

***Salmonella* Typhimurium U292 Outbreak : the Danish Experience**

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Outbreak identification system in Denmark

Weekly meetings in the outbreak group – following surveillance results

Participation from

Statens Serum Institut

Danish Food & Veterinary Administration

National Food Institute

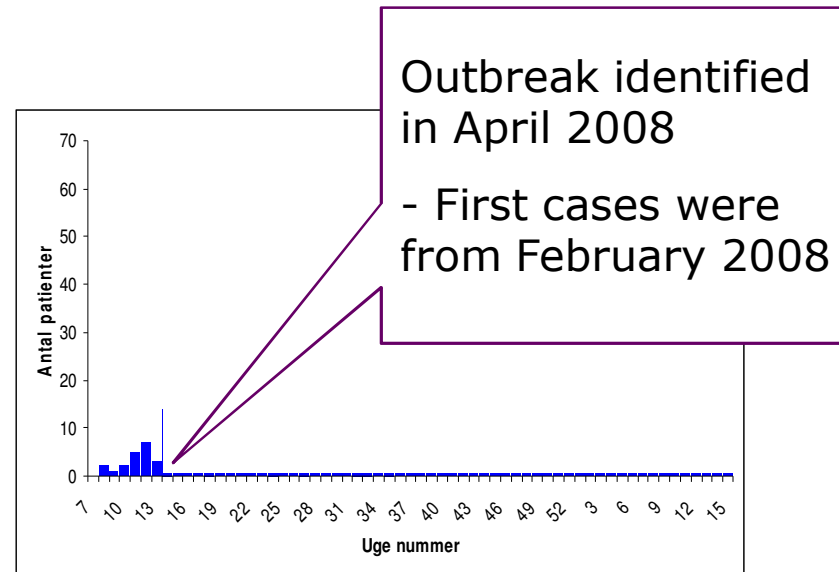
Cooperation among different disciplines:

