Economische aspecten van preventie:
De positie van de veehouder in de zoönoseketen

Henk Hogeveen & Bart van den Borne
Topics in this presentation ..... 

- Zoonoses from an economic perspective
- Incorporating public health in economic analyses
- Zoonoses from a farmers’ perspective
- Some examples
Do it yourself

- Let’s start with a small questionnaire …..
Economic effects of animal disease

Input:
- Land
- Labour
- Capital

Output:
- Milk
- Meat
- Eggs
- Draft power
- Companion
- ......

Human benefit (utility)

After: McInerney, 1996
The field: Economic effects of animal disease

**Input**
- Land
- Labour
- Capital

**Output**
- Milk
- Meat
- Eggs
- Draft power
- Companion

**Human benefit (utility)**

1. Lower efficiency
2. Lower suitability for purpose
3. Lower human well-being

"OLD ECONOMICS FOR NEW PROBLEMS – LIVESTOCK DISEASE: PRESIDENTIAL ADDRESS"

John McInerney*

J. Agricultural Economics, 1996
Zoonoses from an economic perspective

- Is it a private good?
  - A product that must be purchased to be consumed; consumption by one individual prevents another individual from consuming it

Free good
- Good with no opportunity cost, e.g. water

Private good
- Rivalry, and excludability, e.g. coca-cola

Public good
- Non-rivalry, non-excludable. e.g. street lights
Zoonoses from an economic perspective

- Is it a public good?
  - Commodity provided without profit to all members of a society

- Free good
  - Good with no opportunity cost, e.g., water

- Private good
  - Rivalry, and excludability, e.g., coca-cola

- Public good
  - Non-rivalry, non-excludable, e.g., street lights
Zoonoses from an economic perspective

- Is it an externality?

  - Consequence of a commercial activity which affects other parties without this being reflected in market prices
THREE
Do it yourself

- Think about a food safety issue and describe the economic aspects for this food safety issue
  - Private good
  - Public good
  - Externality
As a starting point

- Zoonoses as a private good
- If zoonoses are linked to safety of food, it may have an effect on the demand
  - Effect on prices
- Food companies want to optimize their level of food safety
  - Cost of programme/testing vs
    - Moneterized risk of contamination
    - Expected benefit of high quality image or specific (labelled) food line
What about a government?

- Zoonoses as a public good
- Task for public health authorities
- By organizing health care system
  - State health care
  - Insurance systems
- By regulating food safety
  - Minimum standards of safety (MRL)
  - Traceability systems
  - Farm animal regulations
  - Chemical regulations
How to make decisions as government

- Expert: based on a trusted expert
- Consensus: creating a common position in group of stakeholders
- Political: by representatives of political parties
- Benchmarking: decisions based on outside models, such as international regulation
- Empirical: based on fact-finding and analyses using parameters according to established criteria

Regulatory impact analysis

Source: www.oecd.org/gov/regulatory-policy/ria.htm
Topics in this presentation ..... 

- Zoonoses from an economic perspective
- Incorporating public health in economic analyses
- Zoonoses from a farmers’ perspective
- Some examples
So the benefits of programs are difficult to estimate.

- There are several methods that still can be used by companies and governments:
  - Cost-minimization analysis
  - Cost-effectiveness analysis
  - Cost-utility analysis
  - Social cost-benefit analysis
Social cost benefit analysis

- **All effects**, both monetary and intangible, direct and indirect, are measured and expressed in monetary terms.

- **Underlying theoretical assumption:**
  - Within a society, those who gain could compensate those who lose by reallocating resources up to the point where any further reallocation of resources would not make anyone better off without making the other worse off.

- **Evaluation:** Net value \( \frac{K - \Delta W}{\Delta W} \) Benefit-cost ratio
Received: 28 April 2017
DOI: 10.1111/zph.12417

ORIGINAL ARTICLE

The design of a Social Cost-Benefit Analysis of preventive interventions for toxoplasmosis: An example of the One Health approach

A. W. M. Suijkerbuijk\textsuperscript{1} | P. F. van Gils\textsuperscript{1} | A. A. Bonačić Marinović\textsuperscript{2} | T. L. Feenstra\textsuperscript{1,3} | L. M. Kortbeek\textsuperscript{2} | M.-J. J. Mangen\textsuperscript{2} | M. Opsteegh\textsuperscript{2} | G. A. de Wit\textsuperscript{1,4} | J. W. B. van der Giessen\textsuperscript{2}
Topics in this presentation ..... 

