Sample size estimates for assessing lameness, leg injuries, and body condition score

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Our question: How do different sampling strategies affect the accuracy with which farms are classified according to animal-based measures?

Specific questions:

How many cows? The number can affect both accuracy and the time and labor required

Which cows? Should the sample size formula be applied to the entire herd, lactating cows, or a single pen of high-producing cows?

Our data set:

To provide a true estimate of prevalence, *all* lactating cows (range = 71–901 cows/farm, total = 12,375 cows) on 38 Brazilian farms were:

Lameness scored (1–5 scale: 3 = moderately, ≥4 = severely lame);

Leg injury scored (**carpal** and **hock** joints; 1–3 scale: 2 = moderate, 3 = severe injury); and

Body condition scored (1–5 scale: ≤2.0 = thin)

Sampling strategies assessed:

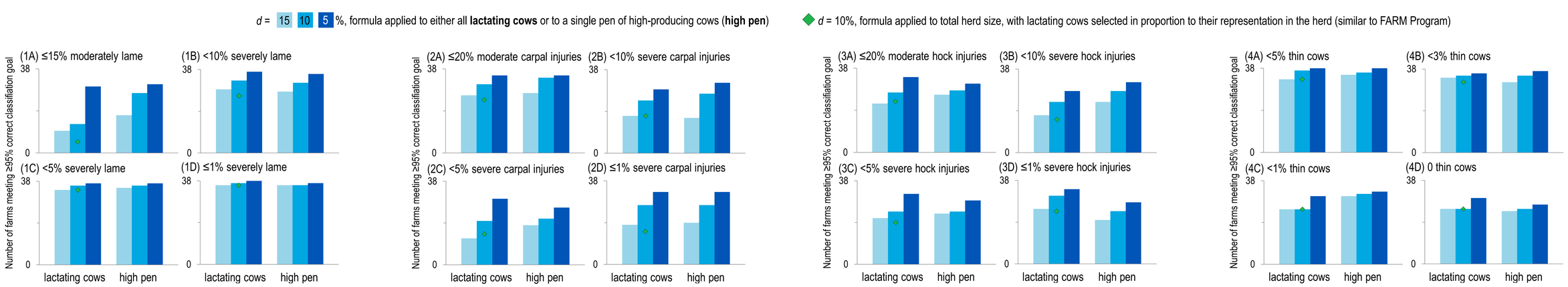
7 strategies (based on *Dairy Well*, *FARM*, *proAction*, *Validus)* were assessed

6 of these strategies (2 × 3): were derived by varying desired precision (*d*) = 15 , 10 , or 5% and applying this to either *all* lactating cows or to a single pen of high-producing cows (the *high pen*)

The 7th strategy was based upon using *d* = 10% applied to total herd size, with lactating cows selected in proportion to their representation in herd (similar to the *FARM* program)

10,000 replicate samples were drawn from our dataset using each of the 7 strategies. For each replicate, we estimated prevalence and classified farms as meeting (below) or failing to meet (above) specified thresholds: ≤15% moderately lame cows; ≤20% moderate carpal or hock injuries; <10, <5, or ≤1% severely lame cows or severe carpal or hock injuries; <5, <3, <1%, or 0 thin cows

Our results: The number of farms correctly classified increased with the number of cows assessed; sampling only from a pen of high-producing cows served as a practical proxy for the larger population



Goal: ≥95% correctly classified sample replicates (out of 10,000). The number of farms (***n* = 38**) meeting this goal is shown relative to each threshold for: (1) moderately or severely lame cows, moderate or severe injuries on the (2) carpal and (3) hock joints, and (4) thin cows

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