RVF Appraising Human Vulnerability

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National Center for Foreign Animal and Zoonotic Disease Defense

Bruce A. McCarl

Distinguished Professor of Agricultural Economics
Texas A&M University

Presented at
RVF Expert Consultation

Washington, D.C.
Dec 16, 2009

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Analysis Team

TAMU Ag Econ
Bruce McCarl
Randi Hughes-Fraire
Mark Musumba
Ruth Aisabokhae

Others?
David Hartley
Terry Nipp

Supported By:
DHS funded National Center for Foreign Animal and Zoonotic Disease Defense at Texas A&M University

Partially Supported:
DHS INC project "Advances in Modeling Economic Resilience"
DHS funded National Center for Risk and Economic Analysis of Terrorism Events (CREATE) at University of Southern California.

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Somewhat Controversial Economic Ideas

- What is the "value" of a human life?
  - The Value of a statistical life, or VSL
- What is the "value" of a lost day to illness or a diminished productivity day?
  - The Cost of Illness or COI
- What does hospitalization add
- What is the value of reducing morbidity or illness?
  - (To whom?
    - The patient? The family?)

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Accepted range in VSL

- EPA: assumes VSL is in range of $1 to $9 million
  - Often uses about $4.5 million (midpoint)
- To our knowledge – no current accepted practice on the value of avoided illness or VSI
  - A current interest of EPA is to find numbers for this

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Cost of Illness

- For some human illnesses, patients die prematurely or are unable ever to return to work. In a COI analysis, the lost productivity for these patients can be represented either by human capital estimates of forgone earnings or by WTP estimates of the value of a statistical life. Therefore, the COI method can partially incorporate the WTP measure for these categories of patients.

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Cost of Illness: Example of Individual costs.

Table 4—Societal costs of foodborne illness

Costs to individuals/households[1]
Human illness costs:
- Medical costs—
  - Physician visits
  - Laboratory costs
  - Hospitalization or nursing home
  - Drugs and other medications
  - Ambulance or other travel costs
- Income or productivity loss for—
  - Ill person or person dying
  - Caregiver for ill person
- Other illness costs—
  - Travel costs to visit ill person
  - Home modifications
  - Vocational/physical rehabilitation
  - Child care costs
  - Special educational programs
  - Institutional care
  - Lost leisure time
- Psychological (psychic) costs—
  - Pain and other psychological suffering
  - Risk aversion

Averting behavior costs—
- Extra cleaning/cooking time costs
- Extra cost of refrigerator, freezer, etc.
- Flavor changes from traditional recipes (especially meat, milk, egg dishes)
- Increased food cost when more expensive but safer foods are purchased

Altruism (willingness to pay for others to avoid illness)

Source: USDA-ERS

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USDA-ERS report

Bacterial Foodborne Disease: Medical Costs and Productivity Losses.

- These estimates were developed to provide analytical support for USDA's Hazard Analysis and Critical Control Point (HACCP) systems rule for meat and poultry.
- They estimated the costs and losses for all 6 bacterial pathogens that were mentioned in the previous slide.

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Table 6—Estimated U.S. salmonellosis cases, 1993

Severity of illness	Estimated cases	
	Low	High
	Number	
No physician visit[1]	746,880	3,734,400
Physician visit[2]	40,320	201,600
Hospitalized[3]	12,000	60,000
Deaths[4]	800	4,000
Total[5]	800,000	4,000,000

[1] Cases in this category were calculated as a residual.

[2] Assuming 5.04% of all cases visit a physician (Ryan 1987).

[3] This category is for those who were hospitalized and survived. Assuming 1.5% of all cases are hospitalized (Ryan *et al.* 1987).

[4] Deaths are calculated using a case fatality rate of 1/1,000. Those who die are assumed to be hospitalized prior to their deaths. Therefore, the total number of salmonellosis patients hospitalized each year is 12,800 in the low estimate and 64,000 in the high estimate.

[5] The low estimate of 800,000 cases was calculated by multiplying CDC's estimate of 40,000 *Salmonella* isolates (Tauxe 1991) by Chalker and Blaser's (1988) low estimate of the number (20) of unreported cases to each reported case. The high estimate of 4 million cases was calculated by multiplying CDC's estimate of 40,000 *Salmonella* isolates (Tauxe 1991) by Chalker and Blaser's (1988) high estimate of the number (100) of unreported cases to each reported case.

Source: US

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Rift and Death

- **Humans-Mortality rate ~1%**
  - **Those who develop hemorrhagic fever, mortality rate is 50%**

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So What Do we need

Plausible scenarios for

- **Death**
- **Lost work days**
- **Hospitalization days**
- **Link to size of animal outbreak**

Endemic vs one time?

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So What Do we need

Can we link an animal event with a human one?

Add humans to epi model

Could we develop baseline human loss then link severity to animal outbreak size?

human = f(animal size, rel pop density)