Dynamic Drivers of Disease in Africa

Framework for assessing the economic costs and burdens of zoonotic disease

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The business case for One Health

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This article outlines a pathway to develop the business case for One Health. It describes the origin and development of One Health and then identifies five potential areas where One Health can add value and reduce costs. These are: (1) sharing health resources between the medical and veterinary sectors; (2) controlling zoonoses in animal reservoirs; (3) early detection and response to emerging diseases; (4) prevention of pandemics; and (5) generating insights and adding value to health research and development. Examples are given for each category along with preliminary estimates of the potential savings from adopting the One Health approach. The literature reviewed suggests that one dollar invested in One Health can generate five dollars worth of benefits and a global investment of US$25 billion over 10 years could generate benefits worth at least US$125 billion. Conservation implications: the time has come to make the bigger case for massive investment in One Health in order to transform the management of neglected and emerging zoonoses and to save the lives of millions of people and hundreds of millions of animals whose production supports and nourishes billions of impoverished people per annum.

Introduction

This article is based on an invited keynote presentation given at the Southern African Centre for

Costs of zoonotic disease

- **Zoonoses sicken 2.4 billion people, kill 2.2 million people and affect more than 1 in 7 livestock each year**
- **Cost $9 billion in lost productivity; $25 billion in animal mortality; and $50 billion in human health**

Map by ILRI, from original published in an ILRI report to DFID: *Mapping of Poverty and Likely Zoonoses Hotspots*, 2012.

Benefits of controlling zoonoses in animals and along the value chain chain

- Credible economic cost benefit studies (n=13)
  - Average benefit cost ratio 6:1
  - Median 4:1
  - Range 1.1-19.8

Ex ante	**5**
Ex post	**6.6**

Developing countries	**3.7**
Developed countries	**7.4**

- Implies $85 billion losses could be averted by $21 billion expenditure

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How can we model disease burden?

What do we include in the burden of disease?

- Disability-adjusted life years (DALYs)
- Economic impact
  - Society/nation
  - Personal
- Environmental impact?

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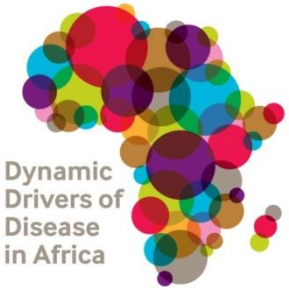

Zoonoses have multiple burdens

- Disease in humans
- Economic consequences of disease in humans
  - For people and society
  - Loss of incomes, and costs for treatments
- Disease in animals
- Economic consequences of disease in animals
  - For people and society
  - Lost production, trade bans

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Two trade offs

1. **Between disease control expenditure and illness in humans and animals**
2. **Between ecosystem change and disease incidence**

