



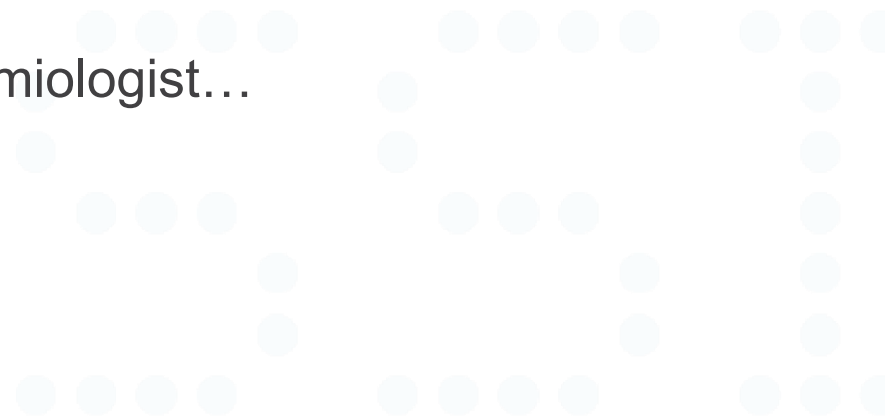
Infectious disease outbreaks in Denmark

Infectious Disease Epidemiology Course
University of Copenhagen
October 25, 2017

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- ❖ What is an outbreak?
 - ❖ Why investigate outbreaks?
 - ❖ Who is doing what in the investigation of foodborne outbreaks in Denmark?
 - ❖ Methodological steps in an outbreak investigation
 - Descriptive epidemiology
 - Analytical epidemiology
 - ❖ Exercise: Playing the role of the epidemiologist...
- 

- ❖ Occurrence of more cases of a disease than expected
 - In a specific area
 - In a specific population
 - Within a specific time period



- ❖ Occurrence of more cases of a disease than expected
 - In a specific area
 - In a specific population
 - Within a specific time period
- ❖ Outbreak=epidemic
- ❖ Pandemic: an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people*

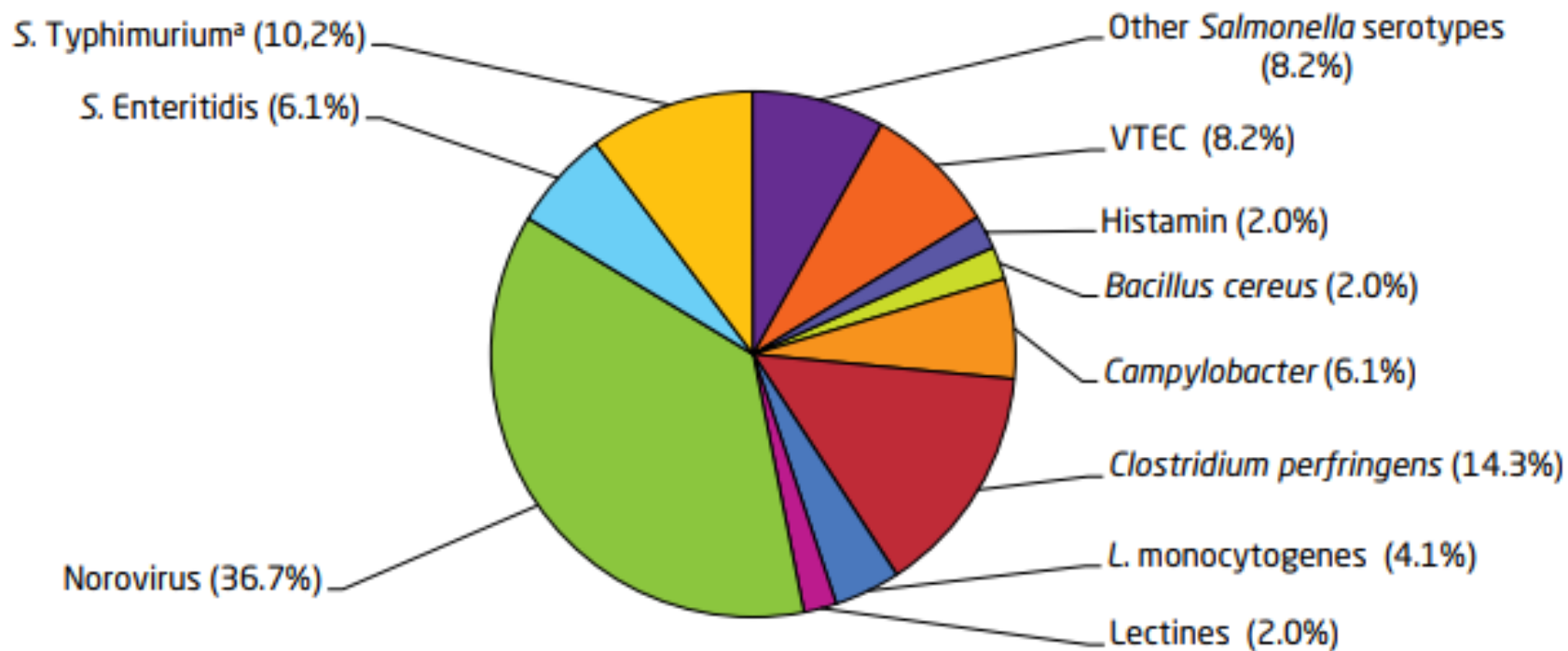
*Last J. A dictionary of epidemiology (4th Edition) Oxford University Press 2001

