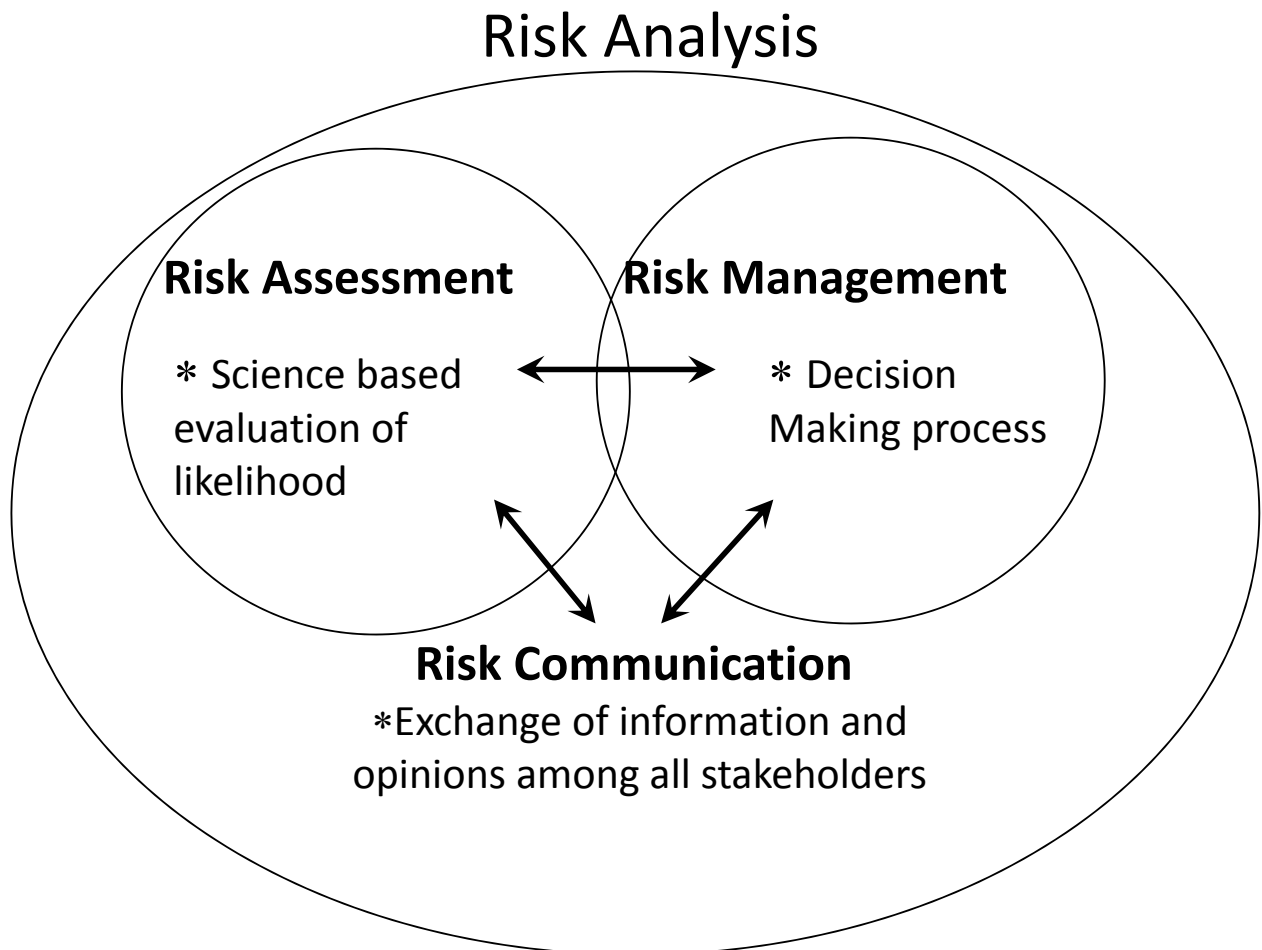


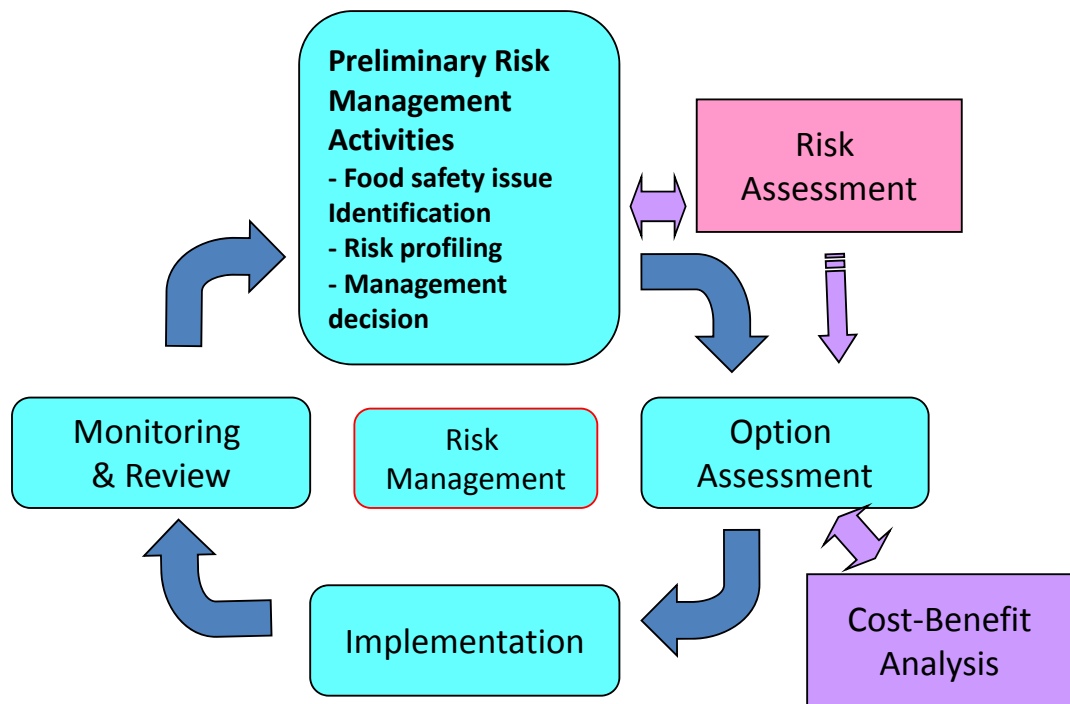
# 食品安全分野における データの意義と課題

## Data for Food Safety - Significance and Challenges

第7回国際ワークショップ  
「社会イノベーションを誘発する情報・システム」  
2015年2月16日  
春日 文子  
国立医薬品食品衛生研究所 安全情報部長  
Dr. Fumiko Kasuga  
Director, National Institute of Health Sciences



