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Linking epidemiology, biostatistics and animal welfare science

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Abstract

Mata, F.: Linking epidemiology, biostatistics and animal welfare science. *Rev. Vet. 33: 2, 220-222, 2022*. Different epidemiological techniques and bio-statistical approaches are put into an animal welfare scientific context, in a variety of species and settings, with reference to a variety of studies provided as examples for reference. Epidemiology is especially important in animal welfare science allowing the use of complex settings outside the laboratory environment using models that account for random factors. It is also important in the introduction of standardised techniques allowing evidence synthesis.

Key words: biostatistics**,** collaborative work, epidemiology, multidisciplinary, teamwork.

Resumen

Mata, F.: Vinculación epidemiológica, bioestadística y ciencia de bienestar animal. *Rev. Vet. 33: 2, 220-222, 2022*. Diferentes técnicas epidemiológicas y enfoques bioestadísticos se ubican en un contexto científico de bienestar animal, en una diversidad de especies y entornos, con referencia a una variedad de estudios proporcionados como ejemplos de referencia. La epidemiología es especialmente importante en la ciencia del bienestar animal, ya que permite el uso de entornos complejos fuera del contexto de laboratorio utilizando modelos que tienen en cuenta factores aleatorios. También, es importante en la introducción de técnicas estandarizadas que permitan la síntesis de evidencia.

Palabras clave: bioestadística**,** labor colaborativa, epidemiología, multidisciplinariedad.

Collaboration in animal welfare science

Epidemiology has been gaining visibility as a tool in the identification of risk factor posed in animal welfare science. It has been used with farm, wild, captive and companion animals [6]. The advancement of science has been favoured by collaborative research between scientist of different fields of expertise [11].

Epidemiology has evolved during the 20th century from the study of infectious disease to a broad science from the cellular and individual level to population level [1], including the social determinants of heath, aggregated into the concept of one health. The concept of one health defines health as the same for humans and animals living under the same environment.

Epidemiologists work in multidisciplinary teams integrating health scientists, statisticians, and policymakers [1]. Accordingly to the concept of one health, this concept can be extended further to all the life kingdoms, therefore health scientists may include human medicine, but also veterinaries, ecologists, sociologists, and many other fields.

It is under this umbrella that can be understood how important it is the capacity to bring in knowledge able to bridge the gaps between scientists with a deep but narrow expertise. Multiskilled individuals gain importance due to their capacity to integrate different expertise, promoting mutual understanding

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and contributing therefore, to bridge the gap between fields of expertise [6].

With these considerations in mind, animal welfare scientists need also to collaborate, with epidemiologists, and therefore biostatisticians. Epidemiology and biostatistics have shown to be important tools for animal welfare scientists to perform professionally with extended capacity in many situations.

The relationship between biostatistics, epidemiology and animal welfare has evolved from the end of the 20th century [12]. The advantages in the use of epidemiological tools in animal welfare were since referred by several authors. This has been the case in risk assessment of environment, management, or genetics, whether in the laboratory or the field in animal settings such as aquaculture, farms, homes, zoos, and equine.

The range of statistical methods used in epidemiology is enormous, and techniques such as general linear models, generalized linear models, survival analysis, meta-analysis and mathematical modelling are widely used.

Table 1 gives examples of the different epidemiological study designs and biostatistical approaches, putting them in an animal welfare scientific context.

Table 1. Matrix showing the interrelation and placing different studies accordingly to the dimensions: type of epidemiological study, area of animal welfare assessed, biostatistical method used (*Italic*) and type of animal setting (*bold*).

	Animal welfare		
Epidemiology	physical health and functioning	affective states: distress, fear, pain	ability to live natural lives
Experiment	–	Williams *et al.* (2013) *RM ANOVA,* equine	Mata and Mwakifuna (2012), *GsLM (c log-log),* farm
cross-sectional	Mata *et al.* (2015) *GsLM (neg. binomial)* captive	Mata *et al.* (2015) *GsLM (log),* equine	Mata and Johnson (2022), *GsLM (logit),* equine
case-control	Mata (2015), *GEE* companion	–	–
cohort	Mata and Bhuller (2022) *cox regression* companion	Mata (2014a), *Survival analysis,* companion	–
ecological	Mata *et al.* (2012) *GsLM (logit, neg. binomial),* equine	Mata et al. (2022) *GsLM (cumulative c-log-log link),* equine	–
models	Mata (2014b), *Maths modelling,* equine	–	–

Note. RM ANOVA: repeated measures analysis of variance; GsLM: generalised linear models; GEE; generalised estimating equations.

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