WHY INVESTIGATE OUTBREAKS?

- Stop the outbreak
- Understand what happened and why
- Prevent future outbreaks
- Improve our knowledge
- Improve surveillance and outbreak detection
- Training
- It is fun!



49 reported food-borne outbreaks in 2016





∴ Local outbreaks

- E.g. restaurant, private party, drinking water

∴ Responsible institutions

- Regional food offices
- Medical officer
- Local laboratories

∴ National outbreaks

- Cases in two regions or more
- International aspect

∴ Responsible institutions

- Statens Serum Institut
 - Reference laboratory
 - Department of infectious disease epidemiology
- Veterinary and food administration
- Food Institute at DTU



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The Central Outbreak Management Group

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STEPS IN AN OUTBREAK INVESTIGATION



1. Confirm outbreak
2. Confirm diagnosis
3. Make a case definition
4. Identify cases and obtain information
5. Describe data: time, place, person
6. Develop hypothesis
7. Test hypothesis: Analytical studies
8. Implement control measures
9. Communicate results



**DANISH SALMONELLA O:4,5,12; H:I:- OUTBREAK
CAUSED BY PORK MEAT LOAF
DECEMBER 2016 TO APRIL 2017**



- ❖ January 20, 2017: Laboratory notices an increase of *Salmonella* O:4,5,12; H:i:- with the same MLVA type
- ❖ February 1, 2017: Danish Patient Safety Authority contacts SSI about a possible *Salmonella* outbreak in a day care centre in Jutland





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- Laboratory-confirmed *Salmonella* O:4,5,12; H:i:- that cluster by WGS and no travel from December 2016 to April 2017

