quarter.

Implementation Problems

The procedures laid out by the Standardized Farm Accident Survey Program were methodologically sound but were difficult to implement consistently across the states. Implementation difficulties, although not the same for all states, could be summarized as follows.

First, there was difficulty in finding sample counties that were truly proportionately representative of all types of agriculture in some states. Also, keeping a selected county active in the survey throughout the year was a problem for some states. Such problems left states with data that was suspect in terms of their representativeness of farms in the state (Brazelton, Fischer & Knutson, 1976; Field & Bailey, 1976). When data from the states were pooled for a national picture of farm accidents, those results were also suspect. Reports by Hoskin and Miller (1979), and the National Safety Council (1982) confirmed these suspicions.

Hoskin and Miller looked at animal accidents from the 21 states that had participated in the program up to that point. Their analysis showed that farms under 200 acres were underrepresented in the survey, and farms 200 acres and over were overrepresented. In the National Safety Council report, types of farms in the survey were compared with U.S. census figures. Compared to the general population of farms, the survey had only slightly more than half as many beef farms, and nearly three times as many dairy farms. Grain farms were also slightly overrepresented. Moreover, some states have never participated in this program, making representativeness from a national perspective extremely difficult.

Second, a large number of volunteers were required for surveys. A volunteer coordinator was needed in each county, and of course, hundreds had to volunteer to serve as interviewers. Dropouts from both groups were common for a variety of reasons. A dropout by the volunteer county leader of-

ten meant that the entire county also dropped out of the survey.

A third problem was that a considerable investment of time and dollars was required to recruit, train, and monitor the volunteer county leaders and volunteer interviewers. Additionally, surveys had to be computerized and analyzed. The investment was willingly made by most state leaders for their first survey, but not beyond that. State leaders who did attempt more than one survey noted that it was much more difficult to find volunteers at the county level for the second one. In general, there seemed to be a feeling that for all the time, cost, and effort that went into the survey program, not enough benefit was achieved.

Yet another problem was a reduction in the number of extension safety leaders throughout the country. Extension safety leaders had directed the survey in most of the participating states. A lack of funding at the state and federal levels left many states without viable farm safety programs and fulltime safety leaders (Schnieder, 1986).

A final problem, though rather intangible and difficult to measure, was the changing nature of agriculture itself. The number of farm families was constantly shrinking, many were busy supporting themselves with off-farm income, and their available leisure time was occupied with an ever-increasing number of social and recreational opportunities.

For all of these reasons, the National Safety Council's standardized farm accident survey fell out of favor, and 1984 was the last year in which any state conducted the standardized survey (J. Burke, personal communication, February 28, 1988).

THE PERSONALIZED MAIL SURVEY APPROACH

A fundamental premise of the personalized mail survey approach is that most people are willing to comply with reasonable requests. However, potential survey respondents must believe that their own, individual contribution to the survey is vitally important. How to achieve this perception among respondents has been the focus of research for many years (Erdos, 1970; Heber-

lein & Baumgartner, 1978; Yu & Cooper, 1983). A comprehensive approach to personalized mail (and telephone) surveys was developed by Dillman (1978). His approach is the basis for the study reported in this article.

In brief, personalizing mail surveys is achieved through both the appearance and content of the survey instrument, cover letters, and envelopes. This means that obvious signs of mass mailing must be avoided. Cover letters must convey in direct simple language the importance of the respondent's answers to the survey. There should be no monetary cost to the respondent for participating; thus, a prepaid, addressed return envelope should be included with the survey instrument. The survey instrument must be attractively laid out, and the relevance of questions should be obvious to the participant. These principles were applied in conducting a personalized mail survey research project in Pennsylvania to collect farm accident data.

THE PENNSYLVANIA SURVEY

The following discussion concerns the development and implementation of the Pennsylvania survey and the survey return rates. The major objectives of this project were to see if a personalized mail survey would be successful in obtaining responses from a representative sample of Pennsylvania farm operators and if such a survey could be conducted at a reasonable cost.