# Risk Management Framework



## Preliminary Risk Management Activities

- Recognition of food safety problems
- Preparation of risk profiles
- Consideration on the needs for risk assessments to be requested to the Food Safety Commission, and if yes, on the risk management questions

# Food Poisoning Statistics (mostly outbreaks)

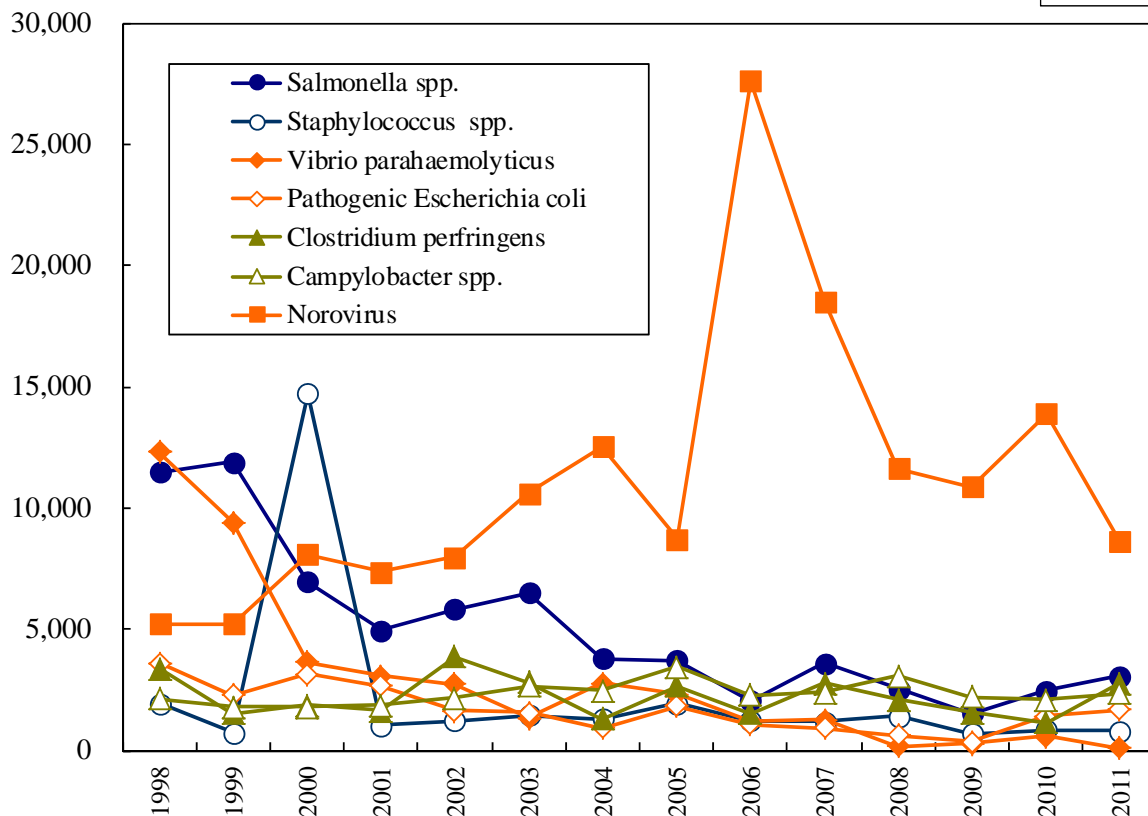
Year	Number of outbreaks	patients	fatality
2003	1,585	29,355	6
2004	1,666	28,175	5
2005	1,545	27,012	7
2006	1,491	39,026	6
2007	1,289	33,477	7
2008	1,369	24,303	4
2009	1,048	20,249	0
2010	1,254	25,972	0
2011	1,062	21,616	11

※Most of causative agents for fatality cases are natural toxins, such as puffer fish toxin (tetrodotoxin) and phytotoxin

MHLW

## Annual trends in patient numbers by pathogens (mainly microorganisms)

(person)



MHLW

## Different laws, different statistics

- Enterohaemorrhagic *E. coli* (VT-positive) infections (2010)

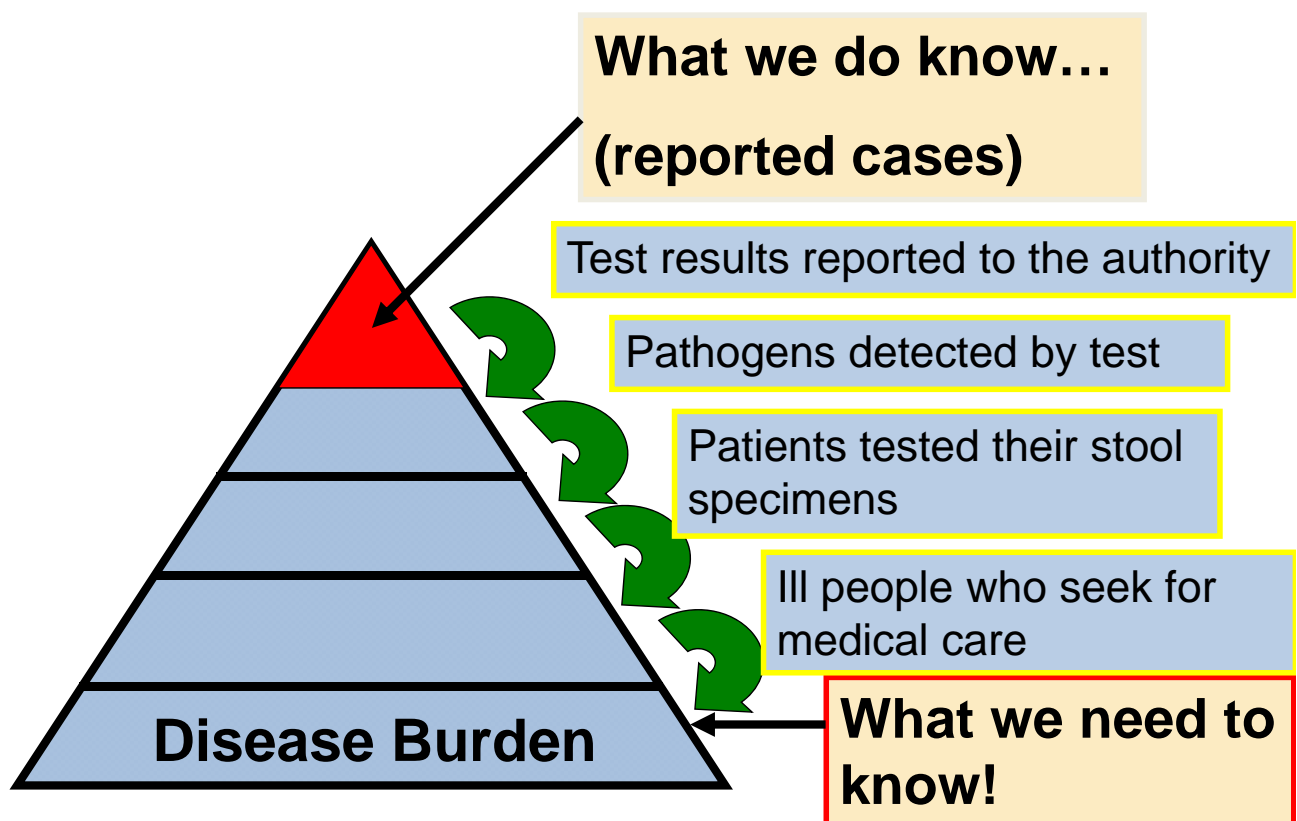
Food Sanitation Law	Infectious Diseases Law
358	2, 719*

