Use of Mailed Questionnaire Data in a Study of Swine Congenital Malformations

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ABSTRACT

A study was designed to evaluate the representativeness and accuracy of data collected on swine birth defects by mailed questionnaire. The study was conducted in the three contiguous counties of Johnson, Lafayette and Pettis in west central Missouri. A personal interview survey and an examination of malformed pigs were used to validate mailed questionnaire data which estimated the frequency and distribution of malformations observed in pigs over a six month period. This period between April and September 1970 was defined as the study period. The results were compared to a previous six month period (April-September 1969), or baseline period, when only the mailed questionnaire was used. The frequency and distribution of the reported malformations by type did not differ significantly (at the p=0.05 level) between the study period (70.4% response) and the baseline period (31.3% response). Evaluation of this and additional data collected during the study suggested that the mailed questionnaire can be used effectively to estimate the frequency and distribution of swine malformations within a defined geographic area.

RÉSUMÉ

Cette étude visait à déterminer la représentativité et l'exactitude des données recueillies sur les malformations congénitales porcines, à l'aide d'un questionnaire postal. L'étude se limitait aux trois comtés adjacents de Johnson, Lafayette et Pettis, dans l'ouest central de l'Etat du Missouri. On eut recours à l'entrevue personnelle et à l'examen des porcelets anormaux pour confirmer les données du questionnaire postal qui révélaient la fréquence et la nature des malformations observées chez les porcelets, au cours d'une période de six mois, c'est-à-dire d'avril à septembre 1970. On compara les résultats de cette étude avec ceux d'une étude antérieure de la même durée (avril à septembre 1969), ou période de base, au cours de laquelle on ne recourut qu'au questionnaire postal. La fréquence et la nature des malformations observées ne différaient pas de façon appréciable (au palier p=0.05) entre la période d'étude (70.4% de réponses) et la période de base préalable (31.3% de réponses). L'analyse de ces données, ainsi que des autres recueillies au cours de cette étude, indique qu'on peut utiliser efficacement un questionnaire postal pour déterminer la fréquence et la nature des malformations congénitales des porcelets, à l'intérieur d'une région géographique donnée.

INTRODUCTION

Disease reporting systems developed for domestic animals (4, 5) with few exceptions (1, 6) have not included data about congenital malformations. In a statewide multispecies study of malformations in Missouri, a mailed questionnaire was designed to collect data relating to congenital malformations in domestic pigs (2). These data were then used to estimate swine malformation incidence rates. The format of the questionnaire mailed semiannually for three years to approximately 40,000 farmers each period has been reported previously (8). The percentage of questionnaires returned ranged between 34% to 40%. Questions arose about the representativeness and ac-

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curacy of data obtained by the mailed questionnaires. Described is a study designed to attempt to answer these questions.

MATERIALS AND METHODS

To evaluate the representativeness of the reports returned, an intensive program was instituted to obtain a much greater percentage response during the six month period (April-September 1970), which was defined as the study period. Results not differing from those of a previous six month period (April-September 1969), the baseline period, would suggest that the respondents in the baseline period were representative of the population. The accuracy of those who responded was investigated by personally interviewing producers, extensively checking the questionnaires, and collecting malformed pigs for necropsy.

Because of possible seasonal variations in the occurrence of swine malformations, the information was collected during the same months for both the baseline and study periods. The contiguous counties of Johnson, Lafayette and Pettis were chosen as the study area. There were 1,040 active producers (i.e. swine breeders whose sows or gilts farrowed pigs) during the baseline period, and 1,060 active producers during the study period. During the baseline period an effort was made to explain the program to producers and enlist their cooperation through extension education programs and local media (newspaper, radio and T.V.). During the study period these efforts were reinforced by personal contacts with civic clubs, producer associations and individual producers. Producers were encouraged to keep accurate records and to report and save by freezing all pigs observed with fatal defects. To facilitate collection of pigs during the study period, freezers were placed in the extension offices in each of the three counties. The method of collecting the frozen pigs and their detailed examination in the laboratory has been described (9).

