Risk Assessment for Guiding Public Health Risk-Based Inspection in Poultry Slaughter

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Purpose

- Evaluate the public health impact associated with changes in inspection activities

- Risk Management Questions
  - Can FSIS reallocate inspectors in young chicken slaughter plants without significant negative impact on microbiological prevalence in the plants?
  - How will the relocation of on-line inspectors to off-line duties, or other areas within or outside the plant, affect human illness?
  - Where within the establishment can relocated inspection activities have the most impact toward reducing microbial prevalence and corresponding human illness?
  - What is the uncertainty about these effects?

Model

- Stochastic simulation model
- Multiple variable logistic regression
- “Pair wise” observations to evaluate variations in personnel assignments and inspection activities in FSIS poultry slaughter facilities with the prevalence of *Salmonella* on young chicken

Model

- Modeled the relationship between changes in *Salmonella* prevalence on young chicken and corresponding attributable human illness

- Independently peer reviewed in 2006 (OMB requirement under the Information Quality Act)

Data

- 2,395 paired observations (CY2003-2005)
- *Salmonella* prevalence: FSIS verification testing data from 154 chicken poultry establishments
- Inspection Activities: FSIS performance based Inspection system
- FSIS data on personnel assignment profiles for each establishment (on-line/off-line staffing)

Multivariate Regression/Stochastic Model

- Dependent Variable: *Salmonella* prevalence on young poultry

- Independent variables:
  - Structural variables: date, type of inspection (SIS, 24.8%; Maestro, 19.8%, NELS, 19.5%, Mixed, 16.5%, HIMP, 13.2%, Nu-Tech, 6.1%), and volume

Multivariate Regression/Stochastic Model

– Independent variables (continued):

- Decision-tracking variables
  - ✓ number of scheduled procedures performed
  - ✓ number of unscheduled procedures performed
  - ✓ aggregated into procedure categories
  - ✓ number of on-line and off-line inspectors
- Performance deficiency variables
  - ✓ number of scheduled not performed procedures
  - ✓ number of non-compliant procedures recorded
  - ✓ aggregated into procedure categories

Human Illness Attributed to *Salmonella* on Young Chicken

Step	Input	*Salmonella*	Data Source/Estimation
1	Incidence of salmonellosis among the U.S. population	14.4/100,00 0	FoodNet Annual Report for 2003[9]
2	Population estimate 2003	290,788,976	US Census Bureau[10]
3	Underreporting multiplier	38	Mead *et al.*[7]
4	Foodborne fraction	0.95	Mead *et al.*[7]
5	Poultry attribution fraction	0.3351	Food Safety Research Consortium[11;12]
6	Young chicken fraction	0.838	ERS[13]
7	Total illnesses	1,591,197	Step = 1 x 2 x 3
8	Total foodborne illnesses	1,511,637	Step = 4 x 7
9	Total foodborne illnesses from poultry	488,840	Step = 5 x 8
10	Total foodborne illnesses from young chickens	424,389	Step = 6 x 9

Note: A Poisson uncertainty distribution used to incorporate variability in salmonellosis cases per year and uncertainty about the relationship between changes *Salmonella* prevalence at the establishment and attributed cases of salmonellosis (Powell, 2000).