\* only symptomatic, including infections from other sources than foods

- *Salmonella* infections (2010)

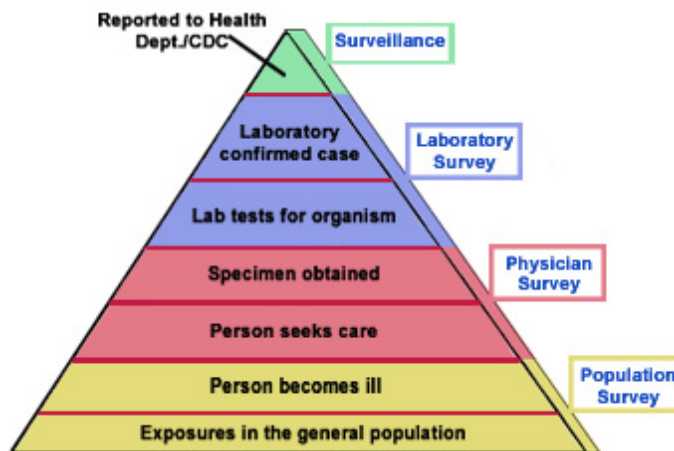
Food Sanitation Law	Infectious Diseases Law
2, 476	904

## Reporting Foodborne Diseases



# Estimating the burden of illnesses

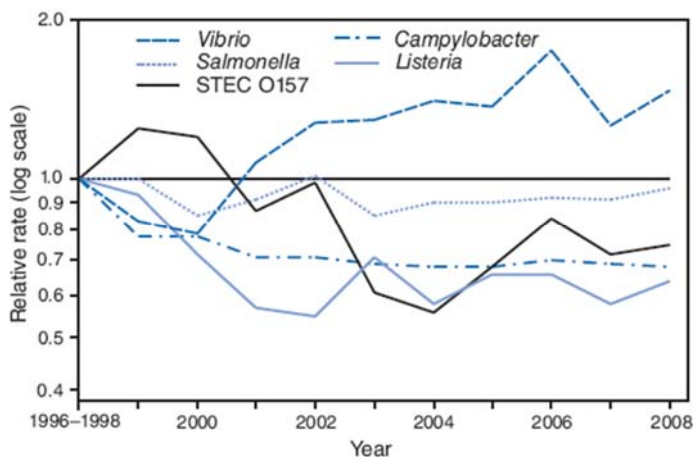
US FoodNet



Burden of Illness Pyramid (<http://www.cdc.gov/foodnet/>)

## FoodNet - active, population-based surveillance for laboratory-confirmed cases in USA

FIGURE 2. Relative rates of laboratory-confirmed infections with *Vibrio*, *Salmonella*, STEC\* O157, *Campylobacter*, and *Listeria* compared with 1996–1998 rates, by year — Foodborne Diseases Active Surveillance Network, United States, 1996–2008†



\* Shiga toxin-producing *Escherichia coli*.

† The position of each line indicates the relative change in the incidence of that pathogen compared with 1996–1998. The actual incidences of these infections can differ. Data for 2008 are preliminary.

- Estimated on the data from participating sites (10 states)
- Determine the frequency and severity of foodborne diseases in the United States
- Determine the proportion of foodborne diseases attributable to specific foods and settings

http://www.cdc.gov/foodborneburden/PDFs/FACTSHEET\_A\_F... 国立医薬品食品... CDC Data & St... cdc.gov

ファイル(F) 編集 移動(G) お気に入り(A) ヘルプ(H)

証明書エラー ナビゲーター... Web スライス ギャラ...

## CDC Estimates of Foodborne Illness in the United States

### FINDINGS

#### CDC 2011 Estimates

**CDC estimates that each year roughly 1 in 6 Americans (or 48 million people) gets sick, 128,000 are hospitalized, and 3,000 die of foodborne diseases.** The 2011 estimates provide the most accurate picture yet of which foodborne bacteria, viruses, microbes (“pathogens”) are causing the most illnesses in the United States, as well as estimating the number of foodborne illnesses without a known cause.\* The estimates show that there is still much work to be done—specifically in focusing efforts on the top known pathogens and identifying the causes of foodborne illness and death without a known cause.

*Reducing foodborne illness by 10% would keep about 5 million Americans from getting sick each year.*

22:35  
2014/04/21

## A pilot study in Miyagi Prefecture

- Miyagi Prefecture
- Size: 6,861km<sup>2</sup>
- Population: 2.36 million (ca. 2% of Japanese population)
- Clinical laboratories run by Miyagi Medical Association have certain share in the Prefecture and had agreed to collaborate

# Study design

Burden of illness in Miyagi prefecture, Japan, associated with *Vibrio parahaemolyticus*, *Campylobacter*, and *Salmonella* was estimated based on the lab confirmed cases.

Laboratory-confirmed cases per year in two clinical labs

- *Vibrio parahaemolyticus* (Vp) : 36 (2005) 27 (2006)
- *Campylobacter* : 542 576
- *Salmonella* : 75 43

The labs conduct about 50% of stool sample tests performed in Miyagi prefecture.

The sensitivities of the test methods utilized in these labs were assumed as 100%.