During the study period personal interviews or written comments made by the producers on the questionnaire were used to evaluate the accuracy of the classification of defects by general category (e.g. legs) reported on the mailed questionnaire. Because of time-cost and personnel limitations, it was decided not to interview pro-

TABLE I. Comparison of Congenital Malformations[a] Obtained by Mailed Questionnaires from the Baseline and Study Periods

	Baseline Period		Study Period	
Body System	Frequency	Proportion of Total Malformations	Frequency	Proportion of Total Malformations
Central Nervous System	9	7.6%	27	11.7%
Head	7	5.9%	20	8.7%
Spine	2	1.7%	7	3.0%
Special Sense Organs	6	5.0%	25	10.8%
Eyes	0	0.0%	12	5.2%
Ears	6	5.0%	13	5.6%
Alimentary and Respiratory	52	43.8%	84	36.4%
Mouth	2	1.7%	9	3.9%
Rectum	47	39.5%	72	31.2%
Open Belly	3	2.5%	3	1.3%
Genito-Urinary (sex organs)	21	17.6%	30	13.0%
Bones and Joints (legs)	26	21.8%	50	21.6%
Other Malformations	5	4.2%	15	6.5%
Skin	1	0.8%	12	5.2%
Other (e.g. Monster)	4	3.4%	3	1.3%
Total Congenital Malformations	119	100.0%	231	100.0%
Total Pigs Born	46,628		108,515	
Malformation Rate/1000 pigs born	2.5		2.1	

[a]Not including hair, tail and rupture defects
$\chi^2 = 7.21$ with 5 d.f.; $p = .21$

ducers that reported only hair, tail, or rupture defects. How accurately these three defects are reported had previously been evaluated, and the Spearman's correlation coefficient for each was significant at the p=.001 level (unpublished data). Therefore, consideration of those defects is not included in this report.

RESULTS

Three hundred and twenty-three (31.3%) of the 1,040 questionnaires were returned during the baseline period. In the study period, 746 (70.4%) of the 1,060 producers responded, 651 by mail and 95 verbally. In

TABLE II. Results of Validation Studies on Malformations Reported by Mailed Questionnaire for the Period (April 1 through September 30, 1970)

Reported Body System	Number Reported and Confirmed	Number Reported but Misclassified	Reported but Determined not to be a Defect	Comments
Central Nervous System	17	1	1	
Head	12	0	1	1 had no defect
Spine	5	1	0	
Special Sense Organs	16	0	6	4 mummified fetuses (not a defect)
Eyes	6	0	6	2 had eyes stuck shut for two days
Ears	10	0	0	
Alimentary and Respiratory	78	0	1	1 had rectum deformed, but pig recovered in a few days
Mouth	8	0	0	
Rectum	67	0	1	
Open Belly	3	0	0	
Genito-Urinary (sex organs)	12	2	7	2 were rectal defects, 7 were ruptures
Bones and Joints (legs)	46	3	0	3 were other malformations (conjoined twins)
Other Malformations	5	1	5	1 was a conjoined twin
Skin	5	1	2	2 had tight skin (not a defect)
Other	0	0	3	2 were ruptures, 1 was a mummified fetus
Total Malformations[a]	174 (86.6%)	7 (3.5%)	20 (9.9%)	

[a]In addition ten defects were reported, but validations could not be completed because when interviewed the producer could not recall the type of defect observed. Twenty additional defects could not be validated because the producer could not be contacted

TABLE III. Comparison of Defects Observed by 22 Swine Producers in 29 Pigs[a] and Defects Observed When the Animal was Necropsied

Body System	Correctly Classified by Producer	Producer Misclassified the Body System	Additional Defects Observed at Necropsy but not Observed by the Producer	Total Defects
Central Nervous System	10	0	15	25
Special Sense Organs	0	0	0	0
Alimentary & Respiratory	10	1	5	16
Genito-Urinary	0	0	1	1
Bones and Joints	9	0	2	11
Other Malformations	2	0	0	2
Total	31	1	23	55

[a]One pig was described as having one eye and hair defect, but when necropsied it was observed to be a mummified fetus without birth defects. Thus, the figures in this table actually refer to 28 pigs

addition, 41 (5.2%) reported that they did not wish to cooperate. Only 233 (18.8%) of the known producers did not reply in either period.