Model Estimates

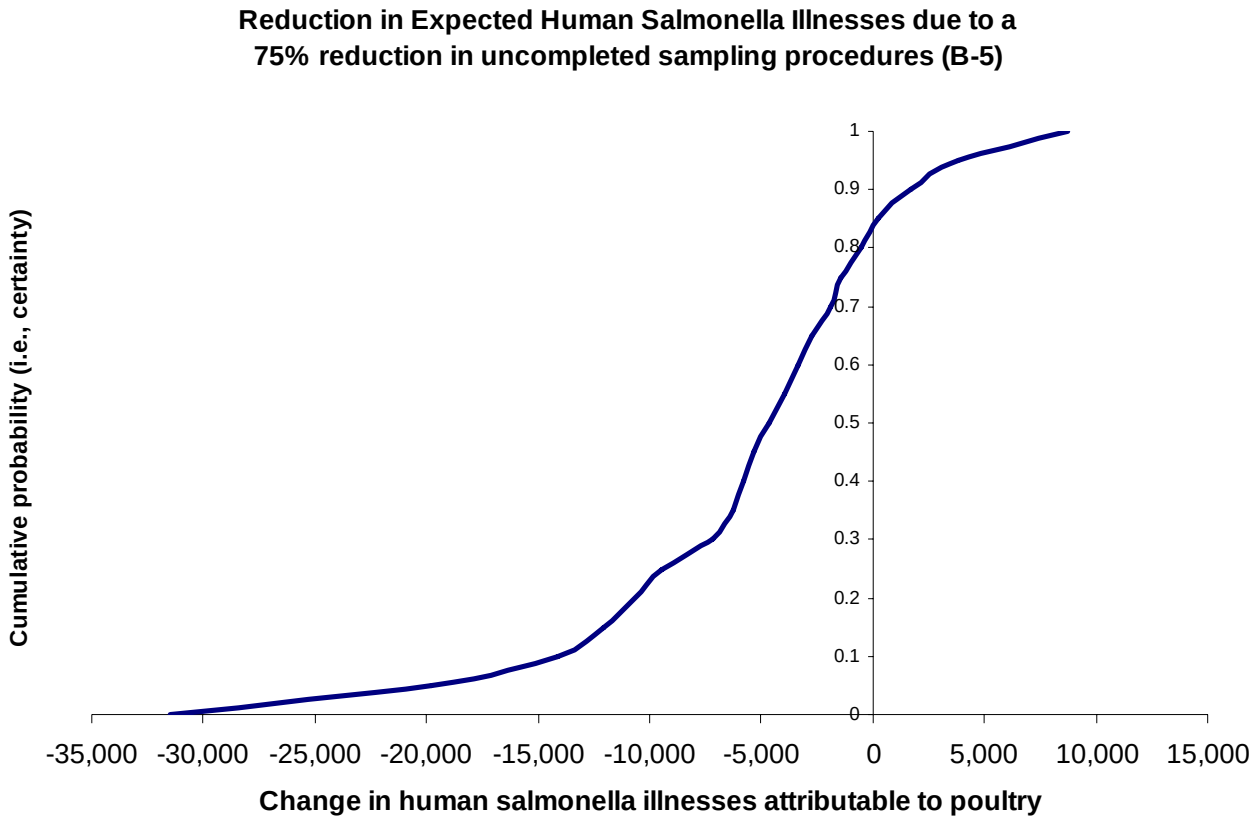
- Public health benefit of FSIS personnel performing additional wholesomeness, sanitation, sampling and other off-line procedures tailored to mitigate *Salmonella* contamination on poultry

- Model showed an association between six types of off-line procedures and a decrease in human illness:

    1. Increased unscheduled sanitation procedures
    2. Increased unscheduled sampling procedures
    3. Decreased unperformed sampling procedures
    4. Decreased unperformed HACCP procedures
    5. Decreased unperformed sanitation procedures
    6. Decease in non-compliances for sanitation procedures

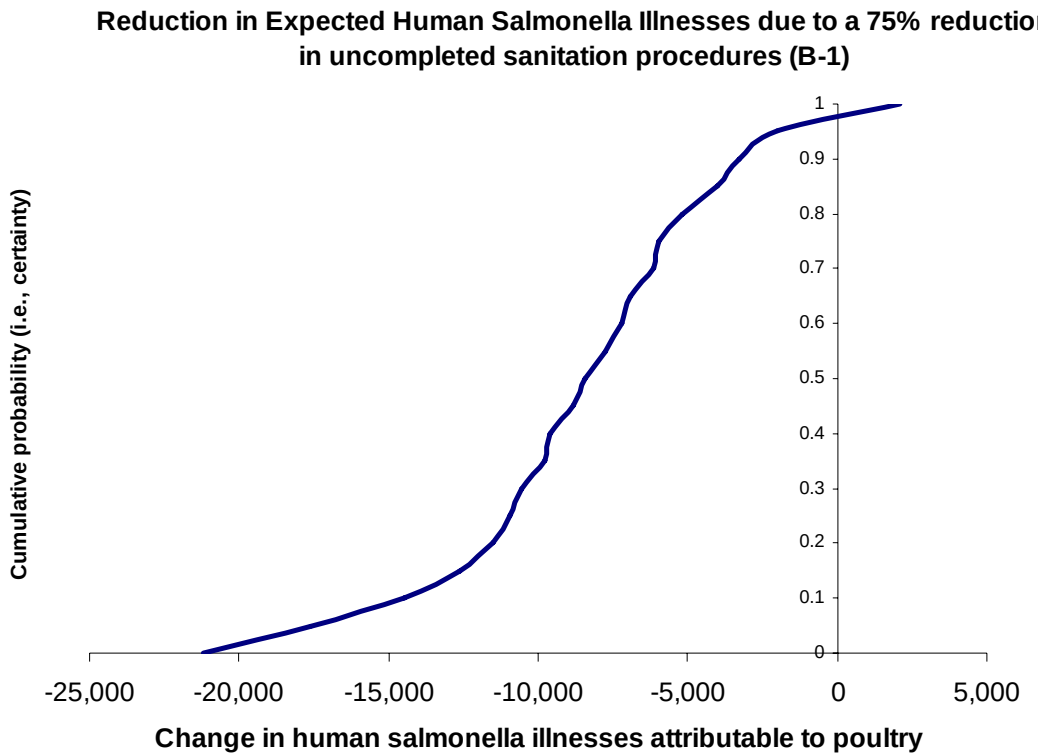
Scenario: Public Health Impact of Decreasing Unperformed Sampling Procedures