Microbiology and epidemiology

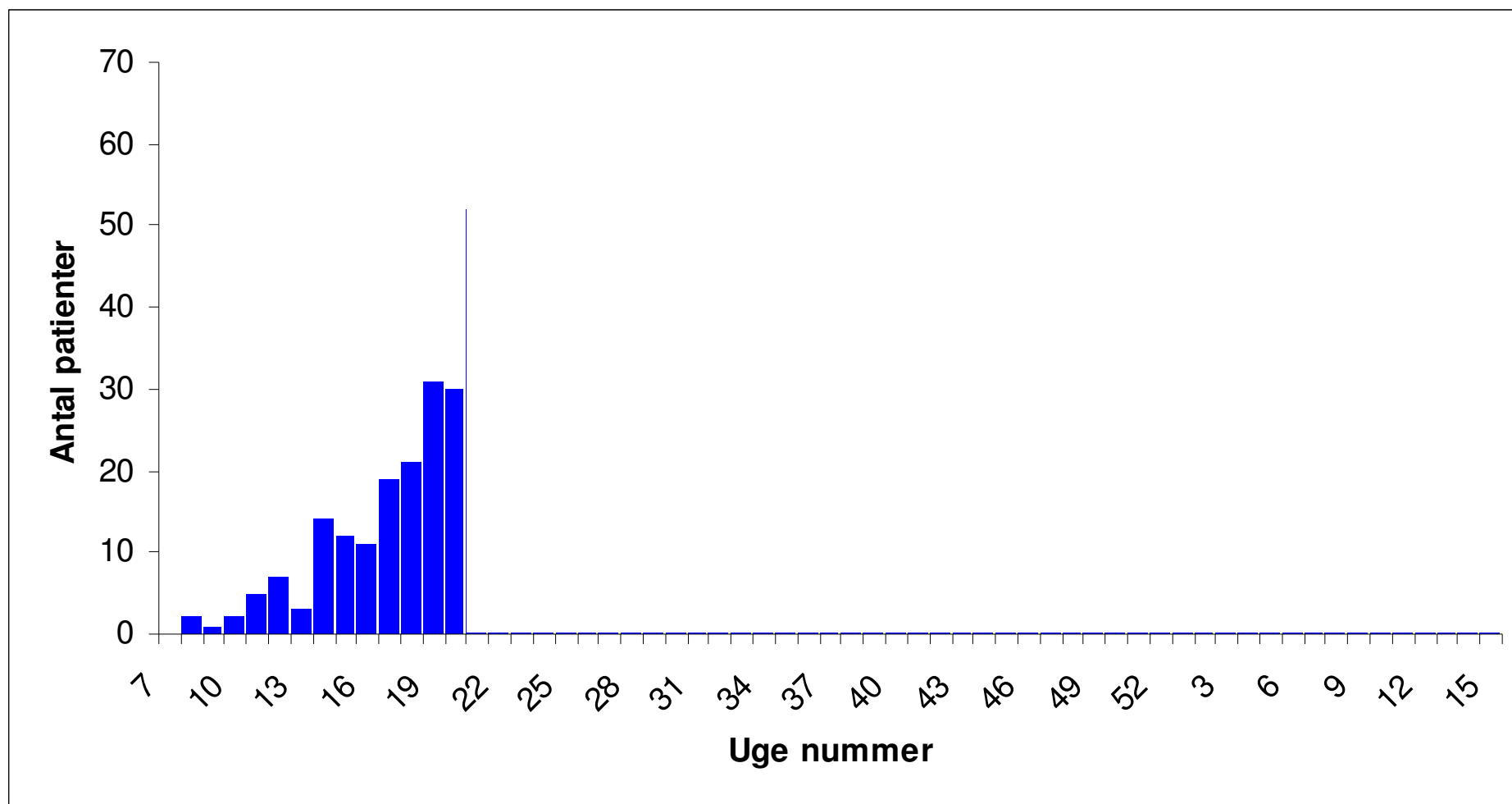
Human and veterinary medicine

Authorities and research

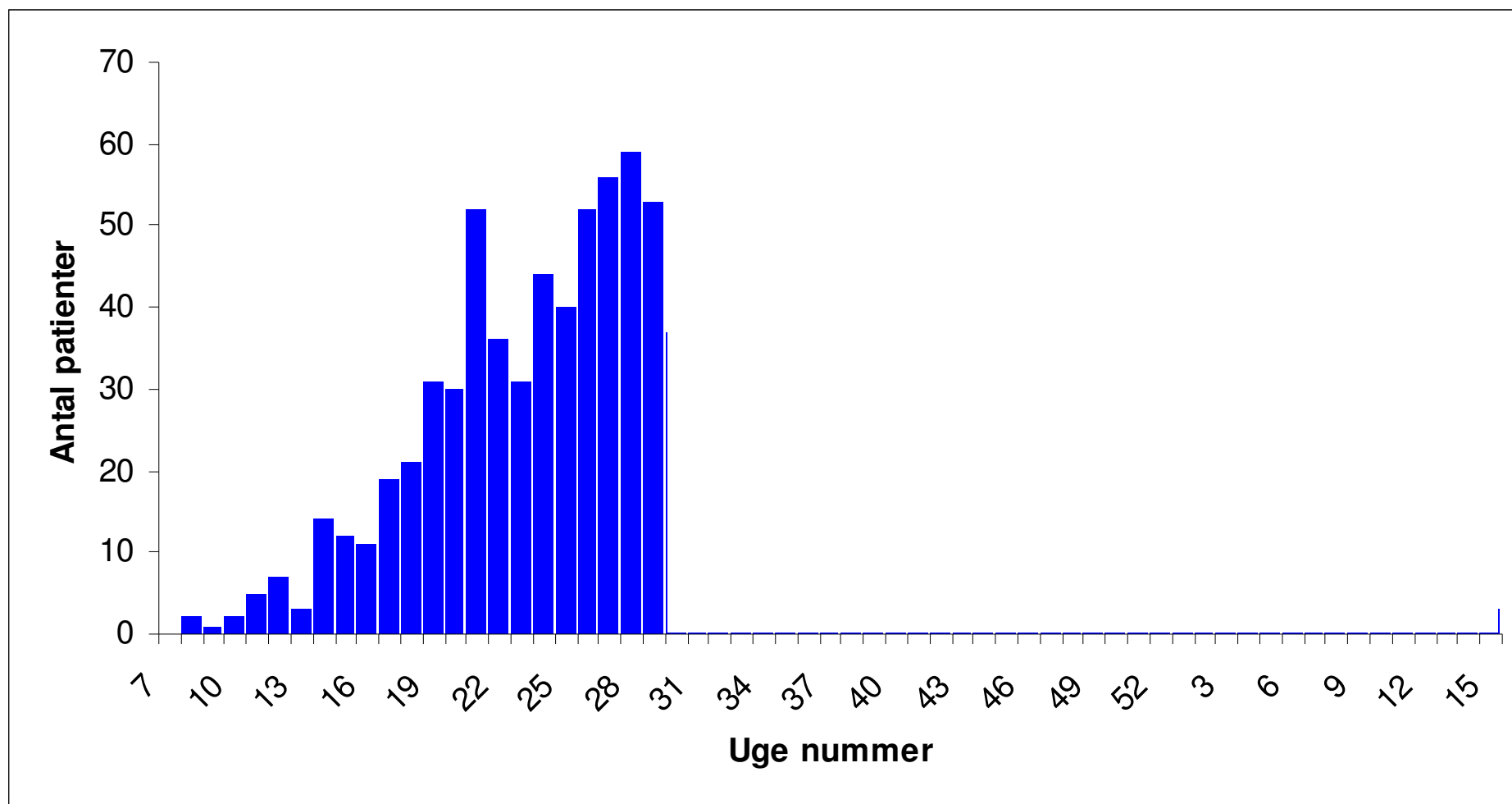