- *Who?*
- *Where?*
- *When?*





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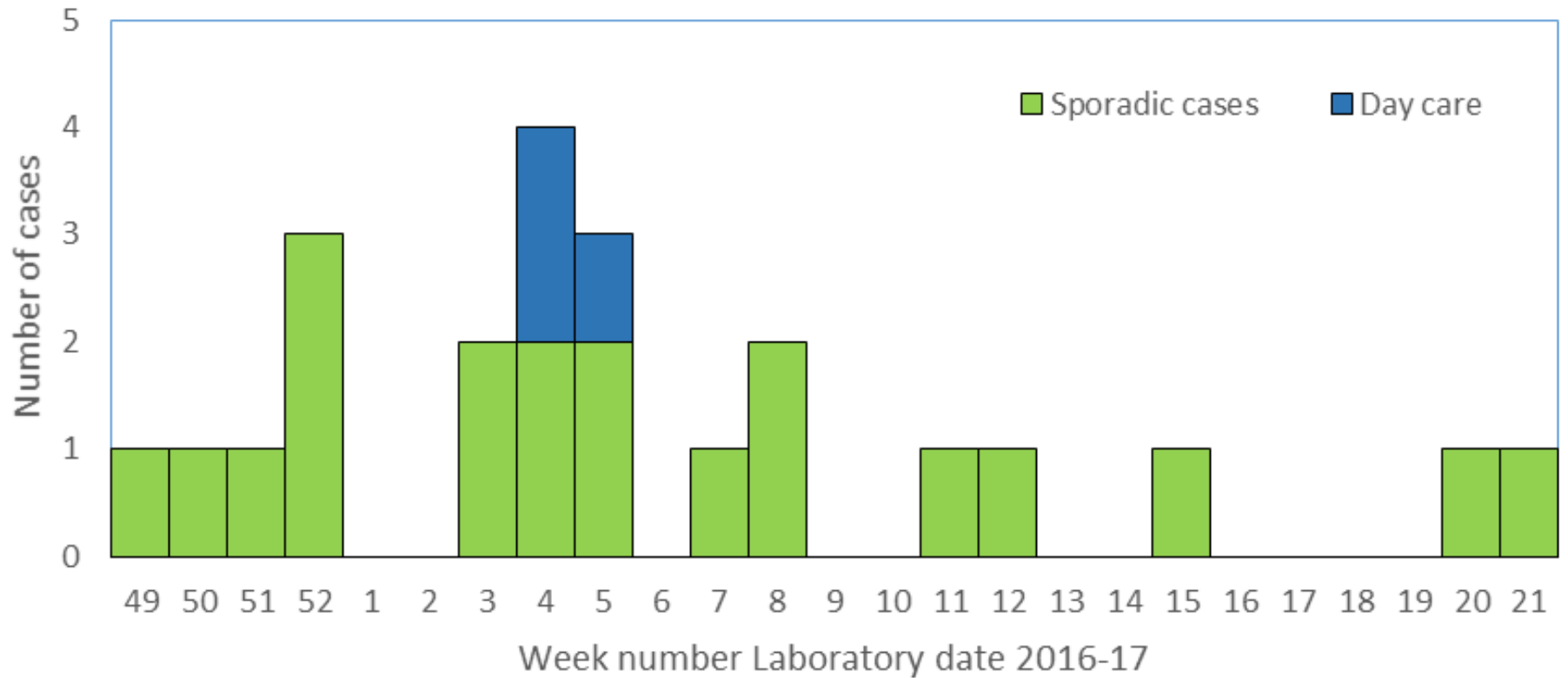