- 75% decrease in unperformed sampling procedures
- Salmonellosis cases reduced by 5,482 (approx. 85% of model iterations)



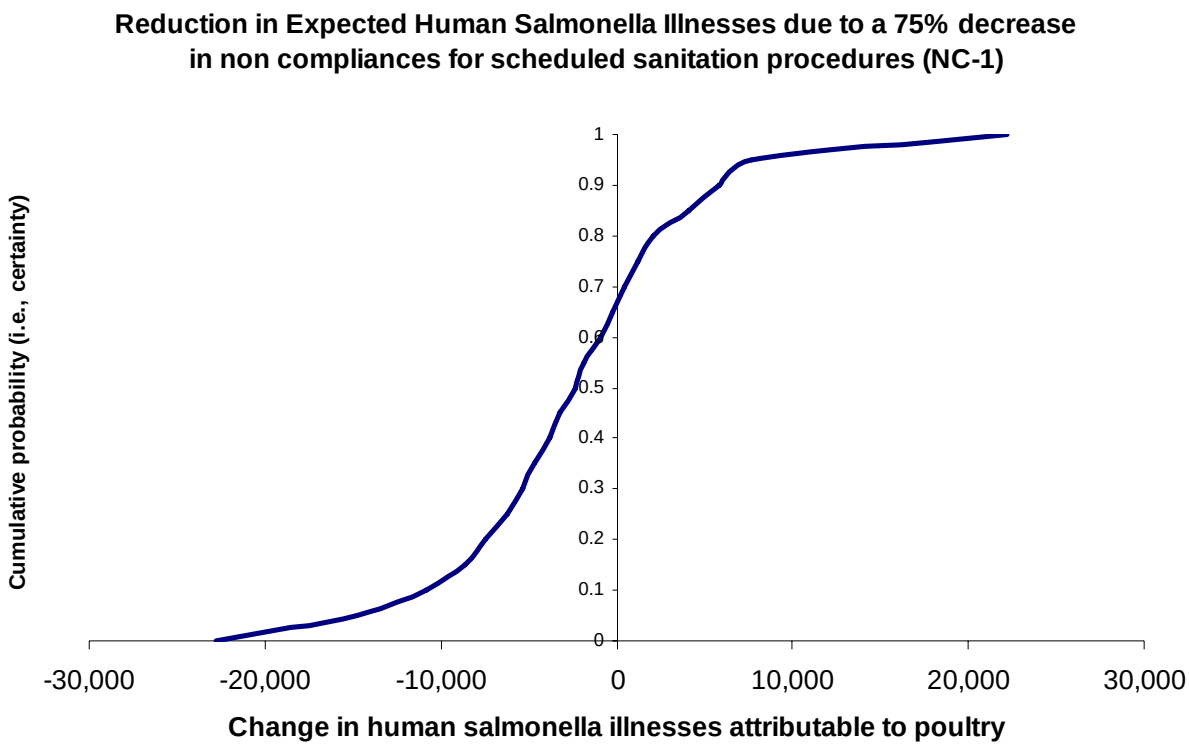
Scenario: Public Health Impact of Decreasing Unperformed Sanitation Procedures

- 75% decrease in unperformed sanitation procedures
- Salmonellosis cases expected to be reduced by 8,592 (95% of model iterations)



Scenario: Public Health Impact of A Decrease in Non-compliances for Sanitation Procedures

- 75% decrease in non-compliances for sanitation procedures
- Salmonellosis cases expected to be reduced by 2,321 (65% of model iterations)



Summary of Model Results

- An increase in number of off-line inspection procedures is associated with reduced human illness from *Salmonella* on young chicken.

- A decrease in the number of unperformed sampling, sanitation, and HACCP procedures are all associated with an expected reduction in human illness from *Salmonella* on young chicken.

Summary of Model Results

- An increase in the number of scheduled sampling, random facility sanitation, and some wholesomeness procedures are associated with an expected reduction in human illness from *Salmonella* on young chicken.
- An increase in the number of unscheduled sampling, and sanitation procedures are associated with an expected reduction in human illness from *Salmonella* on young chicken.
- Other procedures did not show much association with reduced *Salmonella* on young chicken.

Questions?