Cooperation with industry



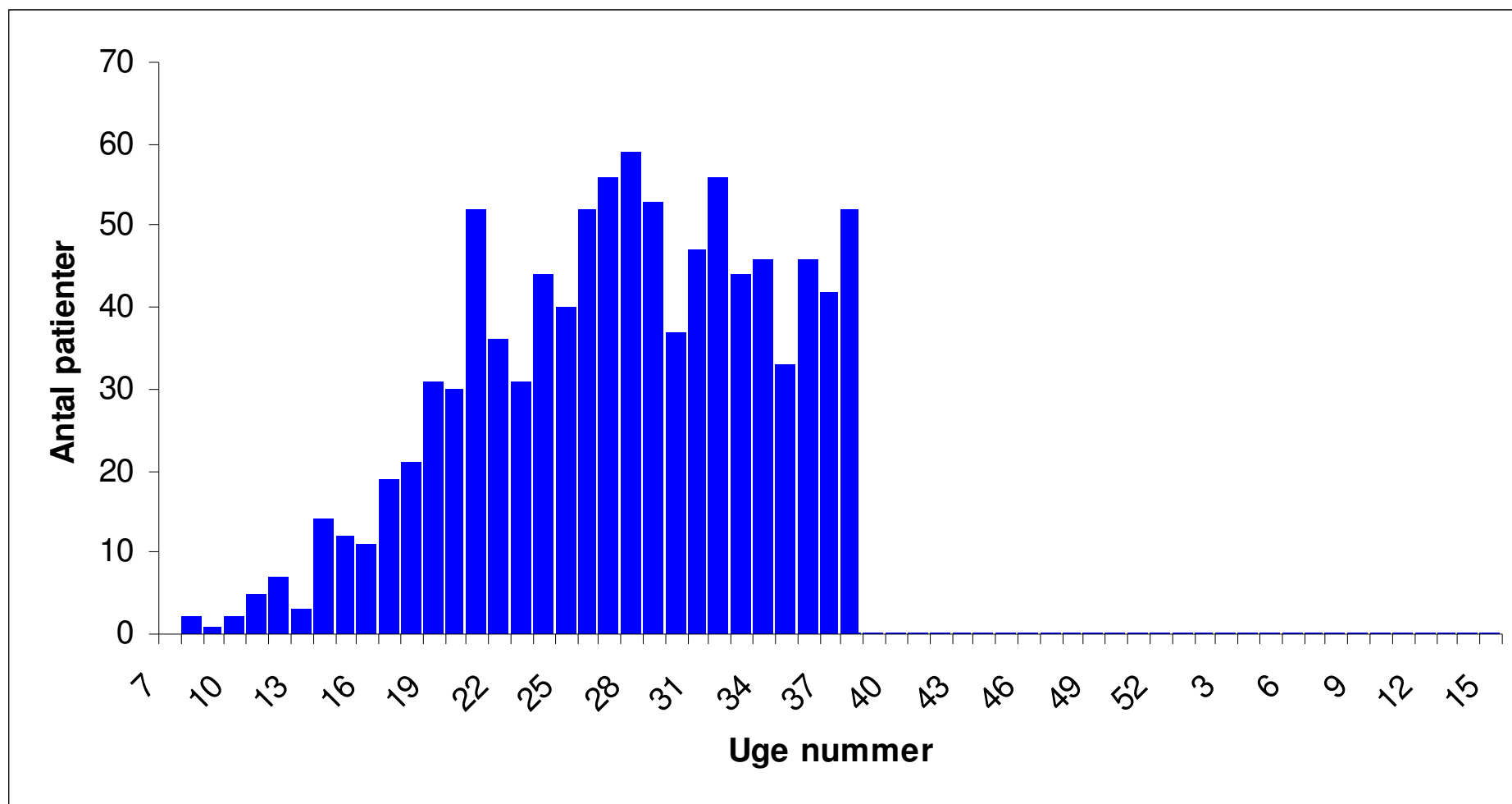
Patients in the U292 outbreak



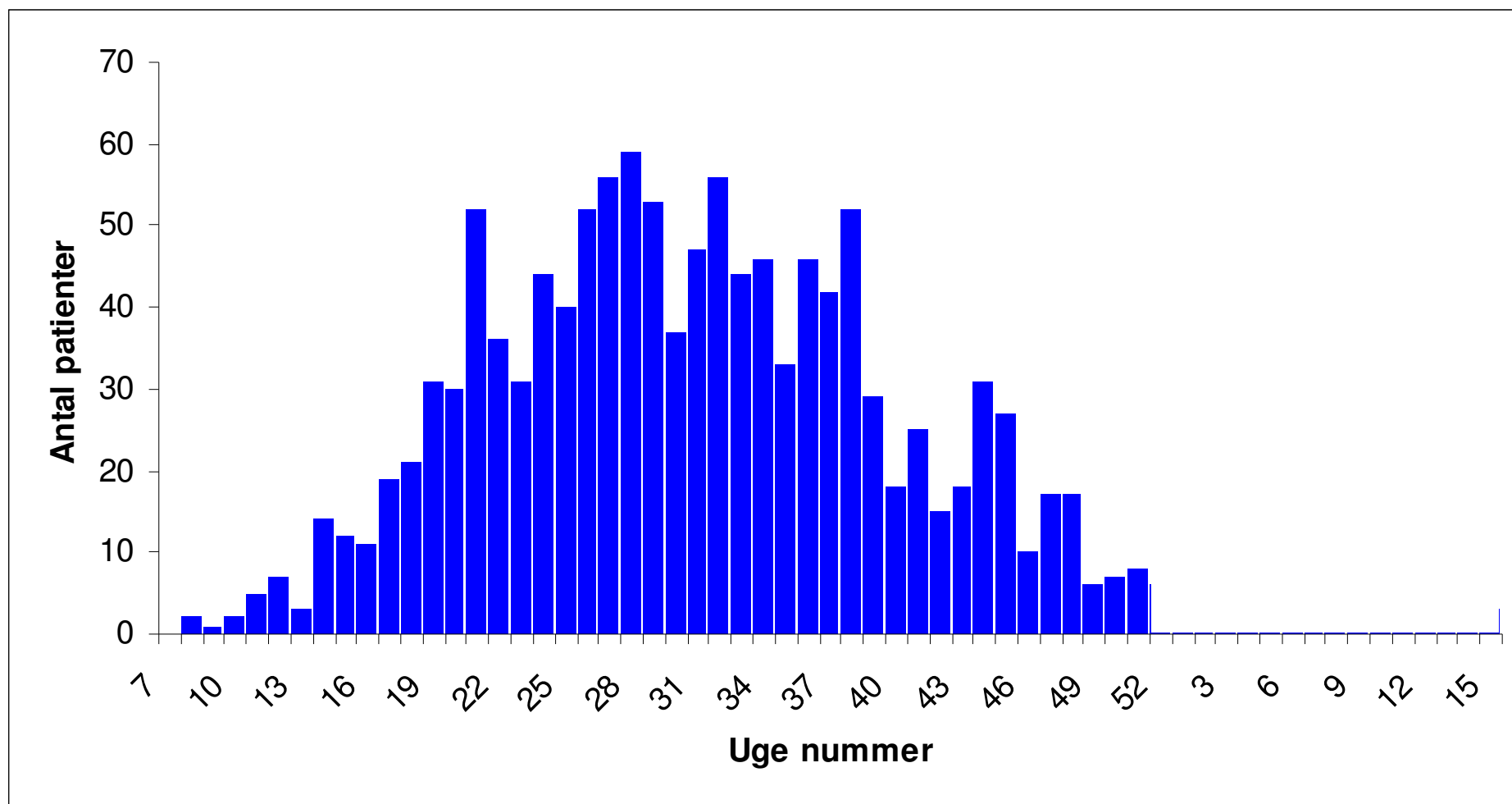
Patients in the U292 outbreak