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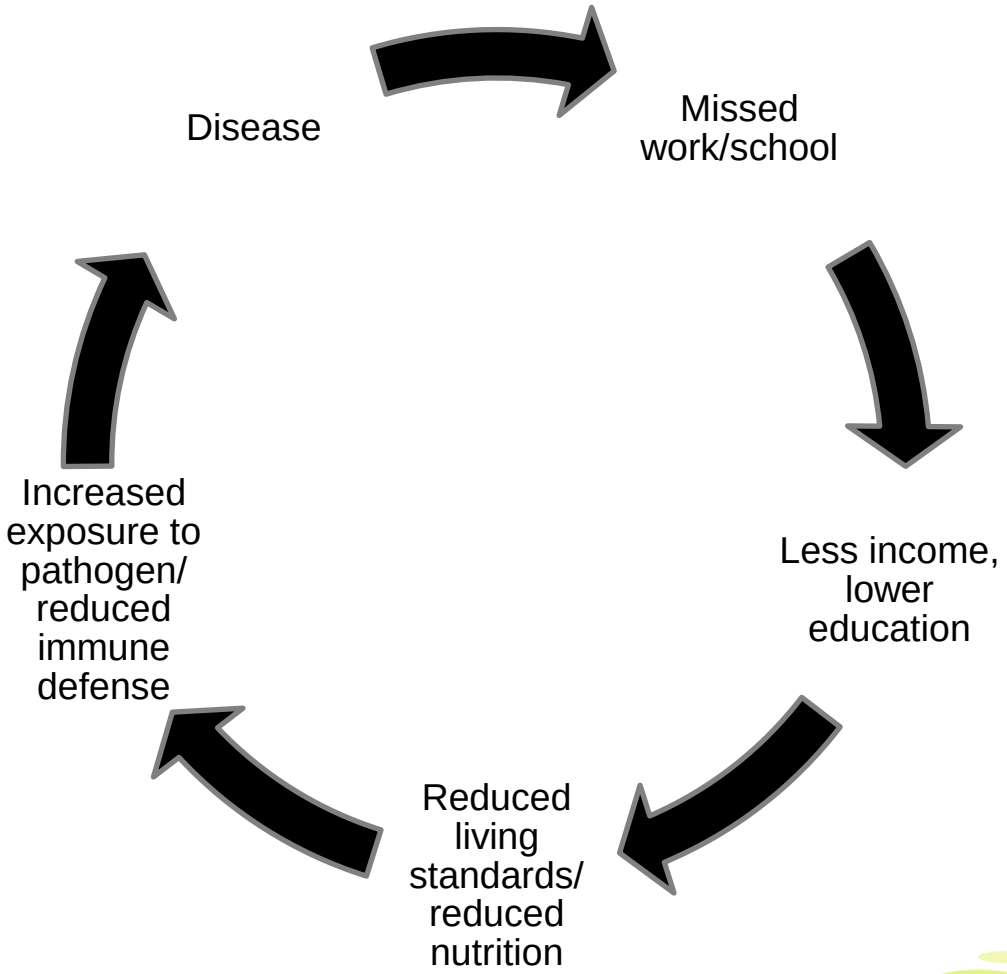
The vicious cycle- for people



How can we model disease burden?

- Simplified situation
- Assessing what we can assess
  - Direct economic impacts
- Collecting more data on what we don't know
- Creating a framework for assessing economic costs and burdens of zoonotic disease

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Two aspects of costs of disease

1. Who pays (public or private sector)?

2. How easy is it to quantify them? (availability of information and applicability /availability of market prices).

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The multiple burdens of zoonotic disease: human, animal and ecosystem health

Included in DALYs

	Actors	Cost of Illness	Cost of prevention	Intangible and opportunity costs
Private	Individual and household	(1) Treatment costs (e.g. medication) (2) Loss of household production	(1) Risk mitigation such as boiling water, buying filters	(1) Disutility of ill health for individual (DALY) (2) Disutility of ill health for friends, family, etc.*
	Livestock sector	(1) Cost of treatment, (2) Herd slaughter, product recall, mortality, morbidity, lower production, loss of exports	(1) Costs of increased biosecurity, (2) vaccination, practices and procedures to control disease along the value chain	(1) Cost of future emerging diseases* (2) Loss of animal genetic resources. *
Public	Health (human and animal)	(1) Treatment costs (hospital provision, etc.) (2) outbreak costs, movement restrictions, culling, (3) vaccination	(1) Risk mitigation such as water fluoridation, vaccination (2) (Disease surveillance, research)	(1) Loss of opportunities occasioned by spending on disease prevention and care*[a]
	Ecosystem	(1) Spill-over into wildlife, (2) loss of ecosystem services	(1) Bio-security, avoiding wildlife and vectors, (2) disease surveillance, research	

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The cost of illness and burden of disease in people- how to measure

