

APPLYING ECONOMIC ANALYSIS TO FOOD SAFETY INTERVENTIONS: AN OVERVIEW

UNIVERSITY
of GUELPH

CHANGING LIVES
IMPROVING LIFE

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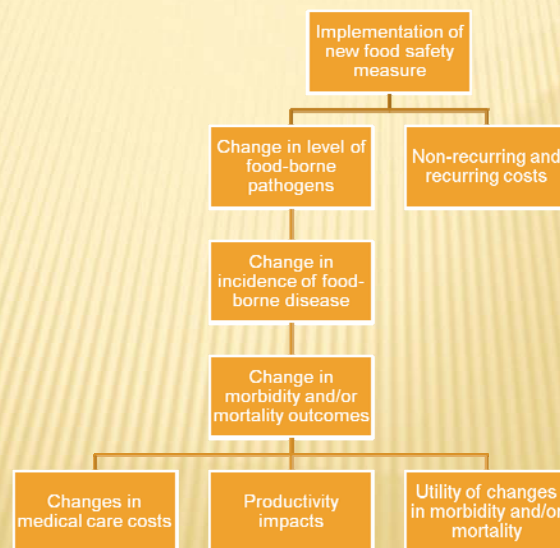
OVERVIEW

- ✗ Context
- ✗ Economic analysis of food safety capacity building and related challenges
- ✗ Applications of economic analysis to food safety
- ✗ Conclusions

CONTEXT

- ✗ Persistence of food-borne illness in industrialised countries
- ✗ Trade impacts of weaknesses in food safety controls in developing countries
- ✗ Need for more and better control measures:
 - + Technical efficiency
 - + Economic efficiency
- ✗ Increasing use of regulatory impact analysis
- ✗ 'Radical' changes in regulatory food safety measures

ANALYSIS OF FOOD SAFETY CAPACITY BUILDING: PUBLIC HEALTH FOCUS



CHALLENGES: PUBLIC HEALTH FOCUS

- ✗ Estimating impact on level of food-borne pathogens
- ✗ Estimating costs of control measures
- ✗ Estimating impact on incidence of food-borne disease and associated mortality/morbidity outcomes
- ✗ Valuing the benefits:
 - + Morbidity states
 - + Value of human life
- ✗ General equilibrium effects

ANALYSIS OF FOOD SAFETY CAPACITY BUILDING: TRADE FOCUS



CHALLENGES: TRADE FOCUS

- ✗ Assessing impact on compliance with export market requirements
- ✗ Estimating costs of control measures
- ✗ Assessing impact on volume and/or value of trade
- ✗ Assessing socio-economic impacts

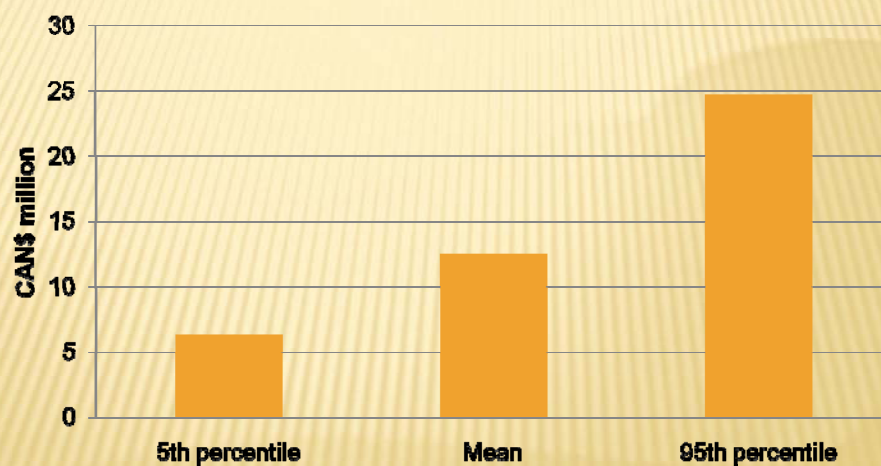
APPLICATIONS OF ECONOMIC ANALYSIS TO FOOD SAFETY

- ✗ Costs of food-borne illness:
 - + Incidence data/Surveillance data
 - + Point estimates/Stochastic approaches
- ✗ Costs of 'compliance':
 - + Engineering approaches
 - + Econometric approaches
 - + Accounting approaches
- ✗ Cost-benefit analysis:
 - + Partial equilibrium
 - + General equilibrium
 - + Trade-based analysis
- ✗ Cost-effectiveness analysis
- ✗ Multi-criteria decision-making