- Zoonoses from an economic perspective
- Incorporating public health in economic analyses
- **Zoonoses from a farmers’ perspective**
- Some examples
The field: Economic effects of animal disease

Input
- Land
- Labour
- Capital

Output
- Milk
- Meat
- Eggs
- Draft power
- Companion

Human benefit (utility)

Disease

1. Lower efficiency
2. Lower suitability for purpose
3. Lower human well-being

Old Economics for New Problems – Livestock Disease: Presidential Address

John McInerney*
J. Agricultural Economics, 1996
Decisions

Failure costs

Incidence/prevalence

Economic consequences

Decision taker
Decisions

- Failure costs
- Preventive costs

- Incidence/prevalence
- Economic consequences
- Costs
- Effectivity

Decision taker

Based on:
- Objectives
- Available resources
Novel dimensions

- Failure costs
  - Incidence/prevalence
  - Economic consequences
- Preventive costs
  - Effectivity
  - Costs
- Societal acceptance
  - Public health
  - Animal welfare
  - Environment

Decision taker

Objectives
Available resources
### Different types of animal health problems

<table>
<thead>
<tr>
<th>Public health effects</th>
<th>Animal health effects</th>
<th>Animal health effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>Large</td>
<td>Win-win</td>
</tr>
<tr>
<td>Large</td>
<td>Small</td>
<td>Problem</td>
</tr>
<tr>
<td>Small</td>
<td>Up to farmer</td>
<td>Who cares</td>
</tr>
</tbody>
</table>
Relatively little work on economics

Source: Shuyue Ma, internship thesis, Utrecht University/Wageningen University
Different interventions affect stakeholders differently  Suijkerbuijk et al., 2017

<table>
<thead>
<tr>
<th>Domains</th>
<th>Effects, resulting in changes in costs and benefits</th>
<th>Cat Vaccination</th>
<th>Freezing Meat</th>
<th>Enhancing biosecurity at pig farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer</td>
<td>Toxoplasma-related patient costs will be assessed</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Consumer surplus&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consumption of meat may change due to change in meat price</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Costs for cat vaccination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human health</td>
<td>Health care costs</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Morbidity and premature mortality due to toxoplasmosis are expressed in DALYs. All short- and long-term effects of infection will be included</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Producers</td>
<td>Producer surplus&lt;sup&gt;b&lt;/sup&gt;. Since we consider freezing meat as an international intervention, the consequences for the producer surplus will be limited as additional costs might spill-through to the consumer. Biosecurity measures will lead to additional costs for pig farmers. Serological testing in slaughterhouses are additional costs for slaughterhouse that might be put through to the consumer, since we assume that this is an international intervention Toxoplasmosis is an important cause of abortion among sheep. Vaccination of cats at farms can reduce these losses. Facilities at companies will be needed such as freezers, extra surface area and electricity costs. These facilities will have additional annual recurrent costs (e.g. electricity, maintenance) leading to higher productivity costs for slaughterhouses and the meat processing industry.</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Employees</td>
<td>Toxoplasma-related productivity losses will be assessed</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Freezing of meat will lead to extra employment. The development, campaign, distribution and vaccination of cats will lead to extra employment for veterinarians The biosecurity measures will affect employment of pig breeders, and fatteners, but also persons involved in rodent control and persons who perform the audits.</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Social security, pensions</td>
<td>A change in employment rate will affect social security and pensions.</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Education</td>
<td>Less infections will lead to less special education</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Step 5. Define and value costs

- Very difficult task (many assumptions)
- Decreased cost-of-illness
- Non health care costs
  - Freezing meat
    - Different cost price (production costs)
    - Different demand (product characteristics)
    - Contingent valuation – Discrete choice exp.
  - Pig biosecurity
    - Higher production costs
  - Cat vaccination
Do it yourself

- How would you motivate ..... 
  - Farmers
  - Pet owners
Topics in this presentation ..... 