Information needed	Type of data	Possible existing sources	Further investigations
Reported cases of disease	Record of individuals diagnosed with disease	Hospital and clinic records, national and provincial health statistics	May be worth visiting local hospitals and clinics to collect data if it is not summarised at national level
Estimate of extent of under-reporting	Compare recorded cases with number actually found	Published/grey literature (PGL) studies or investigations	If field work involves testing people, or finding people with the disease then the prevalence or incidence can be compared to that reported. Often test high risk groups (people with fevers not responding to malaria, people working/living in close contact with relevant animals)
Burden of disease in affected individuals **(Valued as Disability-adjusted life years – DALYs)**	Deaths	Hospital and clinic records, PGL data on death rates and DALYs – the years of life lost (YLL) component	Visit local hospitals and clinics to collect data, ask about it in household interviews
	Disability	PGL studies and interviews and DALY estimates, including relevant disability weights – the years of life lived with disability (YLD) component of the DALY	Interview patients and families to find out about length of illness and extent of disability.
Impact on household incomes while person is ill	Estimated loss of household income generated by the patient during their illness	PGL studies	Interview patients and families

The cost of illness and burden of disease in animals- how to measure

Information needed	Type of data	Possible existing sources	Further investigations
Reported cases (incidence) of the disease over a certain period or prevalence (number or percentage with the disease at a given point in time)	Record of animals thought to have the disease	• Outbreak investigations • Incidence and prevalence studies • Reported cases from veterinary clinics • Other PGL studies	Animal sampling in the field (blood tests)
Estimate of under-reporting	Extrapolation to whole animal population. Difficult because studies focus on high incidence events or high prevalence sub-populations	Published/grey literature (PGL) studies or investigations. Local expertise	Compare results from sampling with other, pre-existing, estimates
Burden of disease in affected animals **(Monetary values)**	Mortality	PGL studies looking at individual diseases. Sometimes records from vet clinics and national veterinary statistics. For many animal diseases, the only impact that is recorded is deaths.	Focus group discussions. Livestock keeper surveys.
	Morbidity (lowered productivity)	PGL field-based studies comparing healthy and infected animals. There aren't many! Estimate and value disease impact on fertility, output (milk, wool, animal traction, etc.), slaughter rates and weights (meat), etc. Note that livestock keepers reactions (cull sick animals) form part of the impact.	Livestock keeper and dog-owner surveys. These are time-consuming and obtaining a suitable control group to estimate impact is difficult. Studying wildlife and companion animals is even trickier.

The cost of treatment and control in people- how to measure

Information needed	Type of data	Possible existing sources	Further investigations
Private costs for treatment and hospitalisation	• Health care seeking costs (often very high for these uncommon conditions) • Time spent by family looking after patient at home and when looking for care of being treated • Patient expenditure on correct and incorrect medication and diagnostics	• Local clinics and medical practitioners, hospitals • PGL studies	Patient and patient family interviews.
Public costs for treatment and hospitalisation	• Cost of hospitalisation, operations, drugs, diagnostic	Ministry of Health, hospital and clinic data	Interviews with care staff in specialist units
Private costs for disease control	• Patient and other members of the public - costs for vaccination, quarantine, any other disease prevention or mitigation measures	• Local clinics and medical practitioners, hospitals • PGL studies	Patient and patient family interviews. Interviews with target populations (e.g. of vaccination campaigns)
Public costs for disease control	• Cost of surveillance • Costs of vaccination	Ministry of Health, hospital and clinic data	Interviews with staff involved in this work

221 Kenyan households interviewed

How much did you spend last year on the following health protection (Kenyan shilling)?

	Mosquito nets	Vaccines & routine clinic visits for kids	Boiling or other water treatment	Insurance (annual fee)	Other health prevention
Mean	762	254	6.8	0.9	586
Range	0-3150	0-5000	4 households paid between 150-600	220 households paid nothing, one household paid 200	0-6000

How much did you spend last year on the following health prevention for animals?