STEPS IN AN OUTBREAK INVESTIGATION

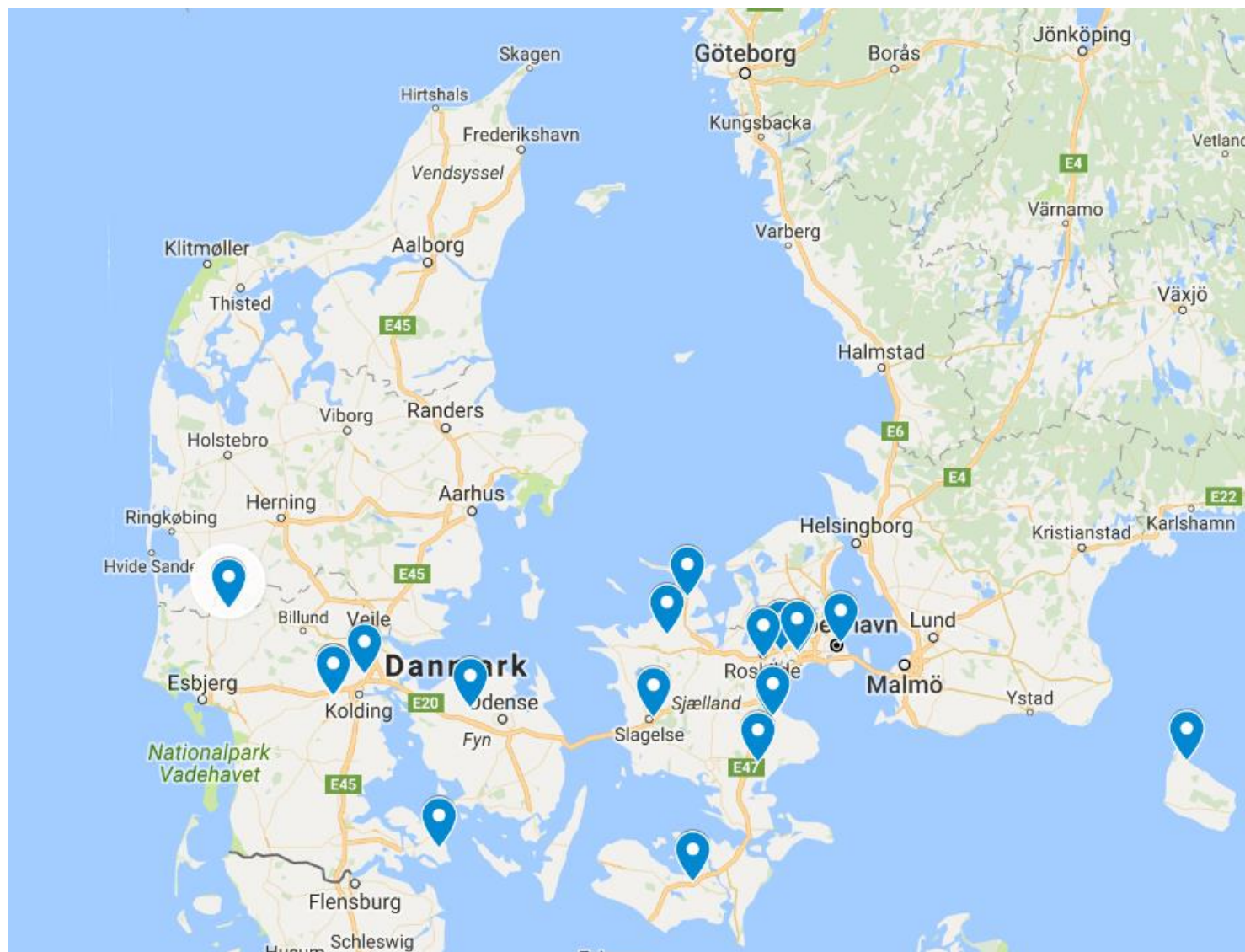
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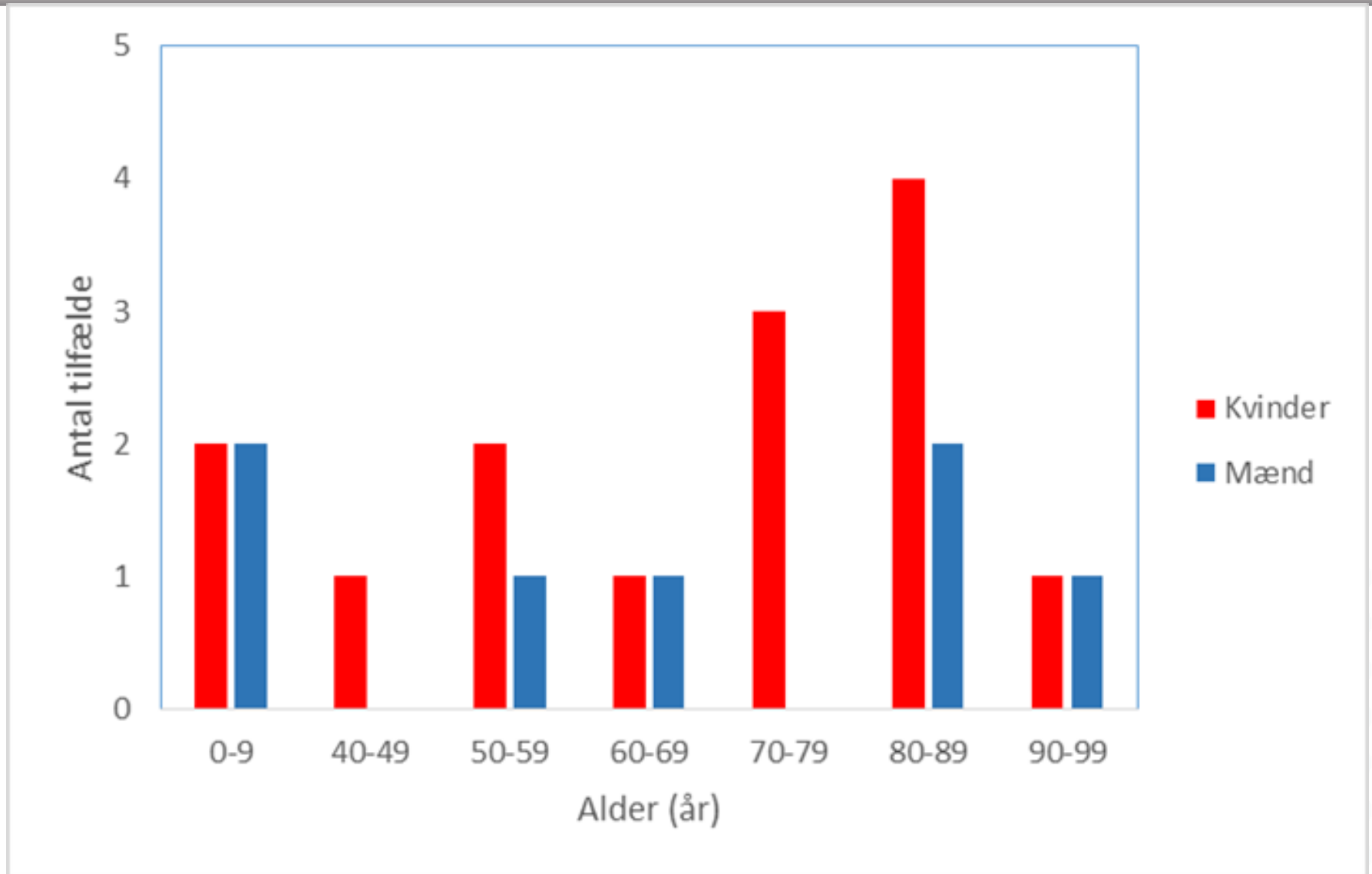
WEEK OF SAMPLE FOR PATIENTS N=21