- Zoonoses from an economic perspective 
- Incorporating public health in economic analyses 
- Zoonoses from a farmers’ perspective 
- Some examples
1. Economics amongst other motivators

- Quantify farmers’ motivative factors for a change in mastitis management
- Adaptive conjoint analysis, 100 farmers
  - Systematically varying the motivation features in a questionnaire
  - Measuring the preferences of the farmer
  - Calculate preferences for individual features
Are you motivated to change your mastitis management to decrease the BMSCC if:

1. It leads to better cow health/welfare
2. You will get a financial reward (bonus/penalty)
   - 50 farmers question as bonus
   - 50 farmers question as penalty
3. It is easier to fulfil legal requirements
4. Your pleasure in work increases
5. It leads to lower economic losses
6. You get recognition
7. The quality of the dairy products are better
<table>
<thead>
<tr>
<th>Motivative Factors</th>
<th>Premium (n = 40)</th>
<th>Penalty (n = 43)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job satisfaction</td>
<td>17.41&lt;sup&gt;a&lt;/sup&gt; (1)</td>
<td>14.90&lt;sup&gt;agij&lt;/sup&gt; (2)</td>
</tr>
<tr>
<td>Overall situation on the farm</td>
<td>15.81&lt;sup&gt;abc&lt;/sup&gt; (2)</td>
<td>14.89&lt;sup&gt;bfi&lt;/sup&gt; (3)</td>
</tr>
<tr>
<td>Economic losses</td>
<td>14.23&lt;sup&gt;bdgij&lt;/sup&gt; (3)</td>
<td>14.39&lt;sup&gt;abcehi&lt;/sup&gt; (4)</td>
</tr>
<tr>
<td>Animal health and welfare consciousness</td>
<td>13.95&lt;sup&gt;cgh&lt;/sup&gt; (4)</td>
<td>14.51&lt;sup&gt;ck&lt;/sup&gt; (5)</td>
</tr>
<tr>
<td>Ease in meeting regulatory requirements</td>
<td>12.45&lt;sup&gt;def&lt;/sup&gt; (5)</td>
<td>9.59&lt;sup&gt;d&lt;/sup&gt; (6)</td>
</tr>
<tr>
<td>Extra financial incentive based on bulk milk SCC</td>
<td>11.35&lt;sup&gt;ehij&lt;/sup&gt; (6)</td>
<td>16.43&lt;sup&gt;efgk&lt;/sup&gt; (1)</td>
</tr>
<tr>
<td>Dairy product quality and image</td>
<td>8.63&lt;sup&gt;i&lt;/sup&gt; (7)</td>
<td>8.66&lt;sup&gt;d&lt;/sup&gt; (7)</td>
</tr>
<tr>
<td>Recognition for a job well done</td>
<td>6.13 (8)</td>
<td>6.63 (8)</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>
2. Motivating dog owners to vaccinate against rabies

- Outbreak since 2010; insufficient uptake of vaccination

Costs of rabies control measures (x1000 $US)
Vaccination saves money:
70% uptake, long-acting vaccine, $US per village (450 pp)
Uptake in 2012: 48 %


- I will vaccinate my dog if the vaccine is free 96%
- I will vaccinate my dog if I have to pay 24 %
- I will cull my dog when there is rabies 40 %
- I will keep the dogs leashed when there is rabies 81 %

Vaccination affected by:

- Attitude
- Perceived behavioural control – Time
- Perceived behavioural control – Able to catch/tie my dog
3. Distribution of costs to prevent E coli VTEC

- On-farm interventions: 730-15,000 €/year
- Slaughterhouse interventions 111,000 – 2,343,000 €/year
And how to distribute costs and benefits?

How zoonotic diseases are transmitted

- **Airborne**
  - Transfer of viruses

- **Vectors**
  - Transmitting infected agents from animals

- **Direct contact with animals**
  - Bites from an infected animal

- **Close proximity to animals**
  - Faecal oral transfer
  - Animal body fluid in cuts

- **Food-borne**
  - Consuming infected meat or milk

Source: WHO
Credit: Rebecca Robinson/LSHTM
Do it yourself

- How would you distribute costs & benefits .....
Questions?
Thank you for your attention

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