University of Basel

One Health: Connecting Humans, Animals and the Environment
Video Transcript

Learn about the elements of cross-sector economics

[Jakob Zinsstag]: One Health can be best explained by an economic metaphor, as being the added value of a closer cooperation between human and animal health. For advocating that approach, it is central to understand the principles of benefit-cost and cost-effectiveness analysis that goes along with a greater integration of human and animal health interventions.

Animals are linked to humans as they are linked to other animals. We will show examples how this is related to both costs and benefits of diseases and disease control. The focus thereby lies on the example of brucellosis control in Mongolia. And we will mention some general principles of One Health economics and discuss the economic aspects of the human to animal interface. Brucellosis is a zoonotic disease which causes late-stage abortion in animals. It is one of the most common zoonosis worldwide, occurring mostly in areas with extensive production of small ruminants and cattle. Humans become infected by direct contact while working as farmers, veterinarians or butchers. It can be transmitted also by consumption of unpasteurised milk and milk products. Human brucellosis is a severe chronic disease characterised by a recurring fever and pain that can put people out of work for long periods.

Brucellosis re-emerged as a major preventable disease in Mongolia after 1990, when the political and economic system changed from a socialist to a liberal market rule. Health and veterinary services provision collapsed, leading to a rapid increase in human infections. International experts recommended to the World Health Organisation that Mongolia should reinstate livestock mass vaccination to prevent brucellosis in humans.

We were subsequently confronted with the questions: 'is it cost-effective to mass vaccinate 25 million cattle, sheep, and goats in order to prevent human brucellosis?' And 'what is the effect of mass vaccination of livestock on human health?'. For this purpose, we developed the first livestock human brucellosis transmission model as a backbone for economic assessments. Costs and benefits are incurred in the private and public sectors for both human health and livestock production. Therefore, we needed an analysis that included human health and livestock production from a societal perspective. Identifying all the sectors involved is an important aspect of a One Health economic assessment. This can be done by considering a flow chart of disease transmission between all involved species like you see here.

It is important to start from the biological and ecological roots of disease transmission to identify the relevant sectors involved. In the case of brucellosis, this meant we considered sheep, goats, cattle, and humans, but we ignored yaks and camels. Once the transmission dynamics of the disease are understood we can simulate the effect of interventions on humans and animals, with the related costs. The first step is to develop statements of costs for the public and the private domains in human health and livestock production. For example, the cost of hospitalisation has both public and private facets. Patients spend considerable sums of money privately on doctor fees, transportation, laboratory, and drug costs, in addition to lost income. If they must employ other people to do their job, these are extra coping costs. In the end, all costs are summarised and presented by the respective sector. The benefits in human public health were roughly $3 million dollars, which is notably lower than the cost of $8 million US dollars for interventions. From this perspective, it wouldn't be financially cost-effective to mass vaccinate the livestock in order to prevent the costs in public health. Combined savings when combining benefits in human health, households, and animal

production totaled $26 million US dollars, which is three times higher than that $8 million US dollars cost of the intervention.

This is a prime example of a One Health approach, showing that interventions become cost-beneficial when viewed from a broader societal perspective that is contrary to the single-sector point of view. Furthermore, if intervention costs are allocated proportionally to the monetary benefits, only 11% of the incurred costs would arise in the public health sector. Including non-monetary benefits to human health, measured in disability-adjusted life years abbreviated as DALYs the costs per DALY averted lies at $19.1. This is considered to be highly cost-effective. Such cost-sharing models between the public health and the livestock sectors illustrate another added value of a One Health approach.