Kubota, Kasuga *et al.* by research grants from MHLW

## Telephone population surveys in Miyagi Prefecture

<b>Telephone survey dates:</b>	<b>22 Nov - 4 Dec 2006</b>	<b>14 Jul - 27 Jul 2007</b>
<b>Response rate:</b>	<b>21.2%(2,126/10,021)</b>	<b>17.7%(2,121/11,965)</b>
<b>Acute GI rate:</b>	<b>3.3%(70/2,126)</b>	<b>3.5%(74/2,121)</b>
<b>Physician consultation rate:</b>	<b>38.6% (27/70)</b>	<b>31.1%(23/74)</b>
<b>Stool submission rate:</b>	<b>14.8% (4/27)</b>	<b>8.7%(2/23)</b>

Case definition :

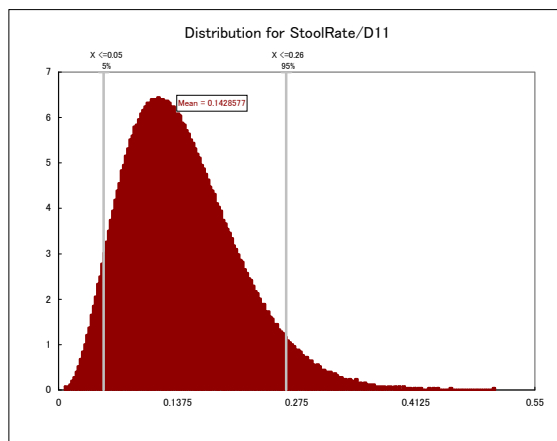
>3 diarrhea in 24 hours, vomiting and/or bloody diarrhea

Kubota, Kasuga *et al.* by research grants from MHLW

# Estimation of Stool Sampling Rate and Physician Consultation Rate (2006 Tele-surv data) [Data weighted by population distribution]

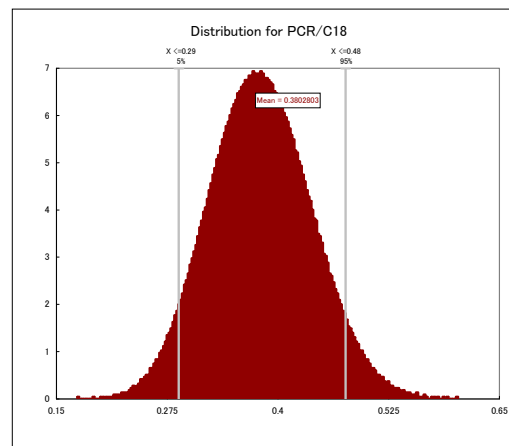
## Estimated Stool Sampling Rate

Beta(5,24) mean=**14.3%**  
5%tile=5.2%, 95%tile=26.3%



## Estimated Physician Consultation Rate

Beta(28,44) mean=**38.6%**  
5%tile=28.8%, 95%tile=47.6%



Kubota, Kasuga *et al.* by research grants from MHLW

A comparison between the estimation of the burden of foodborne disease and patients of foodborne statistics in Japan, from 2005 to 2009

Causative agents	year	the estimation of the burden of foodborne disease*	patients of food poisoning statistics
<i>Vibrio.parahaemolyticus</i>	2005	83,312	2,301
	2006	62,579	1,236
	2007	55,541	1,278
	2008	18,568	168
	2009	13,912	280
<i>Campylobacter.spp</i>	2005	1,545,363	3,439
	2006	1,641,396	2,297
	2007	1,494,152	2,396
	2008	1,328,177	3,071
	2009	1,079,540	2,206
<i>Salmonella.spp</i>	2005	253,997	3,700
	2006	145,512	2,053
	2007	165,867	3,603
	2008	176,098	2,551
	2009	118,608	1,518

\* Assumed to be the same as in the US

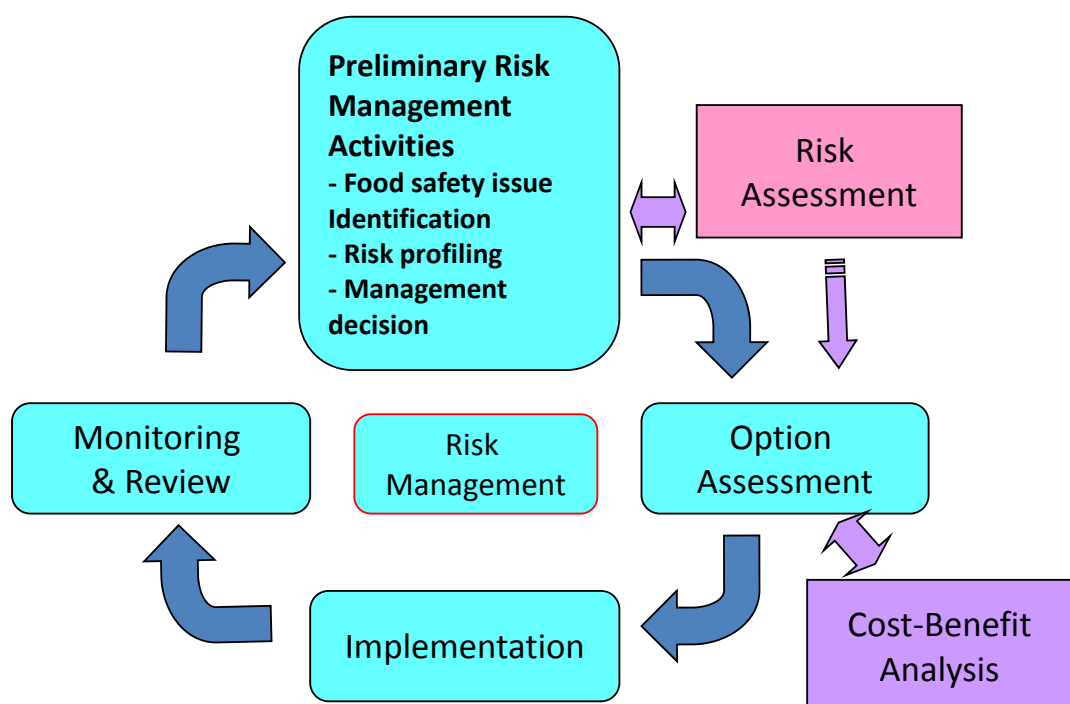
Kubota, Kasuga *et al.* by research grants from MHLW



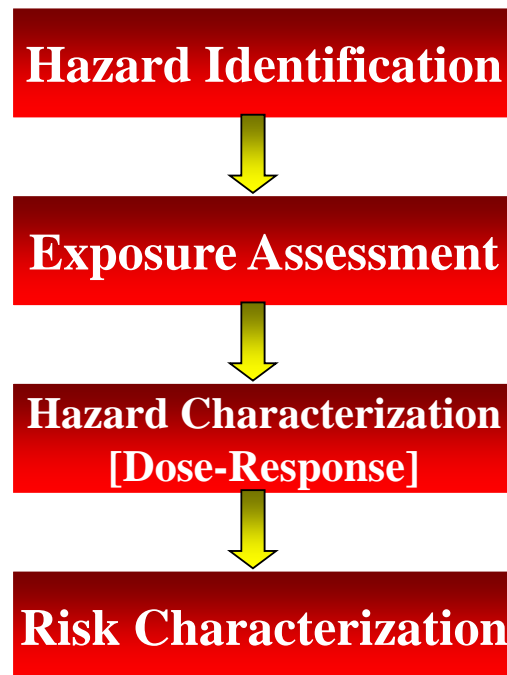
# Challenges 1

- Under-reporting in government statistics
- Complementary studies
- Sample size and small numbers
- Attribution, *e.g.* proportion of foodborne, sometimes requires expert elicitation

