Impact of neglected diseases on animal productivity and public health in Africa

21st conference of the OIE regional commission for Africa, 16-20 February 2015, Rabat, Morocco

Delia Grace, Mwansa Songe and Theo Knight-Jones
Survey commissioned and supported by OIE

Sent to 54 Member Countries
  – 34 responded in time for inclusion:
    • 63% response rate
    • Covers 87% of ruminant, 82% poultry, 64% pig population in Africa

December 2014-January 2015
Survey Content

1 DISEASE PRIORITIES

2 MULTIPLE IMPACTS

3 DISEASE PREVALENCE AND CONTROL

4 TRENDS, DRIVERS AND CHANGE

5 COSTS

6 OPPORTUNITIES
1. Disease priorities
Pareto principle: the vital few & trivial many

Illnesses

GBD: top 10 human disease cause 90% burden
1st priority epidemic disease

Most frequently mentioned in the top three epidemic priorities
FMD: 24 (24%) - PPR: 20 (20%) - CBPP: 17 (17%) - AI: 7 (7%)
1st priority Emerging infectious livestock disease

Most frequently mentioned in the top three emerging infectious livestock disease priorities:
Al: 8 (13%) - RVF: 8 (13%) - PPR: 7 (11%) - FMD: 6 (10%)

- AI: 6 (21%)
- ASF: 3 (11%)
- Besnoitiosis: 1 (4%)
- Blue tongue: 1 (4%)
- BVD: 1 (4%)
- CCPP: 1 (4%)
- FMD: 2 (7%)
- Infectious bronchitis (Q-strain): 1 (4%)
- LSD: 2 (7%)
- PPR: 4 (14%)
- RVF: 4 (14%)
- Sheep-Goat pox: 1 (4%)
- Unknown Camel disease (UCD): 1 (4%)
1st priority foodborne disease

Countries
- Anthrax: 2 (7%)
- Brucellosis: 1 (4%)
- bTB: 3 (11%)
- Colibacillosis: 1 (4%)
- Cysticercosis: 2 (7%)
- Salmonellosis: 18 (67%)

Most frequently mentioned in the top three foodborne disease priorities:
- Salmonellosis: 24 (32%)
- Colibacillosis: 10 (14%)
- Cysticercosis: 6 (8%)
- bTB: 5 (7%)
Most frequently mentioned in the top three wildlife disease priorities:

- Rabies: 12 (18%)
- Anthrax: 10 (15%)
- bTB: 8 (12%)
- FMD: 8 (12%)

- AI: 2 (7%)
- Anthrax: 5 (18%)
- ASF: 2 (7%)
- Brucellosis: 1 (4%)
- bTB: 3 (11%)
- Epizootic haemorrhagic disease: 1 (4%)
- FMD: 7 (25%)
- Monkeypox: 1 (4%)
- Rabies: 5 (18%)
- RVF: 1 (4%)
Most frequently mentioned in the top three zoontic disease priorities:
- Rabies: 26 (27%) - bTB: 15 (16%)
- Brucellosis: 14 (15%) - Anthrax: 13 (14%)

- Af: 3 (9%)
- Anthrax: 5 (15%)
- Brucellosis: 2 (6%)
- bTB: 3 (9%)
- Leptospirosis: 1 (3%)
- Rabies: 15 (45%)
- RVF: 3 (9%)
- Salmonellosis: 1 (3%)
Most commonly cited priority diseases

N=109 diseases
Pareto principle: the vital few & trivial many

GBD: top 10 human disease cause 90% burden

This survey: 20% of diseases got 78% of cites
2. Multiple impacts
‘Combining the total societal benefits, the intervention in the animal sector saves cost, provides the economic argument and thus opens new approaches for the control of zoonoses in developing countries through cost contributions from multiple sectors.’

Roth et al. 2003, Bulletin WHO
# A business case for One Health

<table>
<thead>
<tr>
<th></th>
<th>Annual benefit</th>
<th>Annual cost</th>
<th>Confidence in investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharing resources</td>
<td>4 billion</td>
<td>1 billion</td>
<td>++</td>
</tr>
<tr>
<td>Controllable zoonoses</td>
<td>60 billion</td>
<td>20 billion</td>
<td>+++</td>
</tr>
<tr>
<td>Timely response</td>
<td>6 billion</td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Averting pandemics</td>
<td>30 billion</td>
<td>3.4 billion</td>
<td>+</td>
</tr>
<tr>
<td><strong>Bottom line</strong></td>
<td><strong>100 billion</strong></td>
<td><strong>25 billion</strong></td>
<td><strong>+++</strong></td>
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</tbody>
</table>
Disease impacts
Disease impacts
### SVS considerations in deciding most important diseases