PLACE OF RESIDENCE FOR PATIENTS N=21



AGE AND SEX DISTRIBUTION N=21



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17 interviews conducted

- No common events (apart from the day care)
- Living alone
- Simple food habits

- February 28
 - Frozen ready-made meal: pork meat loaf mentioned by two...
- Follow-up interviews on ready-made meals



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❖ Cohort investigations

- Used in closed settings e.g. restaurant
- Point source outbreaks
- Measure of association: relative risk (RR)

❖ Case control investigations

- No defined group or the group is too big e.g. the Danish population
- First you define the ill and then you find some (non-ill) control persons to compare with
- Measure of association: odds ratio (OR)



- ❖ When the cohort is too big!!
- ❖ Aim: to compare exposures (food items consumed) between ill persons and healthy controls
- ❖ Controls
 - Not ill
 - From the same population
 - Should have the same risk of getting the disease
- ❖ How do you select controls?
 - Friends/family
 - Neighbour
 - Hospital records
 - Danish Civil Registration System (CPR)



- 12 cases
 - Not re-interviewed
 - Exclusion: dead, refused to participate, suspected secondary transmission
- 36 controls
 - Matched by age, sex and municipality





• Odds ratio

	Ill	Not ill
Exposed	a	b
Not exposed	c	d

$$OR = \frac{\frac{a}{c}}{\frac{b}{d}} = \frac{a \times d}{b \times c}$$



- Odds ratio calculation for pork meat loaf

	Case	Control
Ate meat loaf	9	1
Did not eat meat loaf	3	35

$$OR = \frac{9 \times 35}{1 \times 3} = 105$$

=



- Calculating relative risk RR

	Ill	Not ill	Attack rate	Relative risk
Exposed	a	b	$a / (a+b)$	$\frac{a / (a+b)}{c / (c+d)}$
Not exposed	c	d	$c / (c+d)$	Ref.



- ❖ Ready-made meal
 - 83 % of cases versus 28 % of controls
- ❖ Pork meat loaf:
 - 75 % of cases versus 3 % of controls
- ❖ Unmatched analyses
 - Ready-made meal OR=13 (95% KI: 2.1-134)
 - Pork meat loaf from supermarket chain A: OR= 105 (8.1-4720)



- Collected for 6 patient households 3 months prior to disease onset

Text from receipts	No of patient household who bought it (n=6)
Pork meat loaf brand X	4
Apples	5
Bananas	4
Cream	4
"Æbleskiver" 20stk	5
Clementines 1kg	4

❖ Samples

- Food and Veterinary Administration
 - Pork meat loaf from 2 patients homes
 - Two samples from producer (other production dates)
- Producer
 - 28 samples from recalled products

❖ Trace-back

- 1 or more batches of meat loaf sold from December 2016 in supermarket chain A

❖ All samples were negative for salmonella!!

