



Using mixed methods to investigate factors influencing reporting of livestock diseases: A case study among smallholders in Bolivia[☆]



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ABSTRACT

Livestock disease surveillance is particularly challenging in resource-scarce settings, where disease events are often unreported. Surveillance performance is determined as much by the quantifiable biological attributes of the disease, as it is by motivations and barriers perceived by livestock keepers for disease reporting. Mixed methods designs, which integrate the collection, analysis and interpretation of qualitative and quantitative data in a single study, are increasingly used across different disciplines. These designs allow for a deeper exploration of the topic under investigation, than can be achieved by either approach alone.

In this study a mixed methods design was used in order to gain a greater understanding of the factors that influence reporting of livestock diseases in Bolivia. There is a need to strengthen passive surveillance in this country, among other reasons as part of an eradication programme for Foot and Mouth Disease (FMD). Findings revealed livestock keepers in the study area were extremely unlikely to report the occurrence of livestock health events to the Official Veterinary Services (OVS). Communication outside the local community occurs more often through alternative routes and this is positively correlated with disease awareness. The main barriers to disease reporting identified were a lack of institutional credibility and the conflicting priorities of the OVS and livestock keepers.

As for other animal and human diseases across the developing world, passive surveillance of livestock diseases in Bolivia should be enhanced; this is urgent in view of the current FMD eradication programme. Increasing timeliness and smallholders' participation requires a detailed understanding of their likely actions and perceived barriers towards disease reporting. These insights are most likely to be developed through a holistic mixed methods approach of quantitative and qualitative analyses.

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1. Introduction

Early and accurate detection of disease events is vital in order to respond to emerging and re-emerging diseases before they develop into large scale epidemics and also to monitor disease control (Paskin, 1999; Halliday et al., 2012). In resource-scarce settings, with an important presence of smallholders, financial constraints and logistical

difficulties make the establishment of surveillance systems for livestock diseases challenging. Furthermore, animals kept by smallholders play diverse roles in people's livelihoods that go beyond the trade of livestock products (Upton, 2004; Randolph et al., 2007). Surveillance and control programmes designed for commercially oriented producers may lack relevance to smallholders' needs and as a result there may be low motivation for compliance among this group (Mariner, 2009; Halliday et al., 2012).

Quantitative epidemiological research is well suited to capture the biological and measurable aspects of surveillance systems' performance (Thurmond, 2003; Stark et al., 2006). However, an understanding of the motivations and barriers for disease reporting is better approached from a research paradigm where the emphasis is on interpretation and subjective meanings of data gathered by qualitative methods (Lemon et al., 2007), reflecting the potential of combining measurable estimates from quantitative research with people's interpretations and meanings. Approaches to research that involve collecting and analysing quantitative and qualitative data in a single study have been successfully undertaken in recent years to investigate a broad range of issues in disciplines such as education, social policy and health services (Woolley, 2009; Creswell and Plano Clark, 2011).

Mixed methods research represents an integrative investigation of quantitative and qualitative data gathering, analysis and interpretation. The rationale behind its use is that the combination of the two methods can provide a better understanding of the research problem than either approach alone, with each method complementing each other yet keeping its own philosophical foundations (Creswell and Plano Clark, 2011). There are different mixed methods designs where quantitative and qualitative data can be collected, analysed and integrated at different stages and in different sequences. The choice of a certain design depends upon the research question to be addressed, previous knowledge and timing. For example, a study can implement the quantitative and qualitative strands during the same phase of the research process and then combine the results in an overall interpretation. Alternatively, a design can be implemented in two phases using sequential timing, with one strand (qualitative or quantitative) following the other. When the collection and analysis of quantitative data takes place first, the subsequent collection and analysis of qualitative information, is designed so that it follows on from the results of the preceding quantitative phase. The qualitative results are therefore used to explain and understand the initial quantitative results; as such this design is often called *explanatory* sequential design. Similarly, a design may begin by collecting and analysing qualitative information, and build a second quantitative phase to test or generalise the initial findings. This is known as *exploratory* sequential design (Creswell and Plano Clark, 2011). In this design the qualitative part gives the bases to either ensure the quantitative instruments are relevant and adequate or to identify emerging questions to be tested and quantified (Stoller et al., 2010; Wesely, 2012).

Surprisingly, mixed methods designs have not been widely used in the context of animal health and disease reporting. Our study is designed as an initial effort to

address this gap, and provide a fuller picture of the factors that influence reporting of livestock diseases in Bolivia.

Existing studies have predominantly taken a quantitative approach, often using the term 'qualitative data' when implying classification of categorical variables with words. Therefore the use of the term qualitative in the context of quantitative epidemiological studies may lead to confusion. In this study we use the term "qualitative data" to refer to information gathered to capture people opinions and views in order to get a better understanding of their motivations and barriers towards animal disease reporting.

We present a case study of smallholder reporting as part of passive surveillance for livestock diseases in a resource-scarce setting (Southern Bolivia). Bolivia is currently undertaking a considerable effort towards FMD eradication using the so-called "progressive pathway" for FMD control (PCP-FMD) (Anonymous, 2011). The macro-region of the Altiplano (high plateau) has recently been declared free without vaccination and an ongoing control programme is expected to eliminate virus circulation from the Amazon region by the end of 2013. The rest of the country is considered to be FMD-free with vaccination. As recognised by the World Organization for Animal Health (OIE), one of the main challenges faced by the Bolivian veterinary services in the context of FMD control in particular, but also in relation to other livestock diseases, is the strengthening of their surveillance system (Muzio Llado and Gonzalez Ortiz, 2008). Here, our aim is to conduct a comprehensive and systematic investigation of smallholders' characteristics, actions and practices relevant for livestock disease surveillance. This case study will be used to illustrate the application of mixed methods to achieve a more comprehensive description of surveillance systems for animal health that explicitly incorporates livestock keepers' actions and practices.

2. Materials and methods

2.1. Study setting

Bolivia has the third lowest Human Development Index (HDI) in America; most rural households in Bolivia keep livestock and are classified as poor (Klugman, 2010). FMD is the only livestock disease with an active surveillance programme in Bolivia. There is an ongoing voluntary vaccination programme for bovine rabies and voluntary control programmes for bovine tuberculosis and brucellosis in the main milk-producing areas. In pigs, classical swine fever (CSF) is believed to be present with the last outbreak reported in smallholding premises in 2007, but no official control programme is in place. Passive surveillance relies on field sensors accredited by the official veterinary services (OVS); although they are not bound by any type of licensing agreement, they are expected to communicate animal health events to OVS' veterinarians who are in charge of field investigations and are expected to be in constant contact with sensors in their area (Anonymous, 2006).

This study was carried out in the Department of Tarija, in Southern Bolivia, which has a range of different agro-ecological zones, from the high plateaux to the valleys,

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