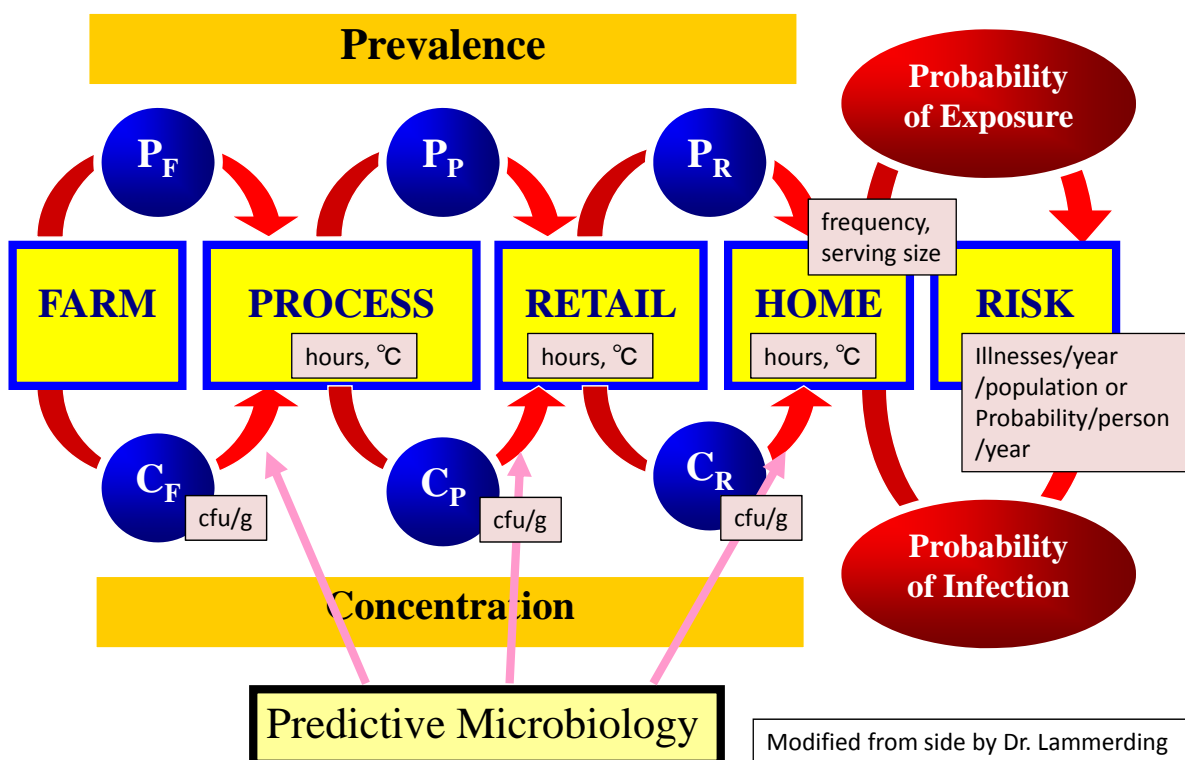
## Risk Management Framework



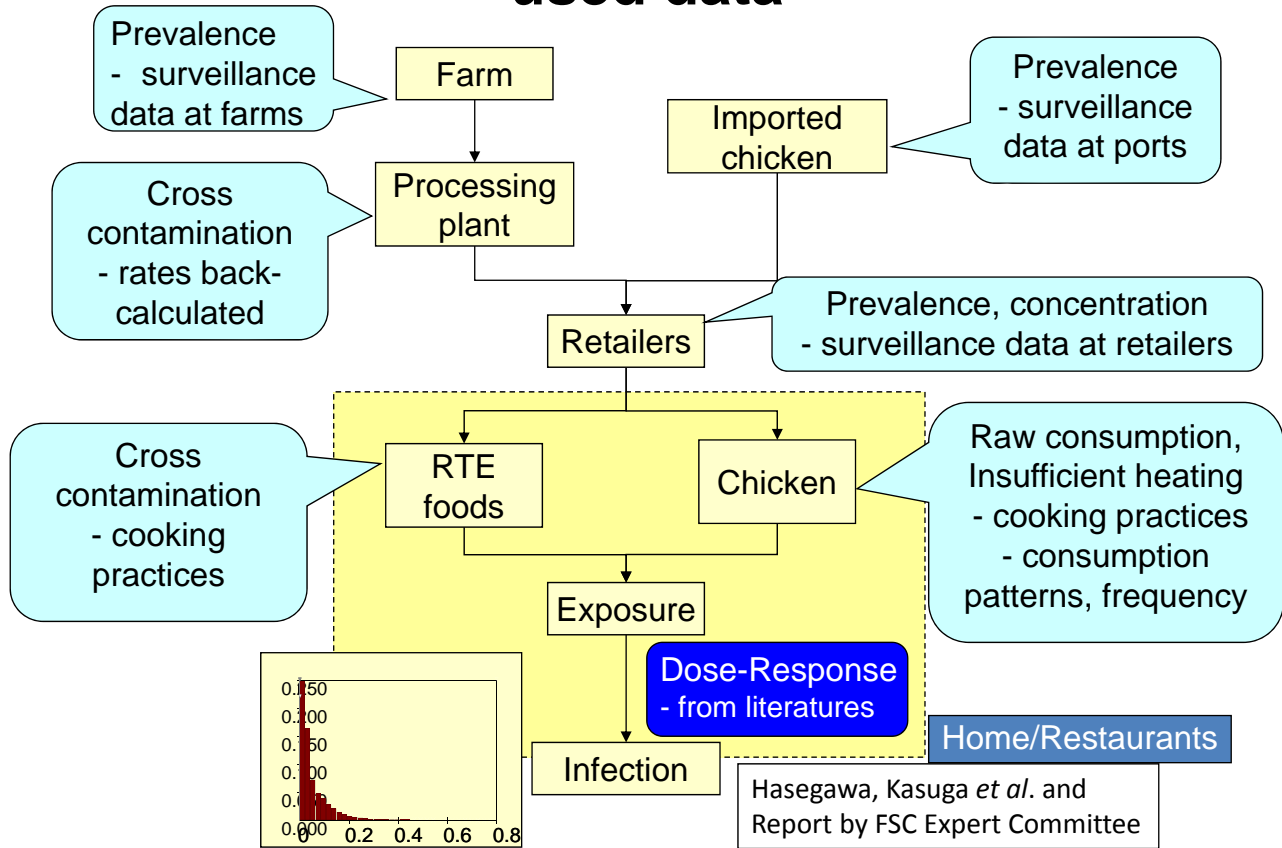
# Risk Assessment Framework



# Microbiological Risk Assessment



# Campylobacter risk assessment model and used data



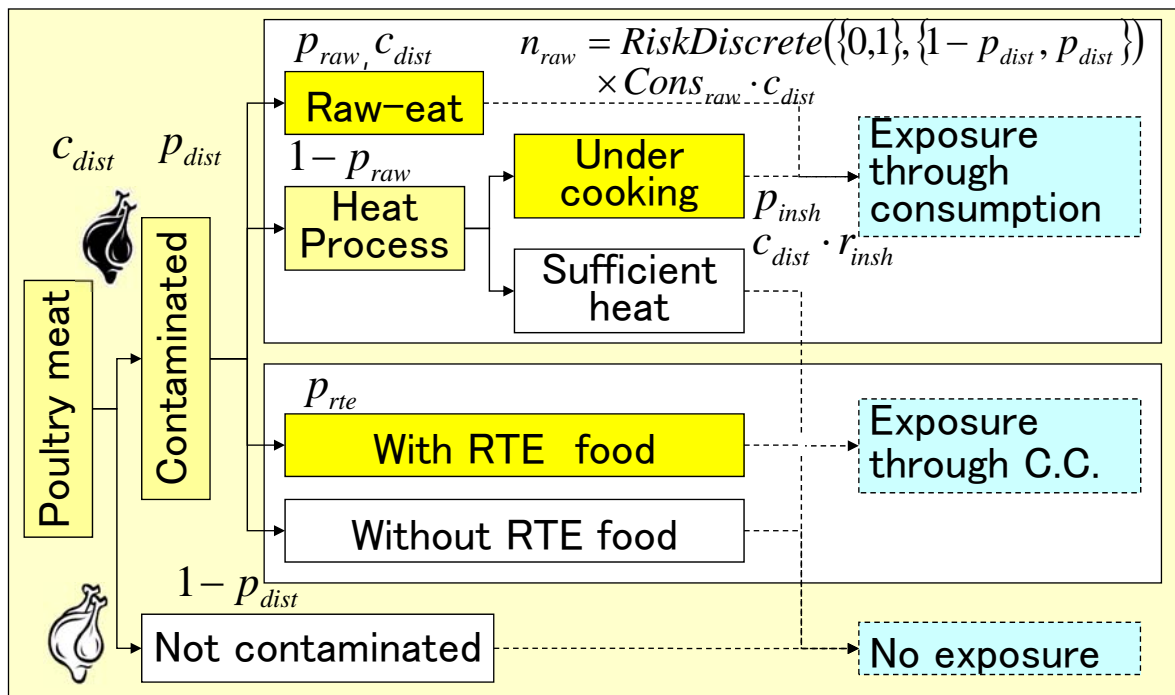
Hasegawa, Kasuga *et al.* and Report by FSC Expert Committee

The screenshot shows a Microsoft Excel spreadsheet with multiple worksheets. The visible worksheets include:

- 1. 全農場数**: Total number of farms. Data: 2,374 farms.
- 2. 農場汚染率**: Farm contamination rate. Data: 588 contaminated farms out of 2,374 total farms.
- 3. 汚染農場における鶏の感染率**: Infection rate in contaminated farms. Data: 37.7%.
- 4. 国内年間出荷鶏数**: Domestic annual chicken production. Data: 471,645,984 chickens.
- 5. 輸入鶏肉の汚染率**: Contamination rate of imported chicken meat. Data: 31 contaminated units out of 201 total units.
- 6. 国内鶏肉の汚染率**: Contamination rate of domestic chicken meat. Data: 1,115 contaminated units out of 1,828 total units.
- 10. 流通鶏肉の汚染濃度**: Contamination concentration of circulating chicken meat. Table with columns: 論文 (Literature), ケース (Cases), 検体数 (Number of samples), 菌数/100g (Number of bacteria/100g).
- 11. 生食の頻度**: Frequency of raw consumption. Table with columns: 状況 (Situation), 人数 (Number of people).
- 12. 不十分加熱調理の頻度**: Frequency of insufficient cooking. Table with columns: 状況 (Situation), 人数 (Number of people).
- 13. 不十分加熱調理における菌の生存率**: Survival rate of bacteria during insufficient cooking. Table with columns: 対数減少率 (Log reduction rate), 最小値 (Minimum), 最確値 (Most probable), 最大値 (Maximum).
- 14. 菌移行率**: Bacterial migration rate. Table with columns: 移行先 (Destination), 移行率 (Migration rate).
- 15. 器具の取扱いと生存率**: Handling of utensils and survival rate. Table with columns: 器具 (Utensil), 生存率 (Survival rate).