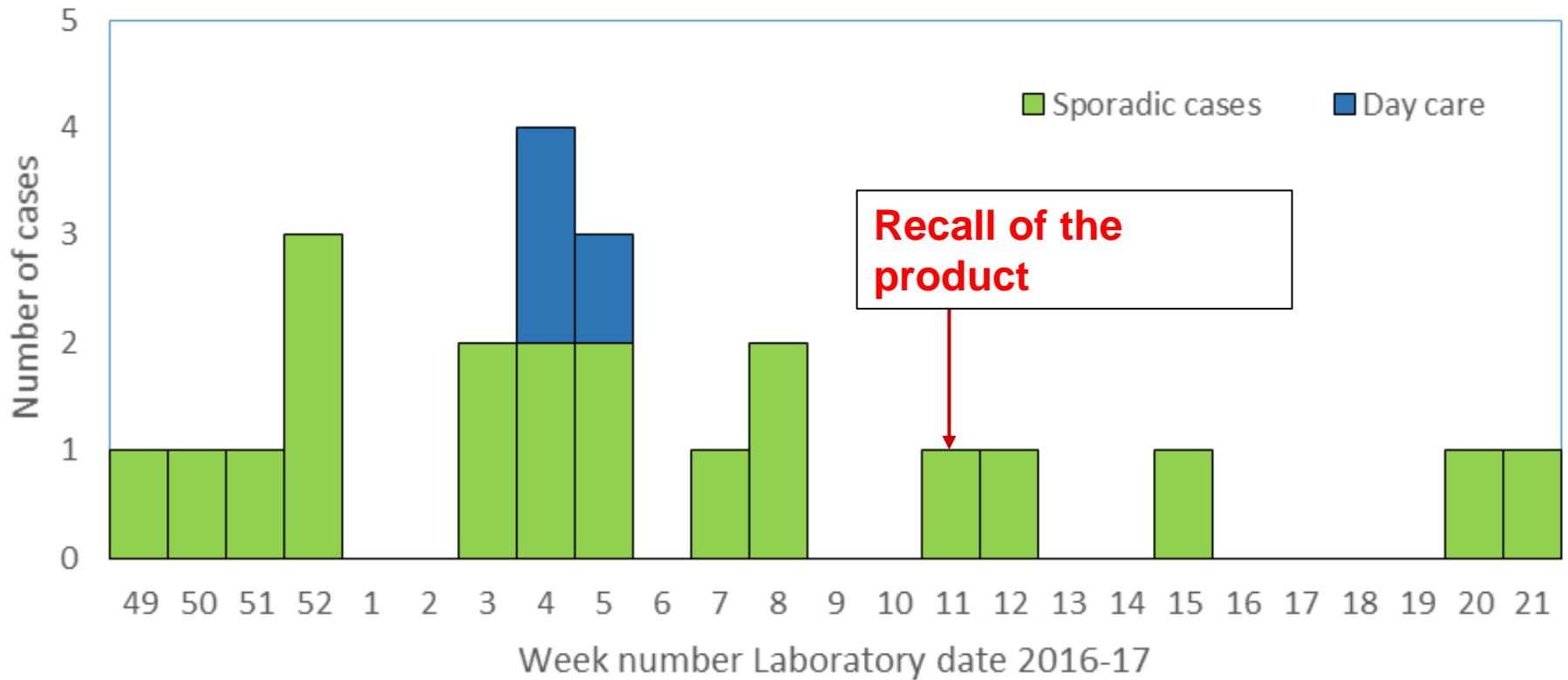


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WEEK OF SAMPLE FOR PATIENTS N=21



Eksport-gigant styrtbløder: Tulip vil renses for dødelig beskyldning

Tulip er hårdt ramt af myndighedernes tvivlsomme beskyldninger om at sælge dødelig salmonella-mad

