

A Regional-level Comparison of the Cost of Food Safety Failures

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Abstract: Food safety failures can have dramatic effects on public health triggering policy interventions. Once policy is in place, the effectiveness of control should be monitored. Two major outcomes of food safety failures - outbreaks and recalls – are often used as proxies of control in food safety economics research. Due to data limitations, or because of a particular policy focus, most studies of the effectiveness of food safety controls have been conducted at a national level. It is unclear what regional or state differences may be lost in this aggregation. As one common metric of the economic impact of food safety failures on consumers, Kuchler and Golan (1999) discuss the cost of illness (COI) approach, which will be employed in this research. COI calculates the consumer burden which is a lower bound of the cost of food safety failures. Other elements of the burden to society include government and firm costs. This poster compares such disaggregated cost elements to inform policy evaluations. The information contained in recall and outbreak databases at a regional level will be compared and linked to covariates to highlight patterns of policy effectiveness. Preliminary results suggest similar patterns of food safety failure costs are indicated using both sets of information in many portions of the US. However, in other regions the two forms of food safety failures lead to very different estimates of the cost burden, suggesting the need to impose weights in policy effectiveness studies.

OUTBREAKS

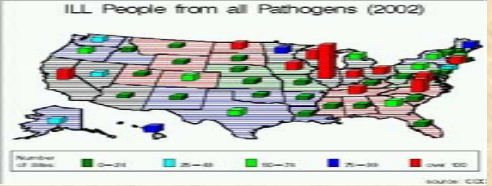
State- and federal-level outbreaks attributed to meat and poultry source: CDC

Detailed (pathogen-specific) etiology allows for calculation of COI

Why regional level?

- Regional policies
- Distortion in aggregation
- Overcoming data limitations

COI approach: linear weighted calculation of consumer's cost



Costs of food safety failures?

Government costs

Number of inspectors

Lower bound : COI from outbreaks

Consumer costs

Firm costs

Approximately 3 times of total recalled expenditures

RECALLS

combined state- and federal-level recalls of meat and poultry

Detailed (pathogen-specific) description allows for calculation of firm cost

Approximate derivation of firm's costs :

$$TC_i = AC_i + EC_i$$

$$AC_i = 3 * \text{Retail price of a product} * \text{Pounds recalled}$$

$$EC_i = 3 P r_i(R) * \bar{R} P$$

$$P r_i(R) = \alpha_0 + \alpha_1 \text{small} + \alpha_2 \text{small} + \alpha_3 \text{south} + \alpha_4 \text{west} + \alpha_5 \text{midwest}$$

\bar{R} = average total recalled amount over all regions

Outbreaks and Recalls (1990s-2002)

- South and West regions have large share of all outbreaks since 1996
- Prior to late 90's, the Midwest region saw a large share of outbreaks and recalls
- After 2000 the South saw an increased in recalls

Why Salmonella?

- Both recalls and outbreaks have *Salmonella* as a common source of food safety failure
- Recalls from *Salmonella*: over 1% in the whole recalls and especially over 10% in 1995
- Application of the simple bilateral externality model:

Joint deficit minimization

$$\text{Min}_{s \geq 0} TCOI_i(s) + TC_i(s)$$

$$TCOI_i'(s^o) = -TC_i'(s^o)$$

$$s^o = f(TCOI_i', TC_i')$$

- $TCOI$: total COI from *Salmonella* (Outbreaks side)
- TC : total cost of recalls from same pathogen
- After minimization, 2nd equation means the first order condition
- By 3rd equation, the Pareto optimal point exists.
- Result: Outbreaks is Recalls' externality
- In some regions, both food safety should be considered.

COI (*Salmonella* case) approach: linear weighted calculation of consumer's cost

Cost of illness (COI)

$$TCOI_i = \sum_l \sum_p S_{lp} h_{lp}$$

where s is actual cost, h is number of ill people

- Severity 1: cases who do not visit a physician and recover fully: \$4
- Severity 2: cases who visit a physician who recovers fully: \$401
- Severity 3: cases who are hospitalized and recover fully: \$13,111
- Severity 4: cases who visit a physician and/or are hospitalized and die: \$4,635,680

Discussion/References

1. There is a need to consider regional characteristics of the costs of food safety failures.
2. From the production side, recall quantity is an internal shock, outbreaks are external shocks.
3. Both types of food safety failures are related to each other.
4. Regional and time series differences.
5. Midwest and South exhibit considerable impacts of both types of food safety failures, especially in the case of *Salmonella*.
6. Midwest and South present the possibility of similar result with *Salmonella* case.
7. Useful to evaluate other pathogens in future research.

Kuchler F. and Golan E., 1999, Assigning Values to Life: Comparing methods for Valuing Health Risks, An Economic Research Service Report

Shiptsova R., Thomsen M., and Goodwin H., 2002, Producer Welfare Changes from Meat and Poultry Recalls, *Journal of Food Distribution Research*, Volume: 33, 25-33

Mas-colell A., Whinston M., and Green J., 1995, Microeconomic theory, *Oxford University Press*, Ch.10

Point estimation result

Outbreaks			Recalls		
Variable	Estimates	Stdev	Variable	Estimates	Stdev
West	2.5576*	0.24345	West	2.66082*	0.71346
Northeast	0.23204	0.22809	Northeast	0.19693	0.88891
Midwest	0.62214*	0.24339	Midwest	2.08315*	1.01556
South	0.45614*	0.21791	South	0.82295	0.93429
Month	0.02154	0.02691	Recovered	0.68517*	0.0969

* significant at 95% confidence level

Assumption :
For comparison of regional level between outbreaks and recalls from *Salmonella*, the time variant is left out – pooling data.
The logarithm of COI, recalled amount, and recovered amount are used.

OLS estimation:
Instead of weighted average point estimates, OLS method is used with regional dummies.
All estimates of regions represent the change of intercept in the regression.

Implication :
In the West and Midwest areas, both food safety failures should be considered.
In the South, it is obvious to recognize that outbreaks are contributing significantly to the food safety failure – because of different error terms in two regression equations, it is difficult to compare the efficiency.