University of Basel

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

Addressing surveillance

[Jakob Zinsstag]: The INDEPTH Network estimates that there are about 1 billion people living in the world's poorest countries who were not registered at birth and neither will be at death. Nearly 50 million newborns per year won't be registered worldwide. Barely one third of the countries outside North America and Europe have the possibility to obtain usable mortality statistics. In the case of mobile pastoralists and their animals for whom we develop joint human and animal health services, it is not easy to estimate their vaccination coverage because of their mobile lifestyle. We tried this by so-called capture-mark-recapture methods, using electronic fingerprints as a marking system. But the proportion of recaptured people was too low to estimate a meaningful vaccination coverage and the total population.

In the last decades, a communication revolution happened in Africa. A large proportion of people also in remote areas have access to mobile communication today. This has enormous effects on developments and represents a huge potential for improvements in disease surveillance and health care. We have tested the principle of mobile human and animal demographic and health surveillance with Chadian pastoralists. We identified 20 pastoralist camp leaders, and, with their consent, we called them every two weeks and asked about the number of humans and animals in their camps. As often as possible, we asked also to talk to women to confirm the numbers of children and also the pregnancy status. We then credited them with some money for making phone calls.

This kind of call centre we had established was much appreciated and used for emergency situations while we helped to organise ambulance services. In this way, we could establish statistics for the demographic composition, birth, and mortality rates of humans and animals. We were afraid that the reported numbers of animals would not be accurate. But as you can see on this graph, the reported numbers of animals were highly consistent with the demographic livestock model. We could further visualise the seasonal migration routes in near real time, and we observed the splitting and merging of herds. Such integrated human and animal demographic surveillance has a high potential to become an integrated disease surveillance and response system that is nearly real time.

Let us also look at dog rabies control. When we vaccinate dogs, we want to know the coverage we have achieved, the number of inaccessible dogs, and the total number of dogs. During our campaign in 2012 and 2013, we calculated every week the coverage of a vaccinated area to know if we had a deficit in coverage. For this purpose, we did a household survey on transect studies using a relatively complicated Bayeisan capture-mark-recapture model. Here, we introduce the principle of the capture-mark-recapture methods using the Petersen-Bailey formula.

We assume a number of marked dogs in a population. When we recapture a sample, we will find n animals, of which m are marked. We then assume a proportion of m to n and capital M to N. We can solve this for N to obtain an estimate of the total population. Bailey has extended the formula to this. He included the standard error of the estimate. Let us assume we have vaccinated 196 dogs in a city quarter, and we want to know if we have reached 70% of coverage. We can then solve the formula for the standard error for m and calculate the number of marked vaccinated dogs that we have to find again, assuming a given standard error.

You see here how the number of animals that have to be recaptured changes with the number of marked animals and the coverage that we are expecting. In this way, we could identify a deficit in vaccination coverage and could extrapolate or guess it for the total population. As you see, One Health methods use population and ecological methods quite rigorously for humans as well as for animals.