Sample Selection

A stratified random sample of 2.12% of farm operators was selected by the Pennsylvania Department of Agriculture (PDA) for the survey. The PDA was used as the sample source because it has the most complete and up-to-date mailing list of farm operators in the state, and the department has the means to generate samples that meet specified parameters. The stratification parameters were type of farm operation, size of farm, and geographic location of the farm. These parameters supplied the survey with a representative sample of the farm operations in Pennsylvania.

Preparation of Materials

Cover letters and a postcard message were prepared by the researchers. Included in the cover letters was the telephone number of the researchers and an invitation to call collect if there were any questions. Subjects who wanted a copy of the results were instructed to put their name and address on the back of the survey instrument. Survey instruments were coded to provide a means of confidentiality for the subjects. The purpose of the code number was included in the initial cover letter.

The envelopes addressed to the subjects were individually typed, and cover letters contained an individually typed inside address and salutation and were individually signed. Postcards were also individually addressed and signed, but the salutation was omitted. The survey instrument was devised by the agricultural statistics task force of the agricultural division of the National Safety Council. Return envelopes were postage-

TABLE 1
PERCENTAGE DISTRIBUTION BY
GEOGRAPHICAL DISTRICT OF
ALL PENNSYLVANIA FARM OPERATIONS,
SURVEY SAMPLE, AND RESPONSE SAMPLE

Pennsylvania District	% of All Farm Operations in State ^a	% of Sample Farm Operations	% of Responding Farm Operations ^b
Northwest	9.8	9.8	9.0
North central	8.4	8.4	8.6
Northeast	4.5	4.5	4.1
West central	9.9	9.9	10.1
Central	16.0	16.0	16.8
East central	5.2	5.2	5.6
Southwest	11.4	11.4	9.9
South central	14.0	14.0	15.2
Southeast	20.8	20.8	20.8

^aBased on PDA Figures. ^bPercentages are of total number of returned forms.

TABLE 2
DISTRIBUTION BY FARM SIZE AND TYPE OF ALL PENNSYLVANIA FARMS OPERATIONS,
SURVEY SAMPLE, AND RESPONSE SAMPLE

Farm Size or Type	All Farm Operations ^a in State	Sample Farm Operations	Responding Farm Operations
Average size in total acres	150	178	182
Average acres of cropland	NA	119	118
<u>Farms with fruit and vineyards</u>			
Average size in acres	34	21	19
% of total farms	2.8	3.5	3.9
<u>Farms with cattle</u>			
Average number of cattle	42	51	52
% of total farms	81.4	79.4	78.2
<u>Farms with milk cows</u>			
Average number of milk cows	39	43	43
% of total farms	32.7	41.2	41.1
<u>Farms with hogs</u>			
Average number of hogs	82	62	72
% of total farms	18.6	15.0	15.0
<u>Farms with sheep</u>			
Average number of sheep	23	23	23
% of total farms	8.3	7.2	7.5
<u>Farms with hens and pullets</u>			
Average number of hens and pullets	1,542	1,272	496
% of total farms	21.2	14.4	15.2

^aBased on PDA figures.

paid and preaddressed. First class postage was used in all instances.

Implementation of the Survey

The timing of a survey contact is important to a good return rate. In surveys with agricultural producers, common sense would suggest staying away from late spring, summer, and autumn mailings because of normal agricultural production schedules. Additionally, the researchers believed that avoiding the holiday season would make sense. Thus, the first survey contact was mailed out on January 11, 1988.

This mailing consisted of the cover letter, survey questionnaire, and a preaddressed stamped return envelope. Exactly 1 week

later, a postcard was sent to all subjects. The postcard reminded those who had not yet responded to do so and thanked those who had already responded.

Exactly 2 weeks after the postcard, a third contact was made with subjects who had not yet responded. The cover letter was shorter and more direct. It noted that the survey had not yet been returned and gave the subject another opportunity to do so. Another questionnaire and return envelope were provided.

