

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Swine Reports

Animal Science Department

January 1999

Explanation of Statistics Used in This Report

Follow this and additional works at: https://digitalcommons.unl.edu/coopext_swine



Part of the [Animal Sciences Commons](#)

"Explanation of Statistics Used in This Report" (1999). *Nebraska Swine Reports*. 129.
https://digitalcommons.unl.edu/coopext_swine/129

This Article is brought to you for free and open access by the Animal Science Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Swine Reports by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.



Explanation of Statistics Used in This Report

Pigs treated alike vary in performance, due to their different genetic makeup and to environmental effects we cannot completely control. When a group of pigs is randomly allotted to treatments it is nearly impossible to get an “equal” group of pigs on each treatment. The natural variability among pigs and the number of pigs per treatment determine the expected variation among treatment groups due to random sampling.

At the end of an experiment, the researcher must decide whether observed treatment differences are due to “real” effects of the treatments or to random differences due to the sample of pigs assigned to each treatment. Statistics are a tool used to aid in this decision. Statistics are used to calculate the probability that observed differences between treatments were caused by the luck of the draw when pigs were assigned to treatments. The lower this probability, the greater confidence we have that “real” treatment effects exist. In fact, when this probability is less than .05 (denoted **P** < .05 in the articles), there is less than a 5 percent chance (less than 1 in 20) that observed treatment differences were due to random sampling. In these instances we conclude that the treatment effects are “real” and caused different performance for pigs on each treatment. Bear in mind, however, if the researcher obtained this result in each of 100 experiments, five differences would be declared to be “real” when they were really due to chance. Sometimes the probability value calculated from a statistical analysis is **P** < .01. This indicates the chance that



random sampling of pigs caused observed treatment differences is less than 1 in 100. Evidence for real treatment differences, then, is very strong.

It is common to say differences are significant when **P** < .05 and highly significant when **P** < .01. However, **P** values can range anywhere between 0 and 1. Some researchers say there is a tendency for real treatment differences to exist when the value of **P** is between .05 and .10. Tendency is used because we are not as confident the differences are real. The chance that random sampling caused the observed differences is between 1 in 10 and 1 in 20.

Sometimes, researchers report **standard errors of means (SEM)** or **standard errors (SE)**. These are calculated from the measure of variabil-

ity and the number of pigs in the treatment. A treatment mean may be given as $11 \pm .8$. The 11 is the mean and the .8 is the SEM. The SEM or SE is added and subtracted from the treatment mean to give a range. If the same treatments were applied to an unlimited number of animals the probability is .68 (1 = complete certainty) that their mean would be in this range. In the example the range is 10.2 to 11.8.

Some researchers report **linear (L)** and **quadratic (Q)** responses to treatments. These effects are tested when the researcher used increasing increments of a factor as treatments. Examples are increasing amounts of dietary lysine or energy, or increasing ages or weights when measurements are made. The **L** and **Q** terms describe the shape of a line drawn to describe treatment means. A straight line is linear and a curved line is quadratic. For example, if finishing pigs were fed diets containing .6, .7 and .8 percent lysine gained 1.6, 1.8 and 2 pounds/day, respectively, we would describe the response to lysine as linear. In contrast, if the daily gains were 1.6, 1.8 and 1.8 pounds/day, the response to increasing dietary lysine would be quadratic. Probabilities for tests of these effects have the same interpretation as described above. Probabilities always measure the chance that random sampling caused the observed response. Therefore, if **P** < .01 for the **Q** effect was found, there is less than a 1 percent chance that random differences between pigs on the treatments caused the observed response. 