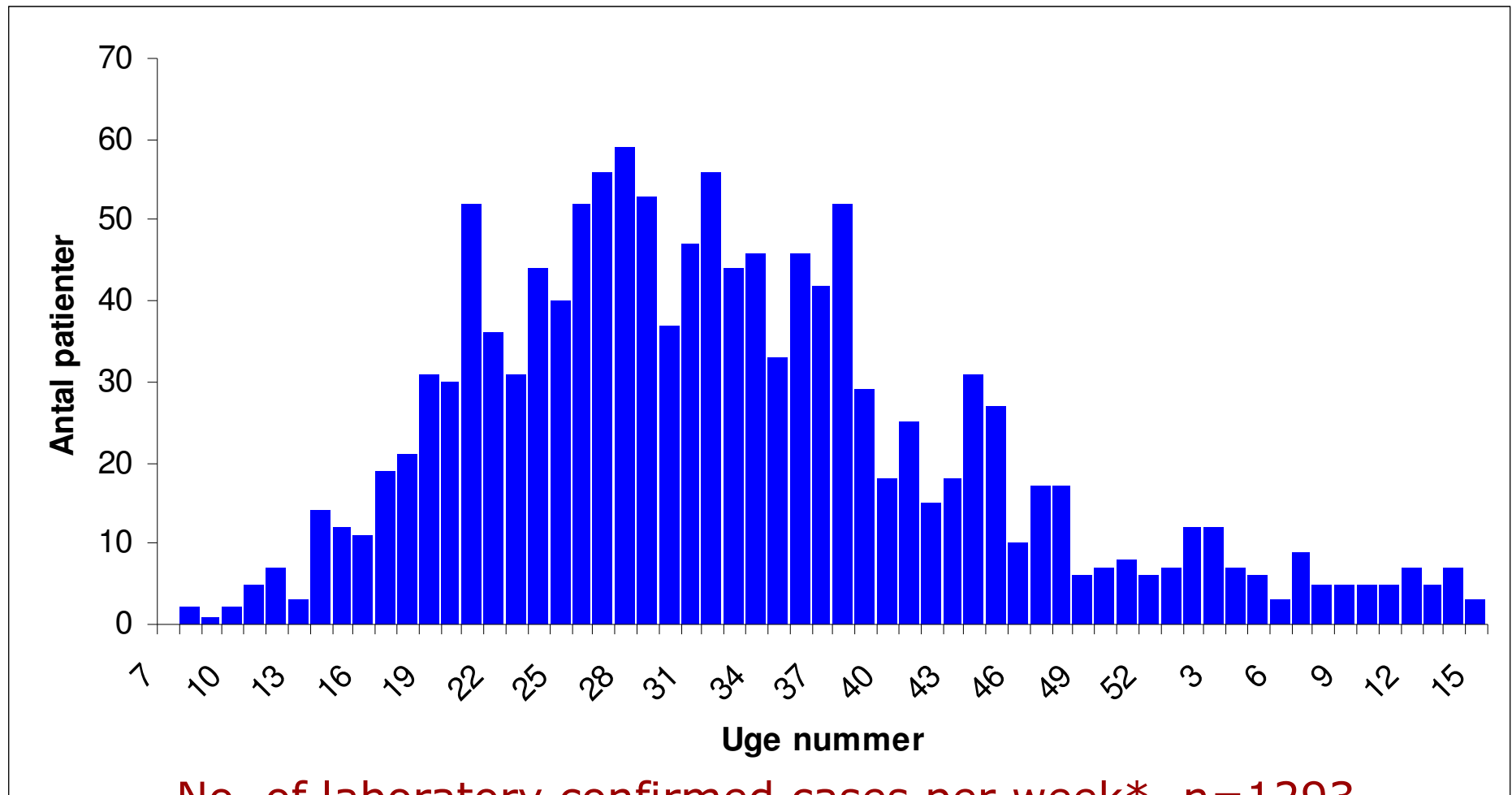
Patients in the U292 outbreak



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Patients in the U292 outbreak