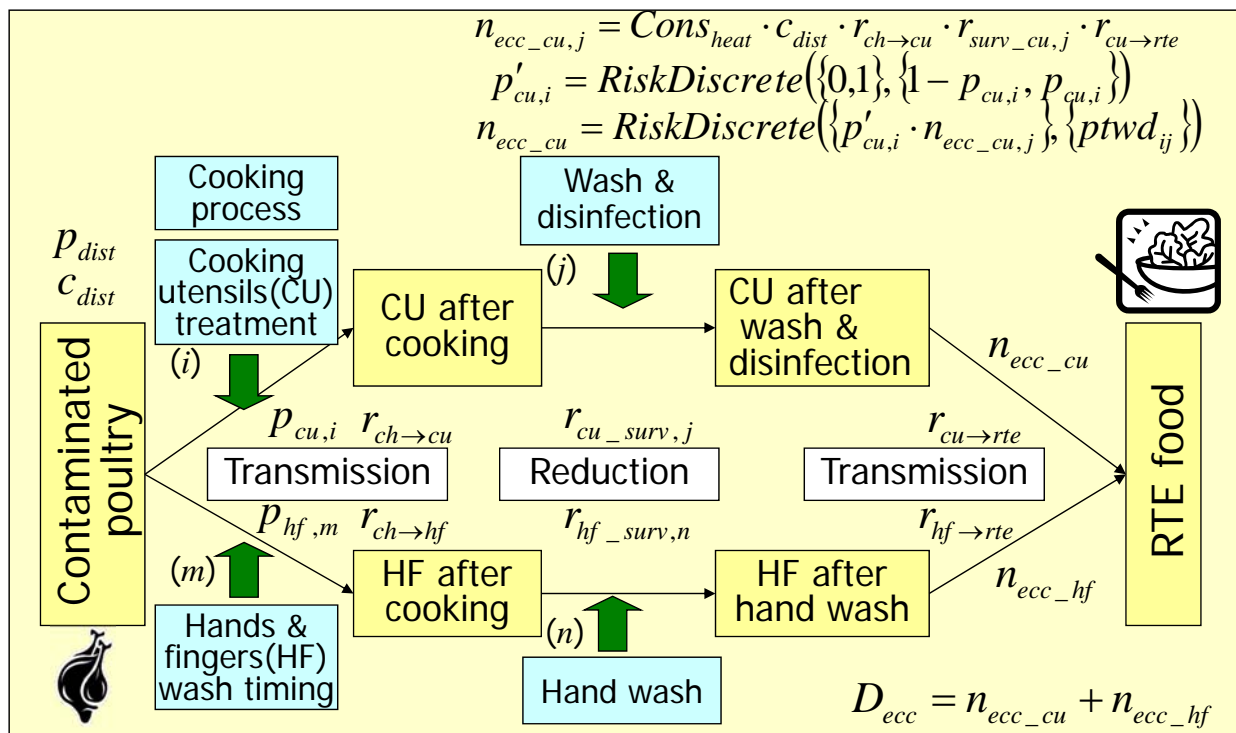
# Cooking & Consumption stage

in *Campylobacter* risk assessment



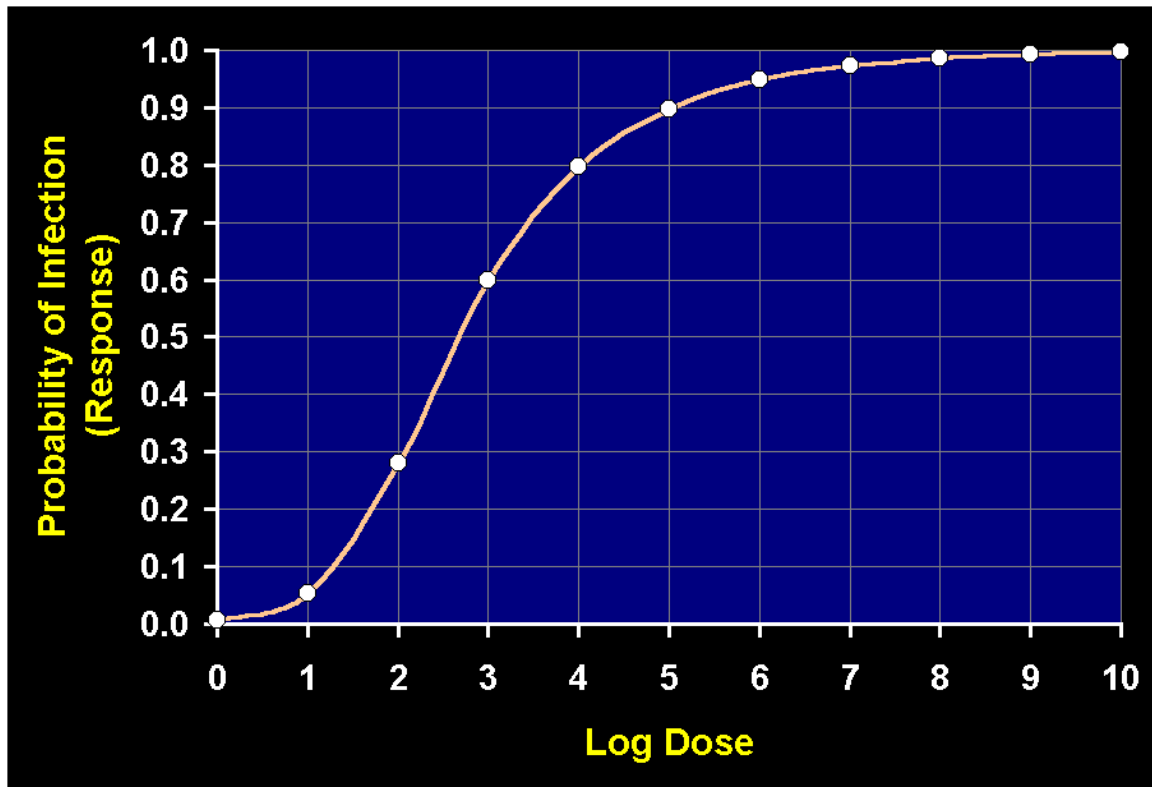
Slide by Dr. A. Hasegawa

## Exposure model of cross contamination during cooking in *Campylobacter* risk assessment

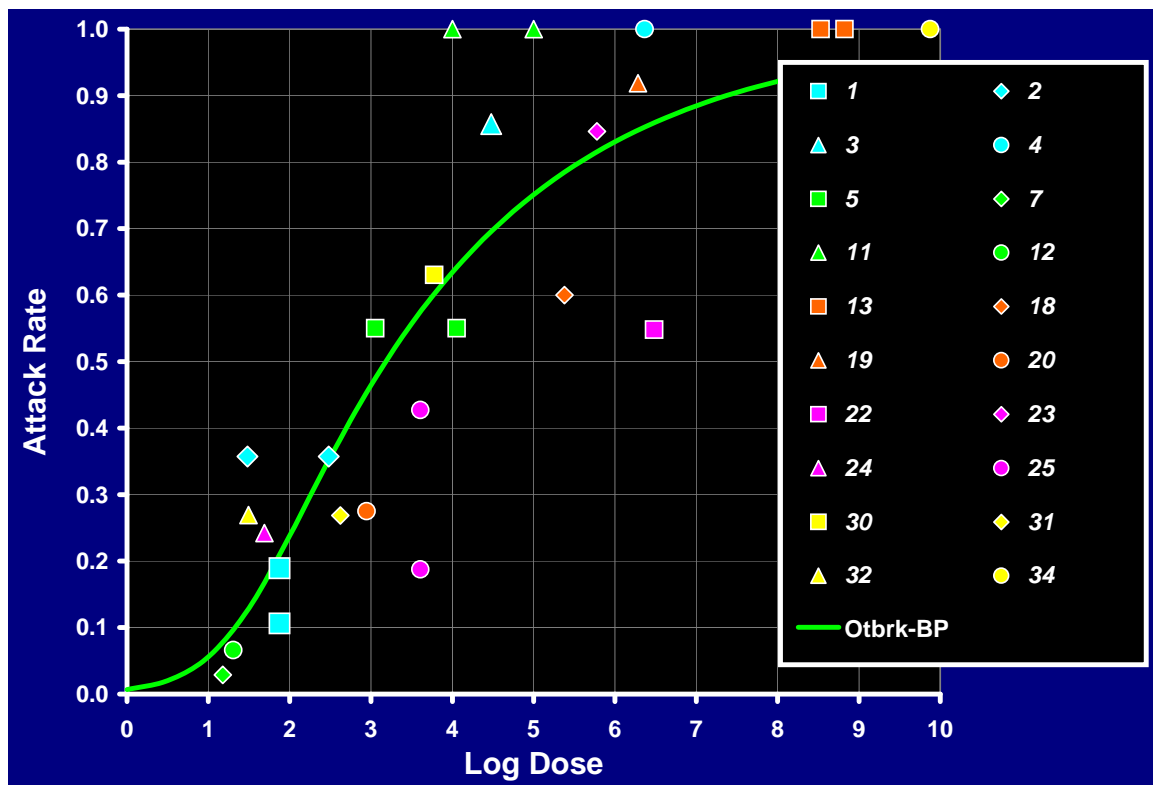


Slide by Dr. A. Hasegawa

# Dose Response



## Beta-Poisson model using outbreak data



## Comparison of various kinds of data for dose-response models

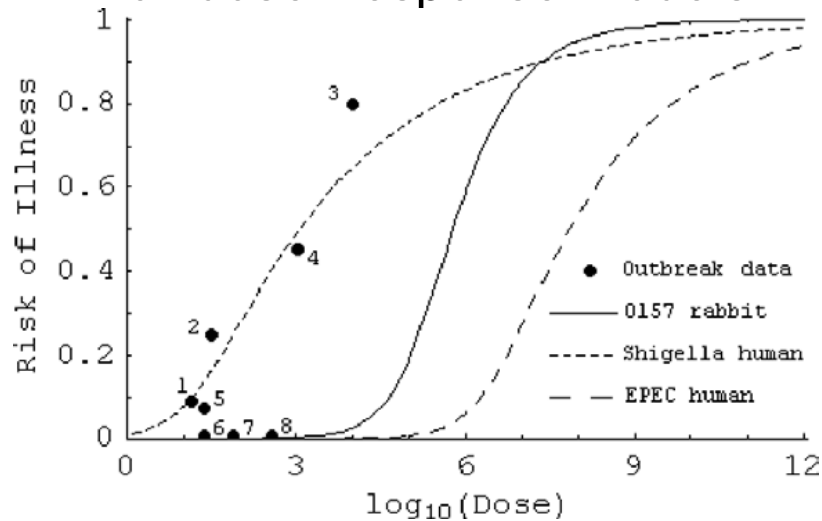
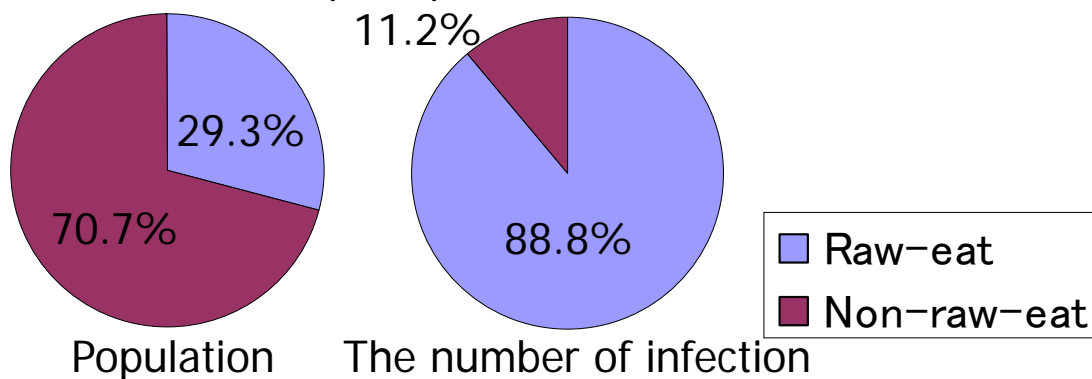


Fig. 1. Beta-Poisson dose response models for animal/human feeding studies with outbreak data superimposed ([1] UK, New Deer, [2] Japan, Morioka, [3] USA, Oregon, [4] Japan, Kashiwa, [5] USA, Washington, [6] USA, California/Washington, [7] USA, Illinois and [8] UK,Wyre).  
