

The Global Burden of Animal Diseases rollout

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With continuing population growth and rising demand for food, livestock and aquaculture are integral to improving food and nutrition security, health and livelihoods for a large proportion of the world's population, especially in low and middle-income countries [1]. These positive contributions are being undermined however, by the negative effects of livestock production and consumption on society and the environment. Livestock produce greenhouse gases and cause environmental degradation [2], act as a stepping-stone for zoonotic disease emergence [3], and antimicrobial use in farming drives the selection of antimicrobial resistance genes [4]. Furthermore, excessive consumption of some livestock products is linked to non-communicable disease risks [5].

The evidence base available for addressing these issues through improving livestock production and animal health systems is globally weak. We lack a systematic approach to understanding global livestock populations and the resources invested in animals by societies around the world. We lack understanding of the major constraints on livestock productivity and the means to address them; and we lack robust measures for the impact of livestock on food security, disease risks and climate change. In 2018 we announced the initiation of the Global Burden of Animal Diseases (GBADs) programme to address these vital issues [6].

Since that time, we have made significant progress in developing a comprehensive framework for characterising livestock populations and assessing the value invested in livestock, as well as a system to capture net losses in production and societal expenditure on animal health issues (see Figure 1). The GBADs programme acknowledges that many animal health problems are related to production and nutrition issues that need to be resolved in a socio-economic context. We imagine a society in which the animals we depend on are disease free, adequately fed and watered, and are kept in environments without risk of injuries and accidents.

An important organisational development has been the integration of the World Organisation for Animal Health (OIE) within the leadership of the GBADs programme, formalising the role taken by OIE in the earlier project phase. This role acts upon OIE's 2016 resolution [7] to improve understanding of the economic impact of animal diseases and gives an important institutional platform to the GBADs programme. Through existing OIE partnerships, GBADs will strengthen links with the Food and Agricultural Organisation of the United Nations (FAO), the World Health Organization (WHO) and the International Livestock Research Institute (ILRI), who are major international collectors, keepers, and users of data on animal health, welfare, food security and zoonotic disease.

GBADs will focus initially on making global estimates of animal disease burdens; over time, this will be strengthened with in-depth country, disease and sector-level studies. GBADs now has strong engagement with research groups in Australia, Ethiopia, Indonesia, Mexico, The Netherlands, Norway, the Republic of Ireland and the United Kingdom and is developing national case studies in those locations. Recognising the importance of the private sector organisations in managing livestock populations, the team has engaged with a number of multi-national companies involved in pharmaceuticals, livestock production and data management in livestock systems.

GBADs working groups, divided into *Themes* will turn data into evidence and impact, beginning with describing where, how, by whom, and why animals are kept in *Populations and Production Systems*. It will generate and integrate information on the biomass contained in livestock populations [8, 9] and estimate the level of investment in animals and the infrastructure used to manage them. The current levels of production will be compared to a state with no disease and perfect health and nutrition to estimate an animal health loss envelope (AHLE). Adapting methodology from the GBD [10], the AHLE will then be attributed to specific causes through careful *Animal Health Ontology and Attribution*. The AHLE will account for *Loss and Expenditure* at farm-level, and will calculate the impacts of lost animal health beyond the farm, in the *Wider Economy and Trade*, and on *Human Health*. To support the latter, we will collaborate closely with the Institute for Health Metrics and Evaluation and the World Health Organization. The data and information generated will be managed in a cloud-based, secure system of *Informatics* which will enable modelling for *Disease Prioritization* and tools for the communication of results. Each theme will be supported by *Engagement* with Governments, the private sector and NGOs.. Alongside a process of institutionalising GBADs methods through an *Education* programme will be put in place; this will result in a global knowledge framework to assess the impact of animal disease and health problems in livestock. These education programmes will be supported by the development of a code of practice presented to the OIE and FAO membership as best practice for undertaking animal disease impact assessments. In this way, GBADs will provide information to public and private sector decision makers, adding value to their management of animal health and welfare.

Climate change and pandemic disease are two of the most significant threats facing humanity in the 21st century, threats with which livestock are closely entwined. The GBADs team is committed to a better understanding of our livestock systems and of their positive and negative impacts on society and the environment at local, global and national levels. There is an urgent need to develop intelligence systems able to enhance decision-making for people managing livestock to limit the environmental consequences and public health risks arising from livestock production and consumption, whilst also helping people across the world access high quality protein and micronutrients, produced in a humane manner.

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Figure Captions

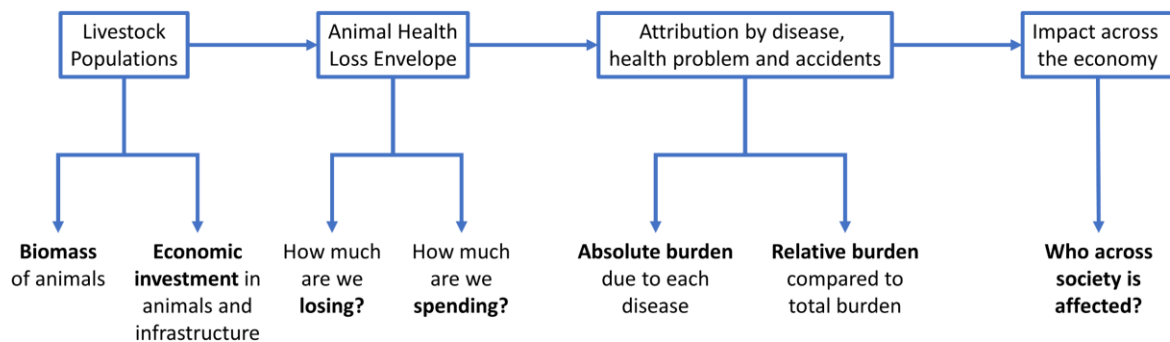


Figure 1. Core structure of the GBADs framework.