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Editors
W. Christopher Scruton
Stephen Claas

Layout
David Brown

Logo Design
Ruth Cronje, and Jan Swanson;
based on the original design by Dr. Robert Dunlop

Cover Design
Sarah Summerbell

What does clustering in nursery mortality frequencies mean?

John Deen, Alejandro Larriestra
University of Minnesota Swine Group

Introduction

An old saying goes "When things are good, they're really good, and when they're bad, they are really bad." This is the opposite of the standard statistical assumption of normality, where everything tends towards a central mean. It has been our argument that an understanding of the mechanisms by which improvements can be made in the nursery is not only through the study of means but through the distributions of outcomes. The best distributions for analytic purposes are those that classify groups into differentiated populations—those that allow for identification of a distinct population at risk. This population can then be compared with the baseline population for analysis. However, any analysis must then have available an adequate number of risk factors to allow a comparison.

There are real opportunities to analyze, in more detail, the management of nurseries. Empirically, many production managers have reported a distinct population of problem nurseries, characterized by higher mortality rates, higher medication costs, and a lower quality of pigs at exit. Putative causes have involved a plethora of infectious processes involving both bacterial and viral diseases in various combinations and permutations. Though the list of causes is long, there is a real difficulty in understanding the relationship with the measurements of concern. Too often the discussed causes are ubiquitous and difficult to control. Take the example of mortality diagnosed as caused by *Haemophilus parasuis*. Undoubtedly, this pathogen is part of the cause of mortality, but it appears that it cannot be the only cause of mortality as it is present in most if not all the pigs in a population. Attacking such a ubiquitous cause may be inefficient, as there may be other factors that are less prevalent and more easily controlled.

It is our hypothesis that the quality of the pigs at entry may be the most important controllable factor. Very little is recorded as far as quality of pigs at entry is concerned. Much of the emphasis of sow unit management has been on maximization of output through capacity utilization and reproductive deficiency. This approach has been effective in utilizing sow unit capacity. However, it has done little to allow correct utilization of downstream nurseries and grow-finish units, in our opinion.

Bimodal closeout mortality

Below is one example of a distribution of nursery closeout mortality rates of groups of approximately 1200 pigs (**Figure 1**). This distribution is similar to what at least some have called "3s and 6s." In other words there is a group of closeouts that has a quite characteristic and expected level of mortality at approximately 2-3%. There is another subset of mortality that is at a much higher level, often in the range of 4-8%. The basic question in this example is: What differentiates the low mortality closeouts from the higher mortality closeouts? In some examinations, we have found that location is a consideration, with mortality being higher in certain units, often associated with enteric disease. However, in this case and many others, no such relationship can be found.

Such a distribution can be called a bimodal distribution. In our rather simplistic analysis, we classify the closeout groups into low mortality groups of 5% or less and higher mortality groups of 6% or greater. The main question is what differentiates the low mortality groups from the high mortality groups.

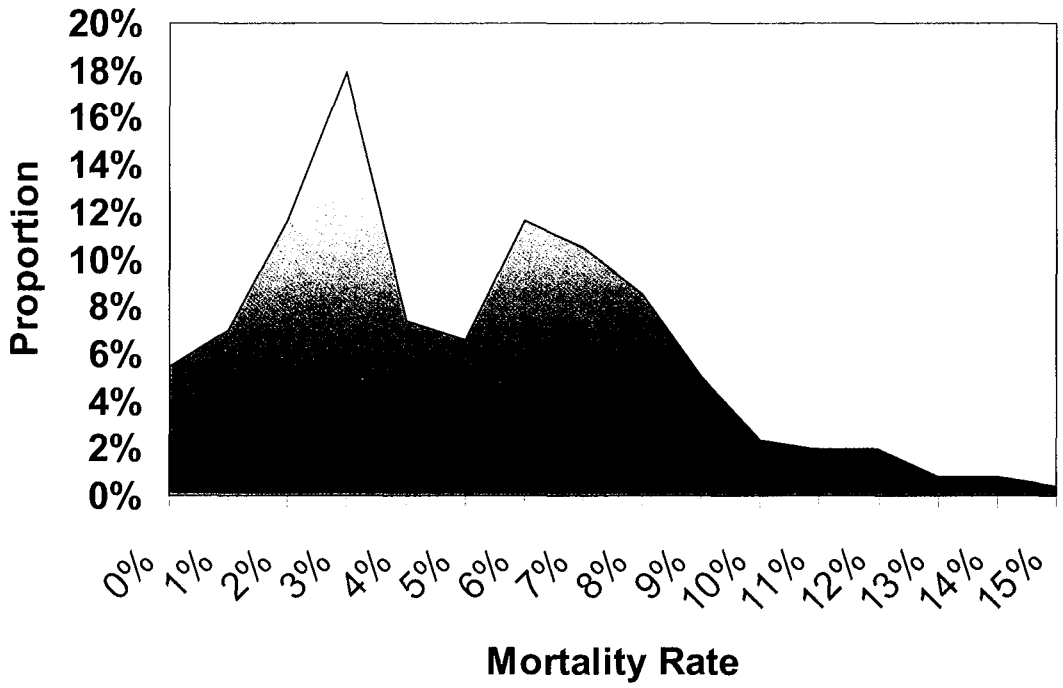
Very little difference could be seen with the size of the group weaned, though the range was relatively small, with a standard deviation of less than 5%. Likewise, there was not a seasonal effect that could explain the difference. The significant difference in this analysis was the proportion of the farrowing group that was gilts. The higher mortality groups had, on average, an 18% higher proportion of the farrowing group as gilts ($P = 0.04$).

By no means does the parity of the dam explain all the differences. However, it does exhibit a factor that is somewhat controllable and should be considered as part of the costs and quality concerns for running a sow unit. What such an analysis has done for us is to exhibit that there are pre-existing qualities that should be analyzed and controlled. There are distinct qualities that should be followed and analyzed in the growing pig area that should be back to the management of the sow herd.

Conclusion

Our aim in growing-pig studies is to emphasize those factors that can cause this differentiation of performance

Figure 1: Histogram of nursery closeout mortality rates.



when the pigs first entered the facility. The effect of gilts has been reported previously (1), but it should be pointed out that the effect shown here is larger than can be explained simply by the presence of gilts. The proportional changes shown suggest a real change in the dynamics of disease in the herd. The mechanism can be through increased carriage of pathogens or even a more susceptible subpopulation in the herd.

Group level effects of gilts have been reported in the past (2), but further analysis should be performed on sow management factors. The gilt effect shown here is not simply a function of replacement rates. The distribution of gilt introduction is also clustered with high numbers of gilts showing up in certain weeks. Efforts to stabilize gilt flow may, in fact, have effects well beyond the sow unit.

References

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