<table>
<thead>
<tr>
<th></th>
<th>Most important</th>
<th>2nd most important</th>
<th>3rd most important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts on food security</td>
<td>65%</td>
<td>18%</td>
<td>6%</td>
</tr>
<tr>
<td>Impacts on the smallholder sector</td>
<td>47%</td>
<td>18%</td>
<td>24%</td>
</tr>
<tr>
<td>Impacts on the pastoralist sector</td>
<td>41%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Impacts on the export sector</td>
<td>35%</td>
<td>21%</td>
<td>18%</td>
</tr>
<tr>
<td>Impacts on the commercial sector</td>
<td>32%</td>
<td>38%</td>
<td>9%</td>
</tr>
<tr>
<td>Impacts on public opinion</td>
<td>15%</td>
<td>18%</td>
<td>21%</td>
</tr>
<tr>
<td>Impacts on wildlife and the environment</td>
<td>6%</td>
<td>26%</td>
<td>24%</td>
</tr>
</tbody>
</table>
3. Prevalence and control
Is there a national list of notifiable animal diseases?

Countries
No: 6 (18%)
Yes: 28 (82%)
Africa: Priority list well aligned with important diseases

Priority List Diseases
- FMD
- PPR
- ASF
- CBPP
- NCD
- Anthrax
- bTB
- RVF

IMPORTANT DISEASES
- RVF
- FMD
- PPR
- bTB
- Anthrax
- Brucellosis
- CBPP
SE Asia: Priority disease not aligned with important diseases

**Priority Diseases**
1: Avian influenza
3: Leptospirosis

**Important Diseases**
1: Vector-borne disease
2: Food borne disease

Author's personal copy

*Original Contribution*

**Zoonotic Emerging Infectious Disease in Selected Countries in Southeast Asia: Insights from Ecohealth**

Delia Grace, Jeffrey Gilbert, M. Lucila Lapar, Fred Unger, Sonia Fèvre, Hung Nguyen-Viet, and Esther Schelling

1 International Livestock Research Institute (ILRI), 30709, Nairobi, Kenya
Vaccination for priority diseases

a) Anthrax

b) Brucellosis

c) CBPP

d) CCPP

e) FMD

f) LSD

g) ND

h) PPR

i) RVF

j) Rabies

k) Sheep-Goat pox

l) ECF
4. Trends, drivers and change
Most diseases are increasing or static

- Zoonotic
- Epidemic
- Vector-borne
- Endemic
- Food-borne
- Emerging livestock
- Fish disease
- Emerging zoonotic
- Wildlife disease

- Decreasing
- Static
- Increasing

Most diseases are increasing or static.
These trends have important drivers

- Climate change
- Trade in livestock & products
- Human population growth
- Intensifying livestock
- Wildlife reservoirs
- Social change
- Economic growth
- Deforestation
- Urbanisation
- Food price
- Wildlife areas incursion
- Habitat loss
- Biodiversity
- Land use change
- Conflict
- Poverty increase
- Wildlife conservation
- Irrigation
- In-migration
- Inequality
- Land purchase by foreigners
Drug resistance an increasing threat

Respondents opinion on AMIR

- **Cattle**
  - Common: 50%
  - Occasional: 25%
  - Not present: 15%
  - No information: 10%

- **Sheep & goats**
  - Common: 40%
  - Occasional: 30%
  - Not present: 20%
  - No information: 10%

- **Poultry commercial**
  - Common: 30%
  - Occasional: 40%
  - Not present: 30%

- **Poultry backyard**
  - Common: 20%
  - Occasional: 40%
  - Not present: 40%

- **Pig commercial**
  - Common: 10%
  - Occasional: 60%
  - Not present: 30%

- **Pig backyard**
  - Common: 20%
  - Occasional: 50%
  - Not present: 30%

- **Fish**
  - Common: 30%
  - Occasional: 40%
  - Not present: 30%
Foodborne disease a public concern
5. Costs
Multiple burdens of animal disease

- **Direct impact**
  - Burden of illness in people (DALY’s)
  - Losses in agri-food chains ($)
Annual losses from animal mortality and costs of disease control in Africa

Million USD

- GiT parasites
- AAT
- Ticks and TBD
- Heartwater
- PPR
- Newcastle
- CBPP
- BVD
- Ectoparasites
- FMD
- LSD
- Brucellosis
- bTB
- Gumboro
- ASF
- ECF
- Shope pox
- Brucellosis
- Coccidiosis
- Dermatophilosis
- CCPP
- Foot rot
- Mastitis
- Aflatoxicosis
- Erysipelas
- Cysticercosis