ANNUAL ECONOMIC COST OF SALMONELLOSIS IN THE UNITED STATES, 2008 (\$ MILLION)

Cost Categories	Did Not Visit Physician Survived	Visited Physician Survived	Hospitalised Survived	Visited Physician or Hospitalised Died	Total
Medical care	0	57.1	153.6	3,987.8	214.6
Lost productivity	64.1	27.4	6.8	0.2	98.5
Premature death	0	0	0	2,333.5	2,333.5
Total	64.1	84.5	160.4	2,337.8	2,646.7

MEAN COST OF GASTROINTESTINAL INFECTION PER 100,000 POPULATION IN BRITISH COLUMBIA, 2007



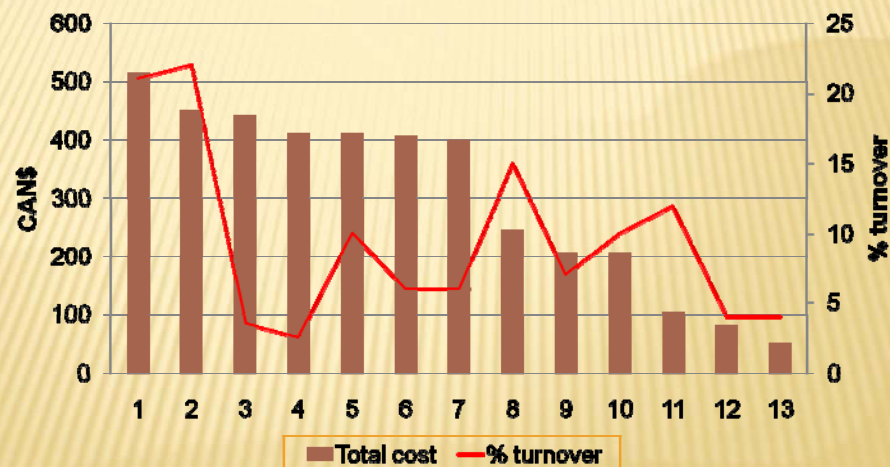
MEAN COST OF GASTROINTESTINAL INFECTION PER 100,000 POPULATION IN BRITISH COLUMBIA, 2007

Cost Categories	Mild Cases (CAN\$)	Moderate Cases (CAN\$)	Severe Cases (CAN\$)
Medical care	385,291	587,489	1,360,780
Medication	42,453	700,304	2,707,681
Stool tests	14,976	12,733	47,919
Lost productivity	700,331	867,830	4,797,629
Travel costs	38	195	397,731
Total	1,143,090	2,168,550	9,311,738
Mean cost per case	122	232	996
Mean cost per capita	12	22	95

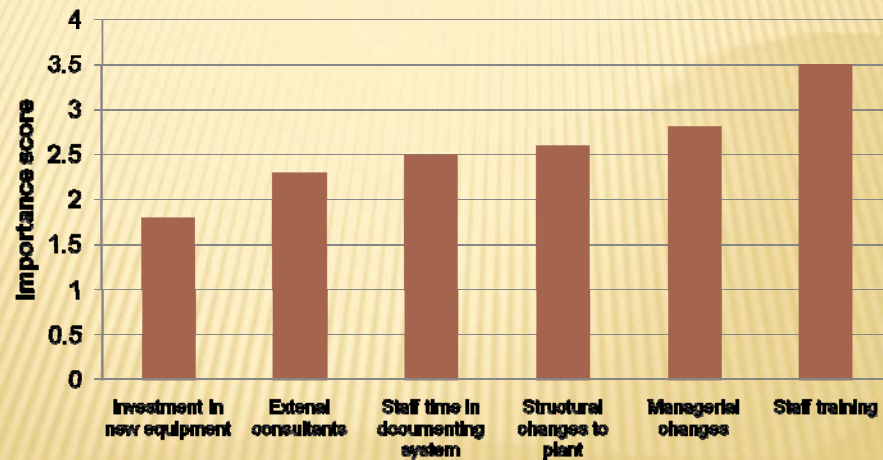
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COSTS OF UPGRADING HYGIENE CONTROLS TO EU STANDARDS IN KERALAN FISH PROCESSING PLANTS