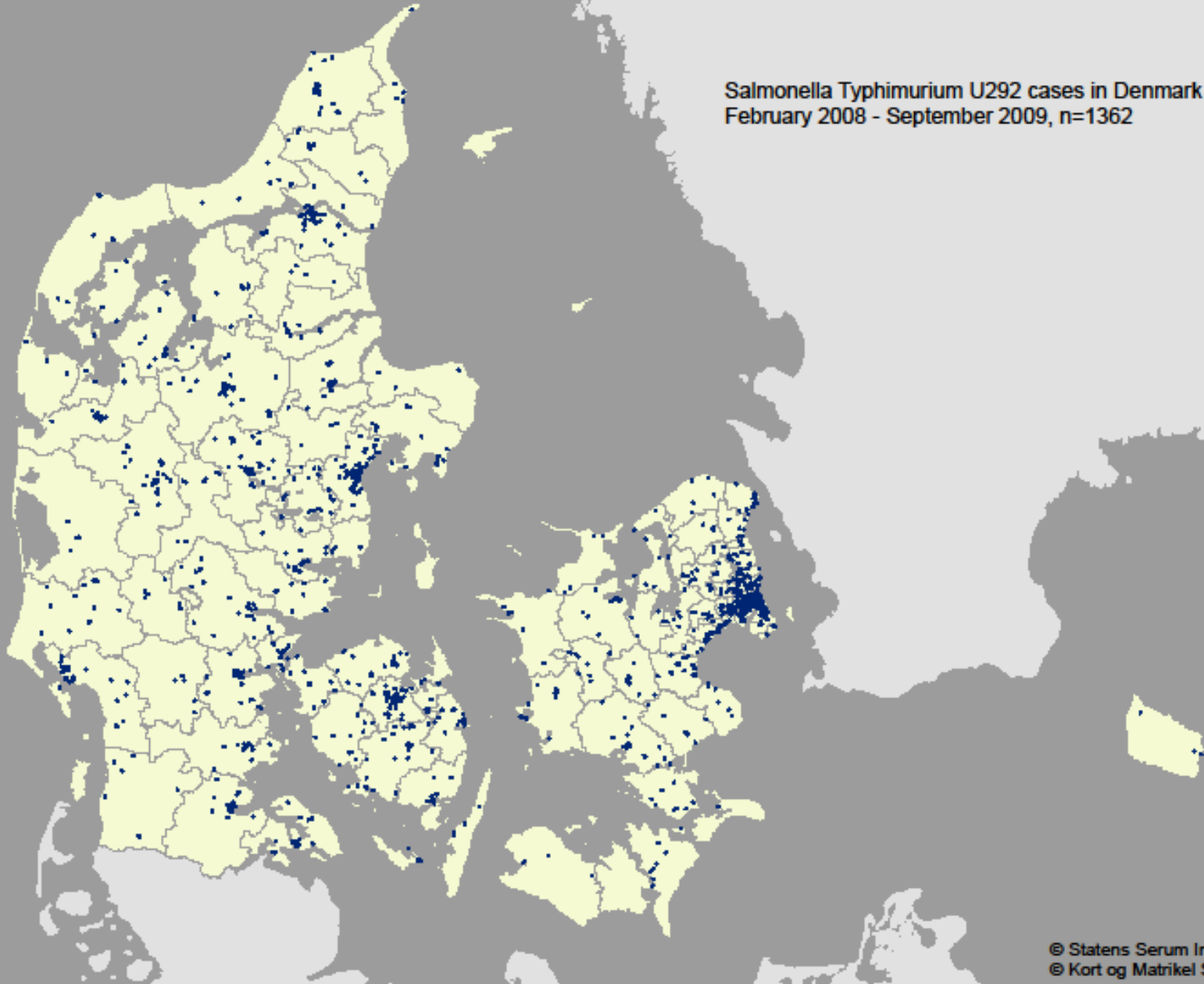
Case definition

- Laboratory confirmed
 - *Salmonella* Typhimurium
 - MLVA type 822 (allowing variation on 1 locus)
- In Denmark
- Disease onset from January 2008

