Designing Veterinary Orthopedic Risk-Factor Studies: Accounting for non-detection rates

Rich Evans

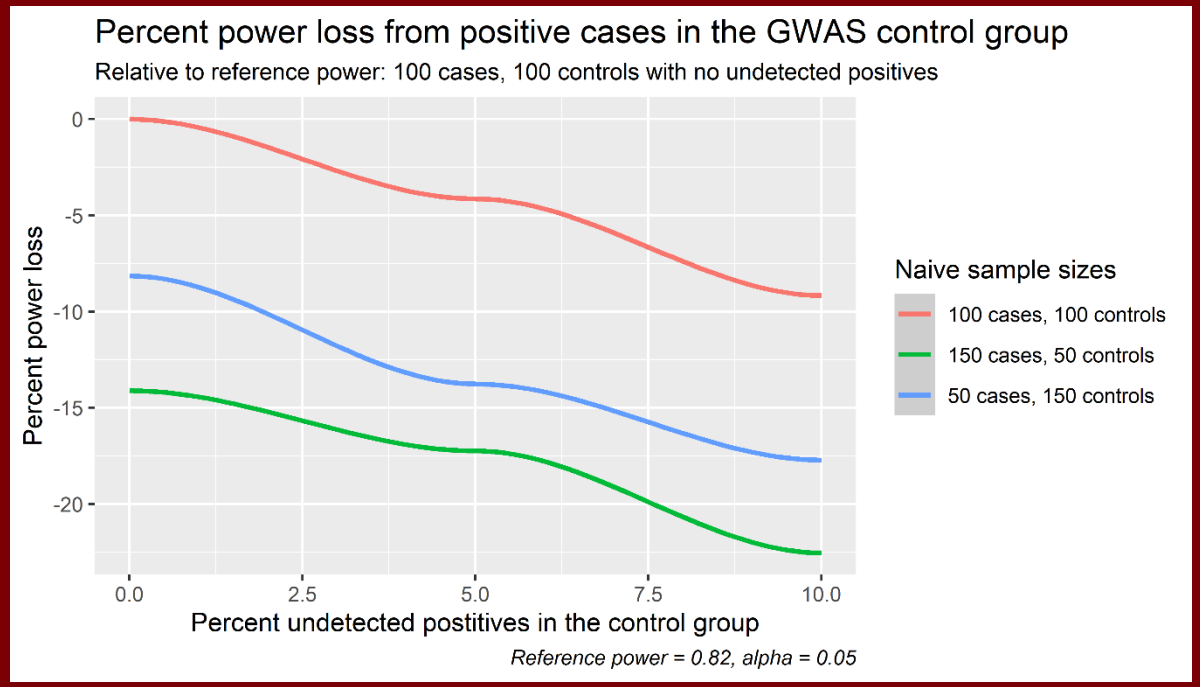
BACKGROUND: In risk-factor studies of canine orthopedic diseases, control groups are treated "naively," as having all unaffected controls, when in fact they are often a mixture of true controls and some undetected cases, usually sub-clinical or sub-diagnostic cases. Other studies have shown the effect of non-detection rates on misclassification bias and developed analytic fixes. **This study looked at the effect of non-detection rates on power as a way to better plan orthopedic GWAS and other risk-factor studies.**

Results: Undetected positives decrease the effect size and reduce power, even for small non-detection rates.

Discussion: Sample size calculations should account for the non-detection rate.

Keywords: Positive-unlabeled data, Presence-only data, GWAS, risk-factor

Naïve models for PU data may decrease power in risk factor studies



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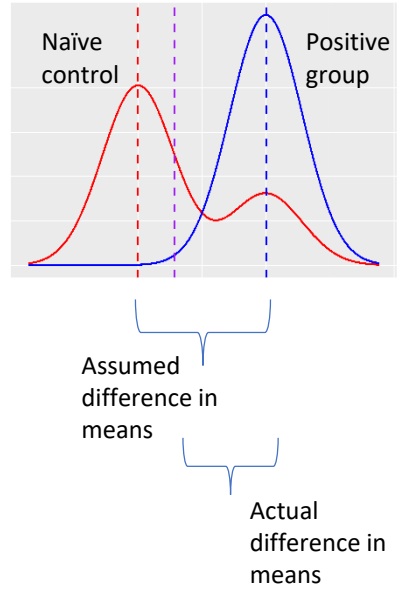

Non-GWAS Examples

Arthur et al. (2016) used a case-control design to assess the risk of osteosarcoma following fracture repair. They noted, "There may be additional cases [in the control group] in which implant-related osteosarcoma was diagnosed in the private practice setting without referral...,"

Wylie et al. 2013 studied risk factors for equine laminitis using controls obtained from an owner survey. The authors noted the PU aspect of their data, "Our study relied on owner-reported diagnoses of endocrinopathic conditions, and this may have introduced misclassification bias."