COSTS OF IMPLEMENTING HACCP IN MEXICAN MEAT PROCESSING SECTOR



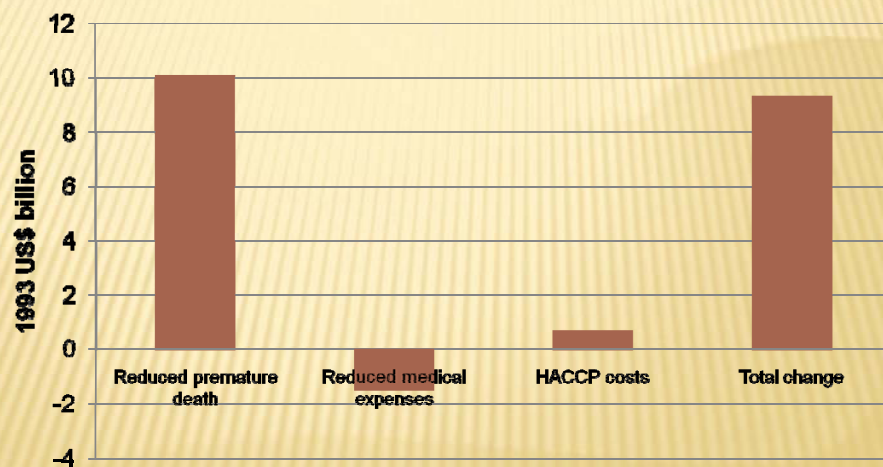
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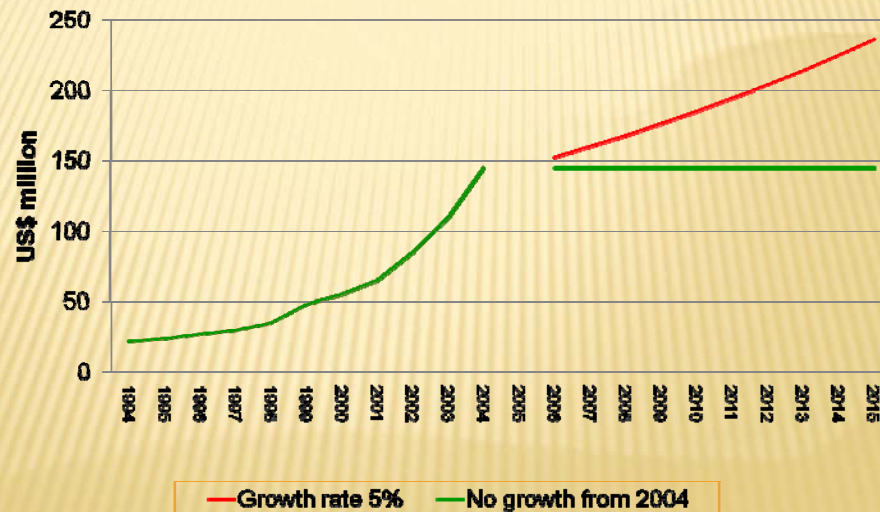
ESTIMATED COSTS AND BENEFITS OF HACCP IN THE US MEAT AND POULTRY SECTOR

Benefit Scenarios	Benefits		Costs	
	Low	High	Low	High
Low-range	1.9	9.3	2.3	2.3
Mid-range I	4.7	23.4	1.1	1.3
Mid-range II	26.2	95.4	1.1	1.3
High-range	47.2	171.8	1.1	1.3