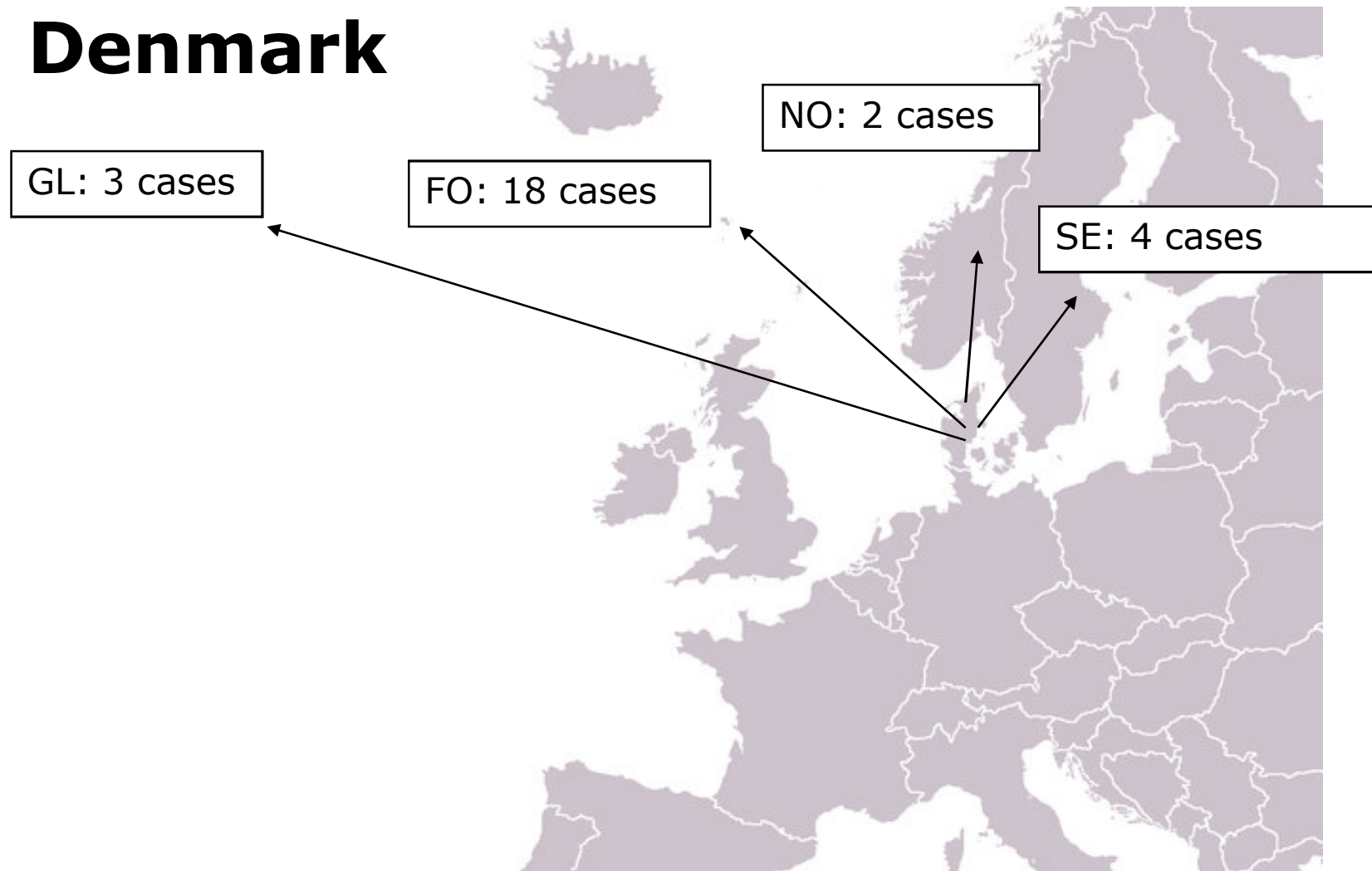
Further characteristics:

- Phage type U292
- Sensitive to common antibiotics tested

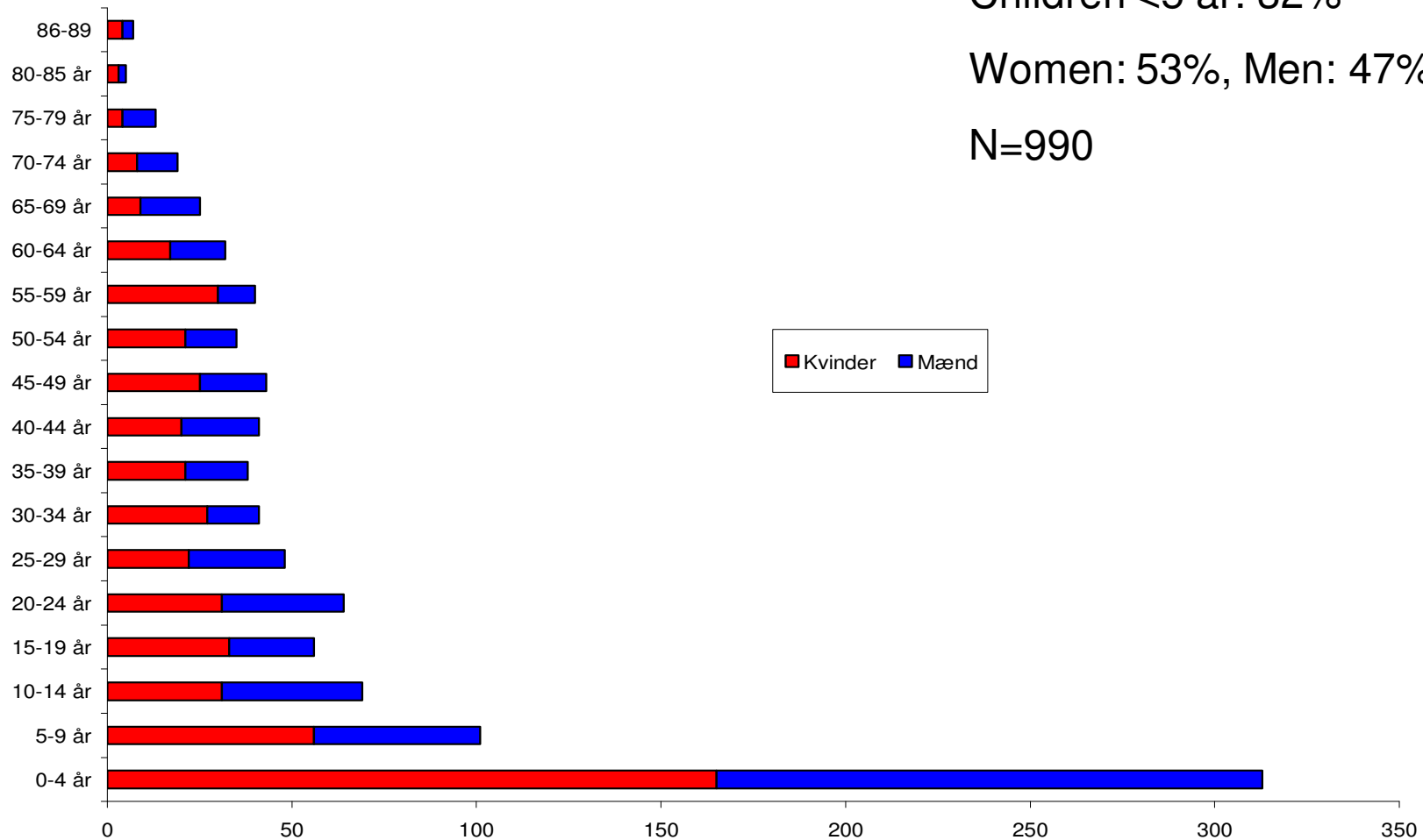
Salmonella Typhimurium U292 cases in Denmark
February 2008 - September 2009, n=1362