Exactly 4 weeks after the third contact, the fourth and final contact was made with nonrespondents. The cover letter emphasized the variety in Pennsylvania agriculture, the uniqueness of each individual's ag-

ricultural situation, and the importance of each response to the success of the study. Another questionnaire with return envelope was provided.

To protect the confidentiality of survey subjects, the PDA would not allow the researchers direct access to the survey sample. Therefore, under a contract with the researchers, the PDA selected the sample, coded the survey forms, and typed, addressed, and stuffed envelopes for each successive contact. The letterhead on the cover letter and the return address on all envelopes was that of the researchers. Postage was affixed by the PDA but was paid for by the researchers. As surveys were returned, the code numbers were relayed to the PDA so that respondents would not be contacted again.

Results

Table 1 shows the percentage distribution by geographical location of farm operations throughout the state, the survey sample, and the response sample. A chi-square analysis showed no significant differences between the sample response farm operations and farm operations throughout the state ($\chi^2=4.56, p < .05, df=8$).

Table 2 shows that generally the percentage of responses closely matched the selected sample for farm size and farm type. There was a large difference in the average sizes of farms with hens and pullets. Howev-

er, this can be attributed to the wide fluctuation in size among farms of this type throughout the state and does not significantly detract from the overall representativeness of the sample.

The second objective of the study was to see if a survey yielding a representative sample could be conducted at a reasonable cost. Table 3 summarizes the printing and postage costs for each of the four contacts used in the survey. Dividing the total printing and mailing cost by the 912 responses results in a cost of \$1.52 per survey response.

The contract with the PDA to implement its part of the survey was \$6,500.00. This cost was for selecting the sample and staff costs associated with administering each of the four mail contacts. Included in this cost was an allowance for telephone interview time in case the mail survey procedure did not produce a sufficient or representative response. Table 4 shows the total costs and the cost per respondent to conduct the survey.

The response rate to each of the four contacts is another factor in determining the survey's cost efficiency. Table 5 shows responses for each mailing to the subjects. Two important observations can be made. First, the fourth contact produced a significantly reduced percentage of responses, compared to the first three contacts. Second, of those responses to the fourth mailing, a much larger proportion of the surveys were returned blank. Of the blank forms returned from all four contacts, 88% had comments such as "no longer farming" written across the top. Overall, 10% of the survey participants either indicated they were not farming or returned blank questionnaires.

Another consideration was whether the personalized mail survey procedure would yield usable accident data. Table 6 shows the number of responses that indicated single or multiple accidents. Of the 101 respondents who reported accidents, 10 indicated having two or more accidents in the past 12 months. The total number of 117 accidents reported in the survey was used to determine a Pennsylvania farm accident rate, as follows:

$$\frac{117 \text{ TOTAL ACCIDENTS}}{(912 - 92) \text{ TOTAL FARMS}} = 0.143 \text{ per farm}$$

TABLE 3
PRINTING AND MAILING COSTS
FOR PENNSYLVANIA FARM SURVEY

Item	Contact Number				Total
	1	2	3	4	
Printed materials	\$190	\$ 85	\$165	\$ 80	\$ 520
Postage	329	236	216	90	871
Total	519	321	381	170	1,391

TABLE 4
TOTAL COSTS AND COSTS PER RESPONSE
FOR PENNSYLVANIA FARM SURVEY

Item	Total	Per Response
Mailing and postage	\$1,390	\$ 1.52
PDA Contract	6,500	7.13
Total	7,890	8.65

The standard error was computed to be 9%. With the standard error, the total number of farm accidents for one year in Pennsylvania was estimated by:

$$(56,500 \text{ farms}) \times (0.143 \text{ accidents per farm}) \pm 9\% \\ 8,080 \pm 727 \text{ estimated accidents}$$

The accident rate of 14.3 per 100 farms compares with 13.5 per 100 farms from the 1976 Pennsylvania statewide survey (Murphy, 1976), and with 11.0 per 100 farms in the Northeast states (National Safety Council, 1982). These latter two figures were obtained using the Standardized Farm Accident Survey Procedures discussed above.