The numbers of reported pigs farrowed were 46,628 and 108,515, and the numbers of reported malformations (excluding hair, tail, and rupture) were 117 and 231 during the baseline and study periods respectively. Thus, the malformation rates were 2.5 and 2.1 per 1,000 total births for the baseline and study periods respectively. Using the two-sample binomial test, no significant difference (at the $p=0.05$ level) was found between these two rates.

The distribution of malformations by body system obtained by mailed questonnaire for both periods is shown in Table I (pigs with multiple malformations are classified as "other"). A chi-square test showed no significant difference ($p=0.05$) between the baseline and study period's distributions of birth defects by body system.

The results of the personal interview survey concerning 201 of the malformations are presented in Table II. A total of 174 (86.6%) of the reported defects were confirmed, seven (3.5%) were misclassified by the swine producer and 20 (9.9%) were determined on interview not to be a defect.

In order to check on the validity of the study interview data, during the study period 29 of the 231 malformed pigs were collected for laboratory study from 22 farms. A comparison by body system of malformations observed and reported in interview by the swine producers and defects observed when the pigs were necropsied is presented in Table III. A total of 31 defects were observed and correctly classified, one defect was misclassified, and one animal was described as having a defect but was actually a mummified fetus without congenital malformations. Twenty-three additional internal defects were observed at necropsy, but had not been observed by the producer because they were not grossly visible to him.

DISCUSSION

Ideally, one would determine the frequency and distribution of swine congenital malformations by direct observation. For large geographic areas and limited budgets, one must hire help or get voluntary help; the least expensive procedure is voluntary reporting. While this procedure can never be as accurate as having the count done on the farm by veterinary clinicians or teratological pathologists, it may be sufficiently accurate to fulfill the study needs. Thus the present study was designed to evaluate the representativeness and adequacy of mailed questionnaire data.

The information collected during the study period (70.4% return) did not differ significantly at the $p=0.05$ level from that obtained in the baseline period (31.3% return). This suggests that the data collected for both periods does not substantially differ from results which would have been obtained with a 100% return. Ninety-five (8.9%) producers did not return their questionnaire but reported directly to the study committee that they were no longer in the swine producing business. This leads us to believe that some individuals in the baseline period did not report for the same reason. Although refusal rates were not ascertained for the baseline period, the refusal rates in the study period and in a previous study (8) suggest that a refusal rate of 5% could be expected in our statewide mailed questionnaire study.

The question of accuracy of reporting can be broken into three parts. First, if a producer had observed malformations, did he report them? Due to financial and time considerations the study design did not permit a complete answer to this question. The possibility exists that some producers reported *no defects observed* either because they did not recognize defects or they wished to misinform us. The latter instance is probably uncommon even though it has been suggested that the better producers and the purebred or registered breeder would not report defects. In the present study, as well as the statewide study (9), a number of the pigs collected for necropsy were purebred or registered. Also, outbreaks of malformations in registered or purebred pigs have been reported and investigated (3, 7, 10). If a number of producers had not recognized and reported malformations when they occurred, the estimated rate of malformations would be an *underestimate* of the true figure. Although we could not confirm this observation in the present study, we believe that a majority of the producers who reported no defects observed did in fact not observe birth defects.

Second, would a producer report that he had observed malformations when in fact

he had not? The personal interview studies showed this occurrence to be rare. Less than 6% of the pigs reported with malformations did in fact not have malformations (Table II).

Third, do producers reporting defects categorize them accurately as to general type, e.g. head defect? The personal interviews (Table II) indicate that producers generally categorized defects accurately on their questionnaires.

The accuracy of the personal interview studies was tested by collecting malformed pigs for laboratory examination and necropsy. A total of 21/22 (95.5%) of the producers who saved pigs for further evaluation were able to describe the gross defect later observed at necropsy. A previous report (13) and unpublished field observations also support this conclusion.

Apart from the question of possible underreporting of malformations, evaluation of the study results suggest that mailed questionnaire data can be used to estimate the frequency and distribution of swine malformations by general type. Producers who report defects are able to recognize and describe malformations that are grossly visible.

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