***Salmonella* Typhimurium U292** **non-travel related cases outside** **Denmark**



Salmonella Typhimurium U292, feb-okt 2008



Demografi of the outbreak

- Gender distribution nearly fifty - fifty
 - Over representation of children, especially small children
 - Elderly people are under represented
 - No vegetarians
 - No Muslim or Jews, or others that exclude pork
 - No clusters associated to canteens, restaurants or institutions
 - High majority of cases related to Denmark
 - Patients are eating typical Danish food and dishes
 - No demographic connection between cases
-
- A total of 1.446 cases (at closure of outbreak Dec 2009)

Steps in the outbreak investigation...

- Descriptive epidemiology – human cases
- Characterisation of the causale organism - *Salmonella*
 - Serotyping
 - Antimicrobial resistance pattern
 - MLVA typing
 - Phage typing
 - PFGE typing
- Comparison of the causale organism with strains from potential sources...
 - National Strain Collection – strains from surveillance, monitoring, research project, diagnostics etc.

Epidemiological typing of "pre-outbreak" isolates of *S. Typhimurium* U292 from animals and food



Dice (Opt:1.00%) (Tol 1.0%-1.5%) (H>0.0% S>0.0%) [0.0%-100.0%]
PFGE-XI **PFGE-XbaI**



Bacteriological investigations

- Routine surveillance in relation to Salmonella control programmes in primary animal and food production
- Risk ranging (for detection purposes)
 - Herds within 2 km range of positive herds
 - Slaughterhouses
 - Meat/Food industries
 - Retail
- Herd investigations, including live animal trade
- Detailed investigation of grocery shopping for 126 cases
- Fridge investigations for 122 cases

Isolation of the U292 – 100% match MLVA

- 1 garbage can in a patient household:
 - Isolated from packing of fresh pork – together with S. Give, S. Infantis and S. Livingstone
 - Isolated from two different meat products, one of Danish and one of non-Danish origin
- 3 pork samples
- 3 cattle herds with clinical salmonellosis
- 1 broiler flock (not slaughtered in Denmark)

Epidemiological investigations

- Hypothesis generating interviews with 81 cases
- Three case-control investigations including a total of 82 cases og 155 controls
- Credit-card records used for case-kontrol investigation
- Case-case investigations based on Fridge results
- Home interviews
- A total of approx. 500 patients interviewed