Strachan, Doyle, Kasuga et al., International Journal of Food Microbiology 103 (2005) 35– 47

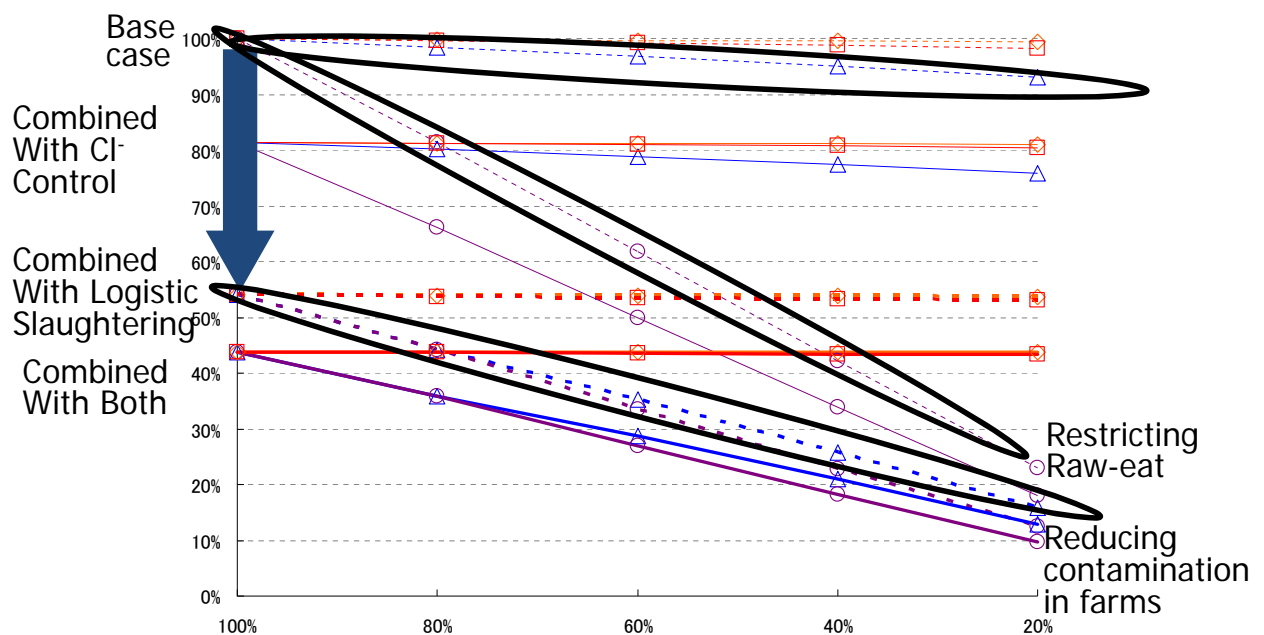
## Result of *Campylobacter* risk assessment

- The number of infection per year

- “Raw-eat” consumers, only 30% of population, account for ca. 90% of the number of infection
- Ave. times of individual infection per year: Raw-eat consumers(3.5) are 19 times higher than non-raw-eat consumers(0.18)



## Effects of risk reduction measures Effects to “raw-eat” consumers in *Campylobacter* risk assessment



Slide by Dr. A. Hasegawa

## Challenges 2

- Quality data is more available but less quantitative data
- Sample size and small numbers
- Usefulness of behavioural data
- Restriction in obtaining data from industries or even from local governments
- Data for dose-response analysis: limited outbreak data, even few or less applicable animal experimental data