SECTOR-WIDE ECONOMIC IMPACTS OF HACCP IN US MEAT AND POULTRY PROCESSING SECTOR



GROWTH IN PERUVIAN EXPORTS OF FRESH ASPARAGUS



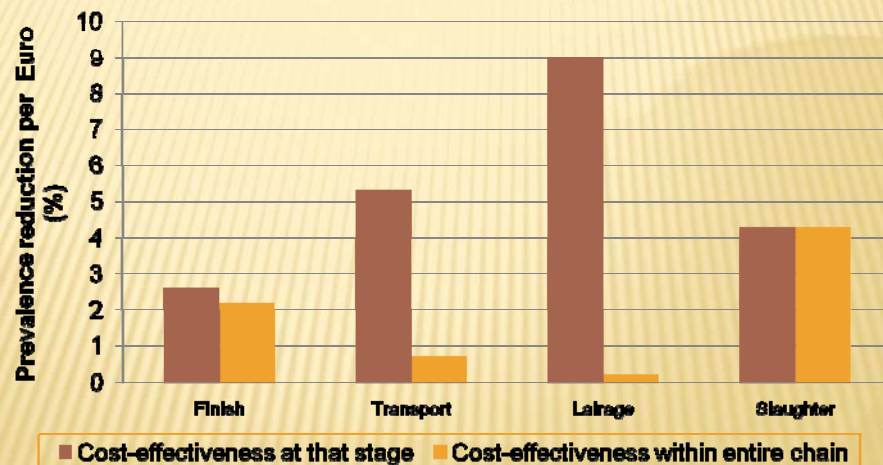
IMPACT OF ENHANCEMENT IN FOOD SAFETY CONTROLS ON PERUVIAN EXPORTS OF ASPARAGUS

Costs/Benefits 2006-15	Minimum	Maximum
Costs of food safety upgrades	\$14.14 million	\$42.43 million
Expected export flows	\$1,958.7 million	\$2,461.9 million
Returns per \$ investments in food safety capacity	46	174

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COST EFFECTIVENESS OF INTERVENTIONS AT VARIOUS STAGES OF DUTCH PORK SUPPLY CHAIN



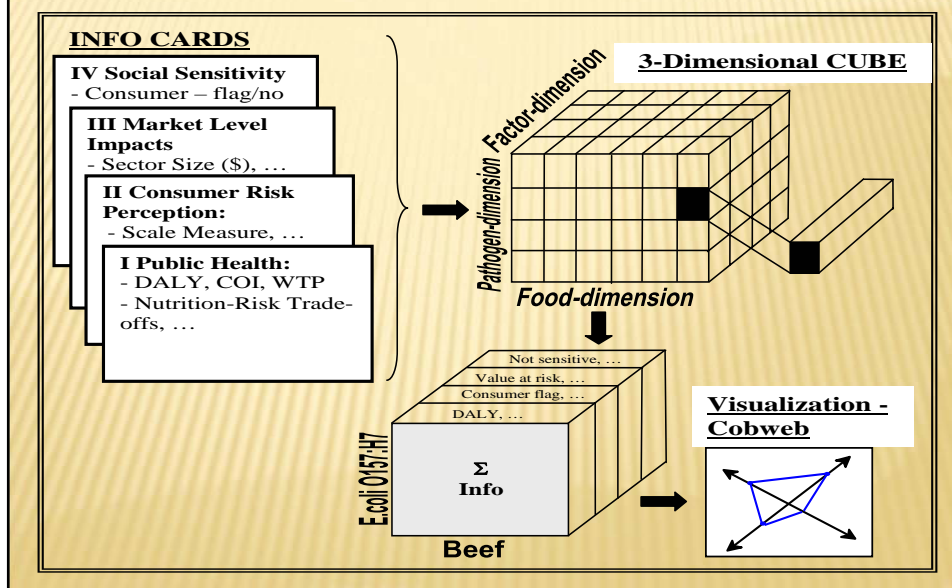
COST-UTILITY RATIOS FOR FOOD SAFETY INTERVENTIONS IN DUTCH CHICKEN SUPPLY CHAIN

Intervention	Risk Reduction (%)	Reduction in Gastroenteritis ('000case/year)	Direct Cost (€million/year)	Cost-Utility Ratio (€'000 /DALY)
Improved farm hygiene (Substantial effect)	94	10	8-63	48-560
Phage therapy	63	6.7	4	35
Carcase decontamination - Dipping	77	9.2	5	28
Carcase decontamination - Dipping & spraying	92	11	26	190
Scheduled treatment - Dipping	77	9.2	5	28
Consumer information on kitchen hygiene	3	0.5	1	190

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MULTI-FACTORIAL RISK PRIORITIZATION FRAMEWORK FOR FOOD-BORNE PATHOGENS



PRIORITIZATION OF SIX FOOD-PATHOGEN COMBINATIONS IN CANADA

Pathogen-Food Combination	Decision Criteria		
	Public health Market impact Consumer acceptance Social sensitivity	Public health Market impact Consumer acceptance	Public health
<i>E. Coli</i> O157 in beef	1	2	3
<i>L. Monocytogenes</i> in ready-to-eat meats	2	4	4
<i>Campylobacter</i> spp in chicken	3	1	1
<i>Salmonella</i> spp in chicken	4	3	2
<i>E. Coli</i> O157 in spinach	5	5	5
<i>Salmonella</i> spp in spinach	6	6	6

CONCLUSIONS

- ✘ Many challenges with economic analysis of food safety controls
- ✘ Economic analysis methods applied quite widely
- ✘learned a lot over time about how to get around some of the key challenges
- ✘ Still not easy!
- ✘ Little evidence of routine use to guide decision-making except in context of regulatory impact analysis
- ✘ Very few applications in developing countries