Af: **Christian Kloster**



- ❖ Outbreak report
- ❖ International communication
- ❖ SSI.dk



The screenshot shows the website of Statens Serum Institut. The top navigation bar includes links for Kontakt, Om SSI, Selvbetjening, Sygdomsleksikon, and English, along with a search box. Below the navigation bar is a menu with categories: Aktuelt, Smitteberedskab, Diagnostik, Vaccination, Forskning, and Bestil. The main content area displays a news article titled "Advarsel: Mistanke om salmonella i forloren hare" dated 16. marts 2017. The article text discusses a salmonella outbreak linked to pork products from Coop. A sidebar on the left shows a list of news items by year from 2010 to 2017. On the right, there are sections for "Søg i nyheder:", "Relateret indhold" (with a link to "Salmonellaudbrud i Danmark"), and "Kontakt" (with contact information for Luise Müller).

STATENS
SERUM
INSTITUT

Kontakt Om SSI Selvbetjening Sygdomsleksikon English

Aktuelt Smitteberedskab Diagnostik Vaccination Forskning **Bestil**

> Nyheder > Presserum > Forskningsnyt > Arrangementer
> Nyhedsbreve > Sygdomsudbrud > Temaer > Følg os

Forside > Aktuelt > Nyheder > 2017 > Advarsel: Mistanke om salmonella i forloren hare

Nyheder

- > 2017
- > 2016
- > 2015
- > 2014
- > 2013
- > 2012
- > 2011
- > 2010

Advarsel: Mistanke om salmonella i forloren hare

16. marts 2017

I alt 19 personer er blevet syge af samme type salmonella-bakterie. Undersøgelserne peger på, at det er en frossen færdigret med forloren hare fra Coop, produceret af Tulip, der er kilden til udbruddet.

Fødevarestyrelsen advarer derfor nu forbrugere mod at spise forloren hare fra Coop. Produktet er produceret for Coop og solgt under mærket Normeat A/S i dagligvarebutikkerne Kvickly, SuperBrugsen, Dagli'Brugsen, Fakta og på Coop.dk.

Den forlorne hare er produceret 4. november sidste år og solgt som frostvare. Retten er beregnet til at varme i enten ovn eller mikrobølgeovn. Det er derfor muligt, at forbrugere kan have forloren hare fra det berørte parti liggende i fryseren. Forbrugere skal enten kassere det eller levere det tilbage til butikken.

"Vi arbejder på højtryk for at opklare denne sag og at opspore og inddæmme kilden til udbruddet", siger beredskabschef i Fødevarestyrelsen Nikolas Hove.

Søg i nyheder: Søg

Relateret indhold

[Salmonellaudbrud i Danmark](#)

Kontakt

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- ❖ Work against time
- ❖ Political/media pressure
- ❖ Don't have full information when you start (react on small signals)
- ❖ Interviews can be difficult
 - Food history hard to remember
 - Selective memory
 - Very ill/dead people
- ❖ In-depth epidemiological analyses often not possible (quick and dirty)
- ❖ Difficult to find pathogen in the food
- ❖ Hidden ingredients
- ❖ Unequal distribution in the food and difference in susceptibility
- ❖ Multiple sources
- ❖ We don't always find the source

- ❖ Outbreak investigation is an important part of the prevention of infectious diseases
- ❖ Outbreak investigation demands a close cooperation between different institutions
- ❖ Interviews and statistical tools are important components of epidemiological methods
- ❖ It is fun, informative and never predictable



IF YOU WANT TO KNOW MORE...



- ❖ Control of Communicable Diseases Manual 20th ed. Heymann D.
- ❖ Annual report on Zoonoses in Denmark 2016
- ❖ Statens Serum Institut www.ssi.dk
 - Epi-Nyt/Epi-News (weekly bulletin)
 - Sygdomsleksikon
 - Overvågning i tal og grafer
 - Opklaring af fødevarebårne udbrud i DK
- ❖ European Centre for Disease Prevention and Control www.ecdc.europe.eu
 - Communicable disease threats report (weekly)
 - EPIET training
 - Eurosurveillance (Rapid communications)
- ❖ World Health Organization www.who.int
 - Disease outbreak news