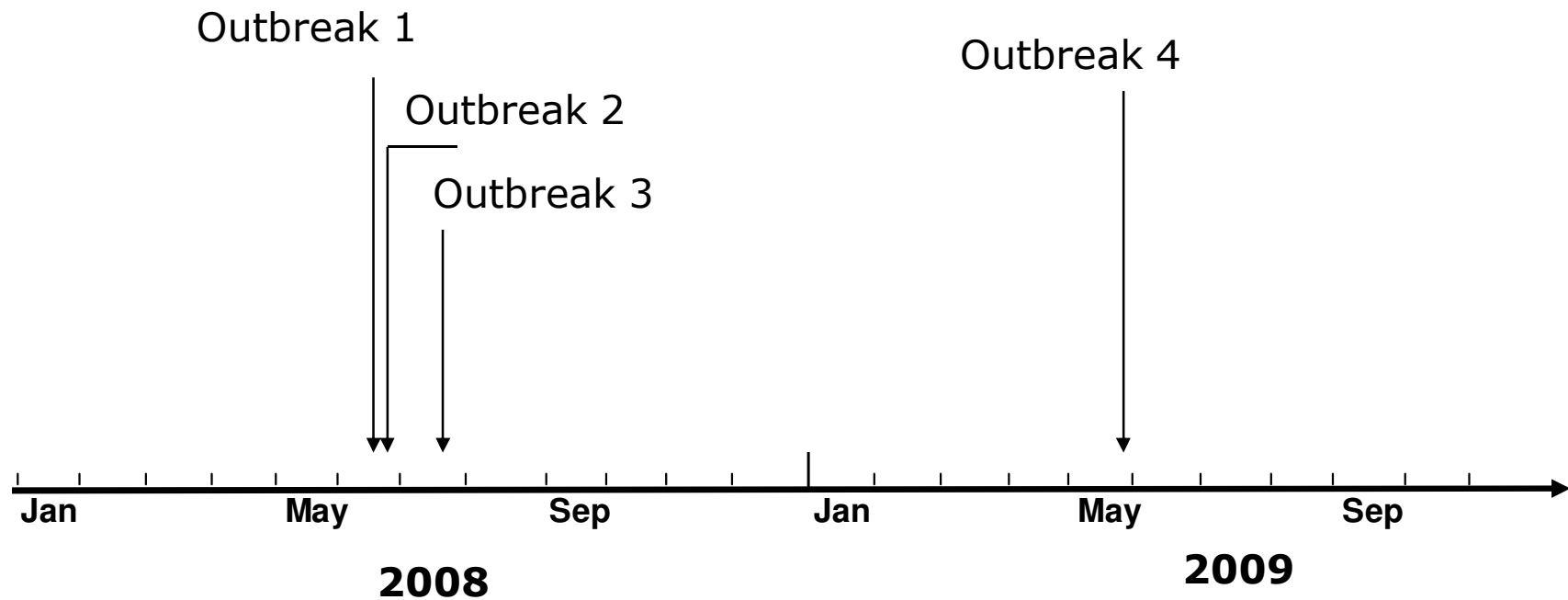
Case control study 1 and 2

- CC 1 (23/4-4/5 2008)
 - 28 cases
 - 83 matched controls
 - Focus: Fresh pork meat
 - No significant results
- CC 2 (10/6-19/6 2008)
 - 20 cases
 - 39 matched controls
 - Focus: Sausages, bacon and cold cuts
 - No significant results

Case control study 3

- CC 3 (8/9-19/9 2008)
 - 30 cases only adults
 - 33 matched controls
 - Focus: Dairy products
 - Result: Chicken significant
 - Follow-up: No common type or origin
- Pooled all 3 CC studies, January 2009
 - Unmatched
 - No significant food items

Cohort investigations



Family birthday party

- 30th of May 2009
- 23/43 ill, Attack rate 53%
- Method
 - Interview with host
 - Sampling of food and kitchen in summer cottage
 - Questionnaire via host
 - Follow-up telephone interviews
- Results
 - Sausages RR= 6.7 (1.02-3.47)
 - Meat balls RR= 2.7 (1.10-6.39)

Hypotheses

- Porc (raw and ready to eat – several product types)
- Bacon
- Honey, barbaque-sauce
- Beef or chicken
- Rape oil
- Butter
- Milk and milk products
- pâté
- Factory contamination strain
- Frozen fish
- Minor ingredients
- Herbs
- Other??

The direct source of the outbreak has not been found!

Limitations of bacteriology?

- The contaminated product has not been collected for analysis – neither during surveillance nor outbreak investigation
- The contaminated product has been collected for analysis
 - but with a false negative result... due to...
 - Contamination below detection limit of the bacteriological method
 - Heterogeneous distribution of bacteria in the contaminated product
 - Limited growth of U292 during analysis
 - Low competitive power of U292 compared to other strains of salmonella and/or competitive flora

Limitations of epidemiology?

- The contaminated product is very widespread
- Un-transparent production and distribution food productions systems
 - Several vehicles/brands
 - Changing vehicles/brands
- Low contamination of product
- Sporadic contamination of product
- Low virulence -> many sub clinical cases

Lack of luck!

An evaluation of the Danish outbreak investigation system

As a result of the unusually long outbreak caused by Salmonella Typhimurium U292, MLVA822 from an unknown source

The Minister of Food initiated (April 2009) an evaluation of the Outbreak Group, to be performed by the Danish Emergency Agency

The evaluation looked into:

- the organizational part of the outbreak investigation
- the organizational management structure

Main results of investigation

National outbreak Group is a sufficient platform

- The group is an efficient forum for co-operation between the actors with a high level of competences

But

- No defined guidelines existed between the implicated institutions to define responsibilities during outbreaks
- There seemed to be no common reference authority to decide on the release of resources and the prioritization of tasks

Adjustment problems

- As the administrative work functions (e.g. meetings, press contact) increased, the Outbreak Group did not adjust its active work force
- The Group was not dimensioned for prolonged, complicated outbreaks with high output and comprehensive information exchange

Recommendations – now implemented



- Guidelines for handling larger or complicated water- or foodborne outbreaks both on the professional and the organizational level
- Guidelines defining the internal distribution of tasks and responsibilities; especially leadership and administration
 - Strategic management of the Group
 - Steering committee with authority to release resources and prioritize
 - Secretary and chairperson, with contact to the steering committee
- Guidelines for targeted communication to public, press and stakeholders
- Formalized co-operation with the other authorities and industry
- Access to administrative support handling e.g. data and information

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- Regional medical officers

- Regional microbiological laboratories

- National Board of Health

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