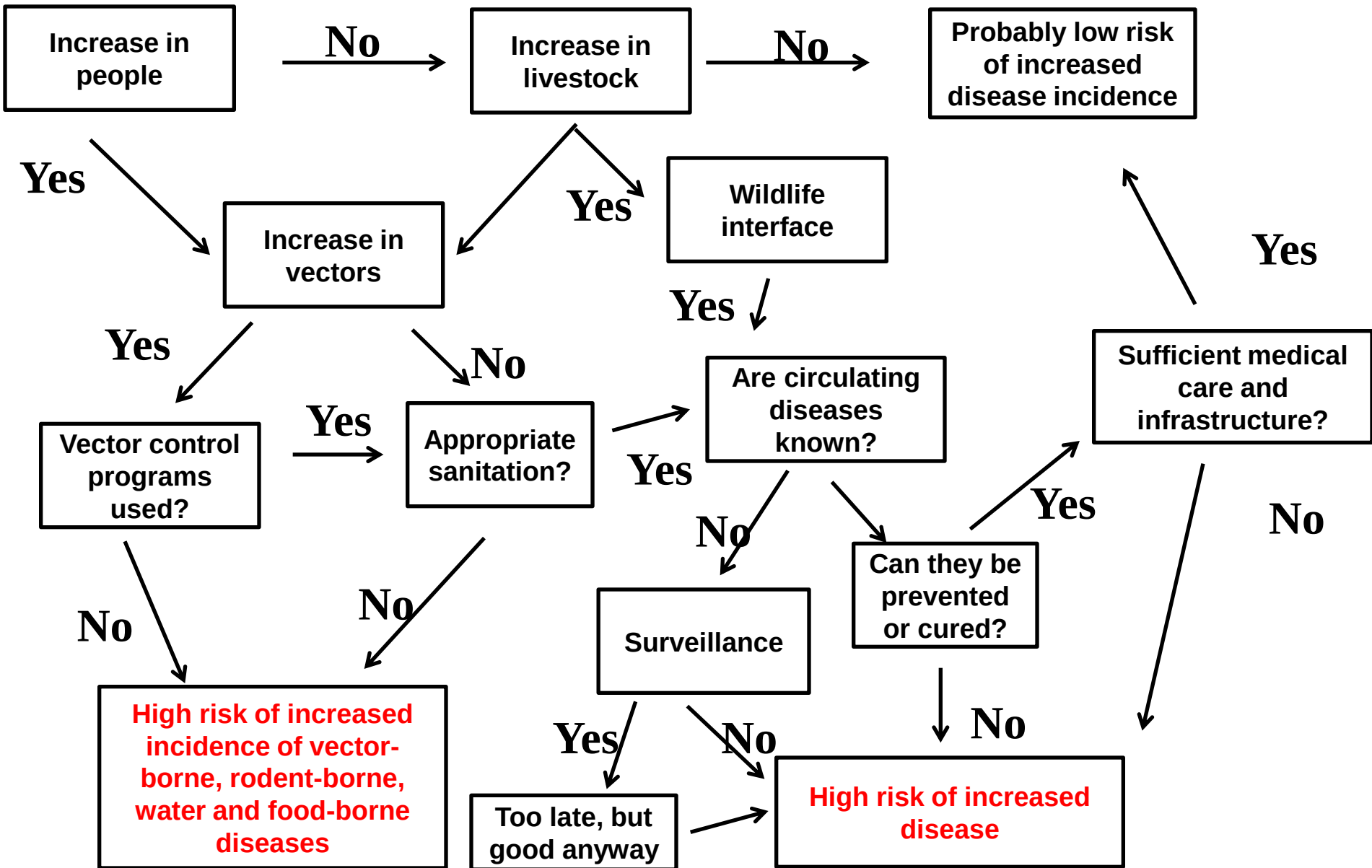
	Deworming	Vaccinations (to prevent not to treat)	Tick and fly treatments	Insurance (annual fee)
Mean	928	437	599	0
Range	0-11000	0-5000	0-5000	Not existing

Sharing resources for health delivery

- Efficiency & effectiveness gains
  - Shared infrastructure; training, services
- Joined up services for zoonoses: Across a range of studies 5-15% reduction in costs +/or improvement cover
- World Bank (2012) estimates 25% savings across a range of joint services for AI and 7% additional costs = net savings of 18%

- Developing country health sector expenditure: 250 billion
- Developing country veterinary expenditure: 2 billion
  - Amenable to joined up services: $4 billion

Political decisions and economy



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In conclusion

- **We need to show the multiple burdens of disease**
- **We need to show the money savings**
- **We need to show economical consequences**

Because money talks.

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Thank you

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