DISCUSSION

The results of this project suggest that a personalized mail survey technique can be used to collect safety-related information from a representative sample of farm operators. Some of the specifics that must be considered in conducting such a survey are the source of the sample and overall costs.

Using the state department of agriculture to generate the survey sample provided an excellent means of selecting a representative sample of farm operations. State departments of agriculture have ongoing state and federal responsibilities to collect data about farms and farm operators in their respective states. This includes establishing an official number of farms, farm types, and so on.

Nevertheless, 10% of the returned surveys were unusable. Because the farm population is constantly changing, it is expected that the mailing list will always be less than perfect. Surveys in additional states will help establish a range of returned, nonusable questionnaires that can be expected. This information will be useful in determining a state's required sample size.

The total costs of this study appear high, and it may cost other states less to do similar surveys in the future. One reason was uncertainty about the response rates from farmers for the kind of information sought. This un-

TABLE 5
SURVEY RESPONSE BY MAILING CONTACT FOR PENNSYLVANIA FARM SURVEY

Variable	Contact Number				Total
	1	2	3	4	
Contact date	Jan. 11	Jan. 18	Feb. 1	Feb. 29	
Return period (in weeks)	1.5	1.5	4	4	11
Number of forms sent	1,200	1,200	700	380	3,480
Number of forms returned	290	302	250	70	912
% of all forms returned	24.2	25.2	20.8	5.8	76
Number of forms returned blank	18	19	29	26	92

TABLE 6
TOTAL ACCIDENTS REPORTED
IN PENNSYLVANIA FARM SURVEY

Number of Accidents Reported	Number of Respondents	Total Accidents
One accident	91	91
Two accidents	6	12
Three accidents	2	6
Four accidents	2	8
Total	101	117

certainly necessitated an extra labor cost allowance for telephone follow-up calls that were not needed and costs for a fourth mail contact that produced a substantially smaller percentage of responses than the first three contacts. The experience obtained in this study, along with a multitude of experiences from other personalized mail survey studies, suggest that allowance for telephone follow-up may not be necessary. In future surveys, researchers may also want to consider using only three contacts.

Another factor that contributed to a higher cost of the survey was the need to have the PDA handle the mechanics of administering the survey. If the researchers had been able to gain direct access to the selected sample mailing list, they could have administered the survey using student help which can be obtained at a lower cost.

Finally, because administering this project had to be worked into other ongoing projects, the PDA printed cover letters and questionnaires and coded questionnaires for the third and fourth contacts for the entire sample. The extra printing and labor cost associated with this would have been greatly reduced if the research institution had administered the project. If these administrative problems can be rectified, total costs for future survey efforts should be reduced.

Only a few farms (10) reported more than one accident. Details for these additional

accidents were not sought. Trying to collect details about a possible second and third accident from each subject would have added to the cost of the survey, and may have discouraged subjects from responding at all because of the additional effort required.

Survey Limitations

This survey procedure provides an adequate means of determining the number of accidents occurring on farms, an accident rate per farm, and general information about each accident. However, it does not allow an in-depth look at various types of accidents, nor does it discover many fatal accidents. For instance, only one fatal injury was reported in this survey.

To have a large enough sample to discover fatal accidents, and to conduct in-depth analyses of accident types, the sample would have to be increased many times. This would add significantly to survey costs. Other analytical methods such as case studies or the critical incident technique may be more appropriate for in-depth analyses of agricultural accidents.

CONCLUSIONS

In summary, the following conclusions can be drawn from the preceding discussion:

1. The personalized mail survey technique is a useful method for collecting general agricultural accident data and related information.
2. State departments of agriculture are excellent sources from which to draw a representative sample of subjects.
3. Survey costs could be reduced if an agreement could be reached with state departments of agriculture that would allow land-grant universities direct access to names and addresses of sample subjects.
4. A larger initial sample size and only three contact mailings may shorten the survey time frame, lower survey cost, and allow more efficient administering of the survey without adversely affecting the quality or quantity of returns.

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