0 1000 2000
200 400 600
800 1000 1200
1400 1600 1800
2000

36
Losses from cattle disease

USD MILLION LOST ANNUALLY

 GIT  AAT  Ticks and TBD  CBPP  BVD  LSD  Brucellosis  FMD  bTB  ECF  Dermatophilosis  Mastitis  Echinococcosis
Losses from sheep & goat disease

USD million lost annually

Heartwater  GIT  PPR  Ectoparasites  Sheep & goat pox  Brucellosis  CCPP  FMD  Foot rot  Echinococciosis
Losses from poultry disease

USD MILLION LOST ANNUALLY

- Newcastle
- Gumboro
- Coccidiosis
- Ectoparasites
- GIT
- Aflatoxicosis
Losses from pig disease

USD million lost annually

- ASF: 150
- GIT parasites: 20
- Ectoparasites: 20
- FMD: 40
- Erysipelas: 20
- Cysticercosis: 40

Total: 224
How does this compare to other estimates?

<table>
<thead>
<tr>
<th></th>
<th>Million USD</th>
<th>Value sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLDA</td>
<td>$39</td>
<td>0.03%</td>
</tr>
<tr>
<td>SVS estimate</td>
<td>$9,000</td>
<td>6%</td>
</tr>
<tr>
<td>Literature</td>
<td>$30,000</td>
<td>21%</td>
</tr>
<tr>
<td>BMGF</td>
<td>$35,000</td>
<td></td>
</tr>
</tbody>
</table>

2/3 from death 1/3 production

Only death or control

<table>
<thead>
<tr>
<th></th>
<th>Million USD</th>
<th>Value sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>979</td>
<td>16%</td>
</tr>
<tr>
<td>UK</td>
<td>1,178</td>
<td>8%</td>
</tr>
</tbody>
</table>

Reporting common, non-pathognomonic disease a challenge

Bovine brucellosis according to 440 surveys

<table>
<thead>
<tr>
<th>Region</th>
<th>Bovine brucellosis Predicted cases annual</th>
<th>Bovine brucellosis Cases reported 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Africa</td>
<td>21,104,976</td>
<td>12</td>
</tr>
<tr>
<td>West Africa</td>
<td>30,646,060</td>
<td>37</td>
</tr>
<tr>
<td>South Africa</td>
<td>8,492,555</td>
<td>6305</td>
</tr>
<tr>
<td>North Africa</td>
<td>7,952,853</td>
<td>1073</td>
</tr>
</tbody>
</table>

Source: LRI report to DFID Mapping poverty and likely zoonosis hotspots
Diagnosis a challenge

Cases from Bura health centre

- Malaria
- Typhoid

Cases from Hola health centre

- Malaria
- Typhoid
- Brucellosis

A total of 1,323 samples collected in cross-sectional surveys, 481 already screened

Sero-prevalence

- WNV
- Dengue
- RVF
- Q fever

Pathogen

- Non-irrigated area
- Irrigated area
6. Opportunities
How to improve disease reporting

- Increasing resources for veterinary services
- Increased engagement of farmers in disease control programmes
- Improved information flow between farmers and veterinary services
- Better links between central and district, local, field veterinary services
- Capacity building in epidemiology
- Investment in information and communications technology
- Increased engagement of private vets in disease control programmes
- Affordable, pen side diagnostics
How OIE can help reduce disease impact

- Training to focal points
- ARIS and WAHIS inter-operability
- Improving synergy between OIE focal points and others
- Improving temporal stability of OIE focal points
- Ensuring OIE focal points have more time for OIE responsibilities
- Making WAHIS more user friendly
Take homes

- Unlimited wants in a world of limited resources
- Vital few and trivial many: Pareto principle
- The multiple burdens of animal disease
- What cannot be measured, cannot be managed
- Foreseen is forearmed
Ways Forward

- An Africa list of “neglected animal diseases”? 
- More detailed disease impact studies? 
- Sharing & harmonisation of contingency plans? 
- Pilot novel ways to improve reporting? 
- A One Health system for monitoring animal use of antimicrobials? 
- Norms for informal food markets?
Conclusion

- Good progress has been made on disease control, priority lists, contingency plans, and vaccination
- SVS have broad-based, equitable, development-oriented approach to disease control
- **But** diseases have multiple, heavy burdens and trends are upwards
- **While** new and important threats emerge (climate sensitive disease, EIDs, FBD and AMR)
- **And** limited quantification of impacts may chill investment in disease control

Therefore improved reporting, more information, stronger engagement, and deeper co-operation, is needed to tackle neglected animal disease in Africa.