

**THE IMPACTS OF HERD SIZE UPON PRODUCTION EFFICIENCY
AND ANIMAL HEALTH IN THE U.S. SWINE INDUSTRY**

CROOKS, A.C., HURD, H.S., DARGATZ, D., HILL, G.W.¹

As the consuming public continues to demand a low-cost, high-quality product and the animal industries consolidate further, there is an increasing need for an ongoing source of information on the health and productive efficiency of all food animal groups (Glosser, 1988). The objectives of this paper are to describe a preliminary analysis of the effects of increasing herd size on selected production and disease parameters based on data from the National Animal Health Monitoring System, National Swine Survey.

MATERIALS AND METHODS

The National Swine Survey began with a multiframe probability survey of farrowing operations in 1,662 swine herds in 18 states. This sample represented about 60 percent of the U.S. hog farms and 80 percent of the swine population in 1989. Data collection began in November 1989 and was completed in March 1991 (USDA:APHIS:VS, 1991). Government veterinarians established an on-farm health record system on 712 swine operations. Sow and litter observations were made for 21,768 complete farrowing to weaning periods. Farms were visited four times over a 90- to 120-day period.

Herds participating in the survey were stratified, for analysis, into four groups according to the number of breeding females in the herd (50 or less, 51-100, 101-200, and greater than 200). Comparisons were made among the four groups with respect to selected production efficiencies and disease frequencies.

Analysis of variance was conducted along with pair-wise comparisons using Fisher's least significant difference test for each production variable: weaning age, weaning weight and pigs weaned per sow per year. Analysis of variance was used to compare the 21-day incidence densities for clinical cases of scours, respiratory and nervous problems, and deaths to evaluate the effects of herd size.

RESULTS

In strata 1 (1-50 breeding females), 1,485 (6.8% of total) litters were observed from start to finish which represented 178 farms (25% of total). Strata 2 (51-100 females) had 3,046 (14%) litters, and 159 farms (22%); strata 3 (101-200 females) contained 6,885 (31.6%) litters, from 196 (28%) farms, and strata 4 (200+ females) had 10,353 (47.5%) litters and 179 (25%) farms. Figure 1 demonstrates the substantial difference in weaning ages and weights among herd sizes. A variance analysis of weaning ages, weights and numbers of pigs weaned per sow per year demonstrates that there is a difference ($p < .001$) across herd

¹United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services, Animal Health Information Programs, 555 South Howes, Fort Collins, CO 80521, U.S.A.

size strata. Comparisons showed that the means of each of the three paired herd size groups vary significantly.

Incidence of the common health problems among piglets are provided in Table 1. The overall F statistic shows the significant differences in the incidences of scours and respiratory disease across strata. Only scours showed a trend for increase due to increasing herd size.

SUMMARY AND CONCLUSIONS

This paper reports two principle observations from the swine survey conducted by the National Animal Health Monitoring System (NAHMS). First, the largest swine operations were managed for production efficiencies as measured by earlier weaning ages and lighter weaning weights. These decisions resulted in more pigs weaned per sow per year. Second, as production intensity increases (herd sizes grew larger), there did not appear to be a consistent increase in health risk. The effects of herd size in the nursery and finishing floor were not evaluated.

As shown by the production measures, the large-size farms were using the farrowing facility more intensely. Others have anticipated that this intensity would result in increased disease due to the build up of disease organisms, stress, and crowding (Friendship, 1986; Bendixen, 1988; Kliebenstien, 1983). This effect was observed for scours only.

The contrast in risks between diseases tended to decrease the concern of reporting biases among various herd sizes. Also, all herds were using the same type of record keeping system, as established by the government veterinarians.

The implications of this preliminary analysis are that not only did large herds enjoy certain advantages of size economies, such as increased purchasing or selling power, but they also manage the animals in a manner so as to achieve the greatest production efficiencies. Also, they experienced little to no increase in disease risk. This observation may decrease the concern of the opponents of intensive agriculture on the basis of risks to animal health.

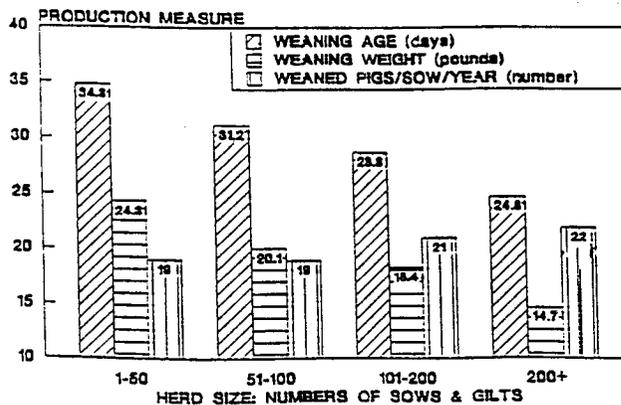


Figure 1: Swine production measures by herd size.

Table 1. Twenty-one (21) day incidence densities for clinical cases of scours, respiratory and nervous system problems, and mortality.

Incidence of	-----Herd Size-----				Computed F Statistic 3, .05
	1-50	51-100	101-200	200+	
Scours	2.7	2.6	3.3	3.6	5.03*
Respiratory System	1.1	1.8	0.4	0.7	15.88*
Nervous System	0.6	0.5	0.5	0.6	0.13
Mortality	1.2	1.1	1.3	1.3	2.87

*Exceeds critical F statistic 3.78 (3 degrees of freedom at .05 level of significance).

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