Waterborne disease in Sweden. Risk and adaptation

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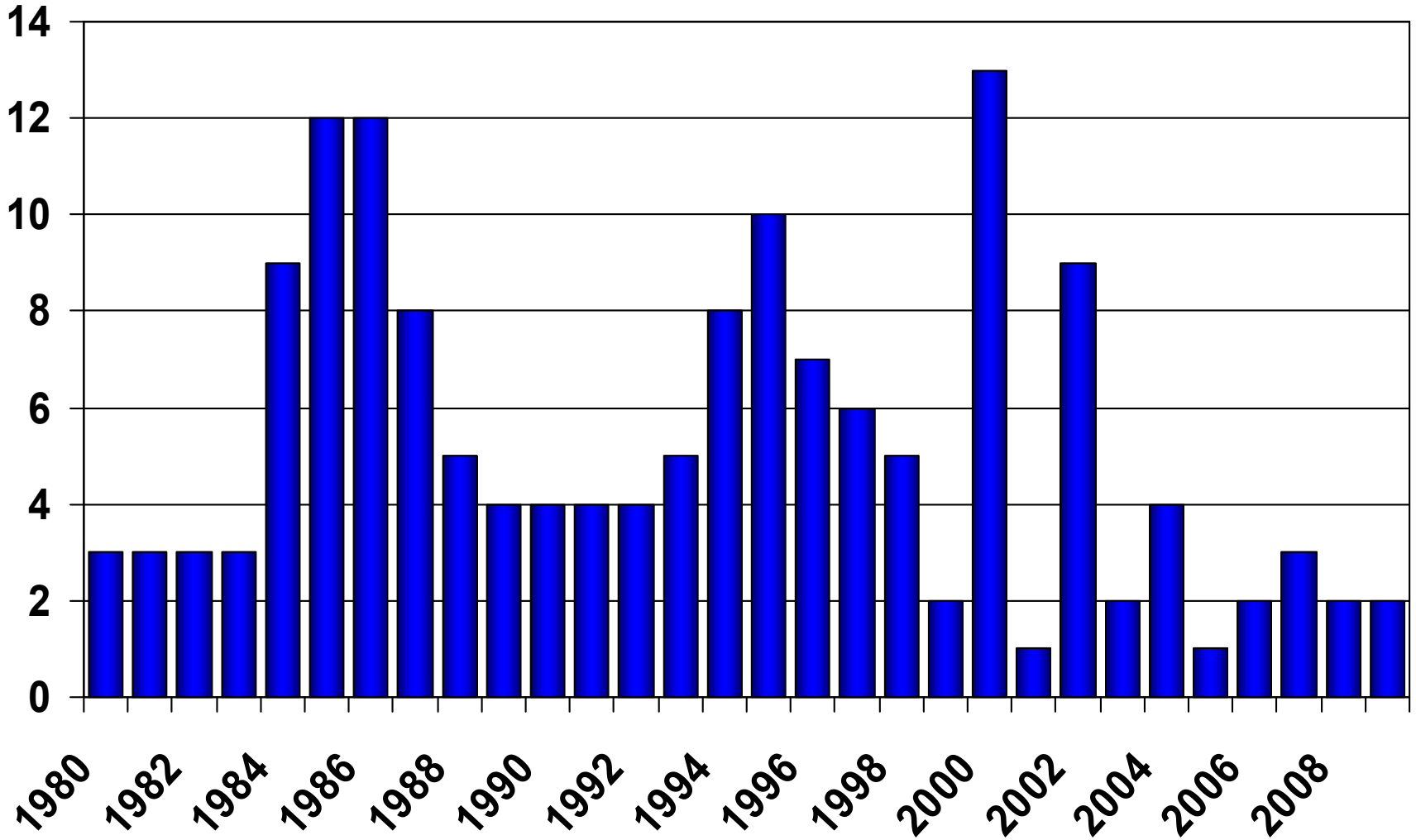
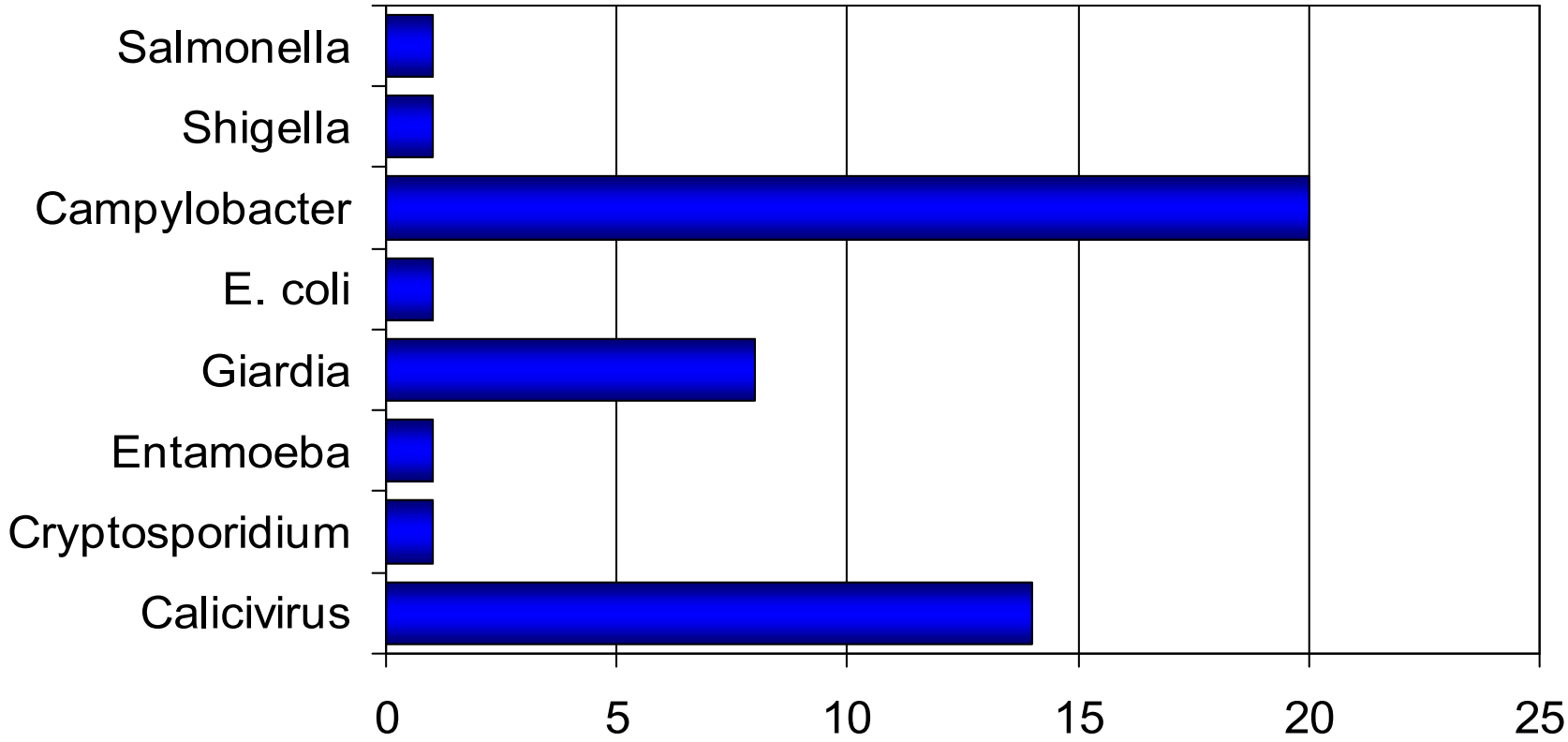
Waterborne outbreaks in Scandinavia

- The picture has changed from the historical perspective. Waterborne disease has been registered since 1880.
- ”New” organisms like different viruses, *Giardia*, *Cryptosporidium* and impact from animal sources give new challenges.
- Extreme weather events gives higher variability. We can however also learn from events due to snow melting periods in Scandinavia.
- Vulnerable groups are less well accounted for.
- Impact from over the borders – both in and out.

Number of waterborne outbreaks
1980 to 1/5 2009 (Total 158)
90 outbreaks from 1992!



Outbreaks related to agents



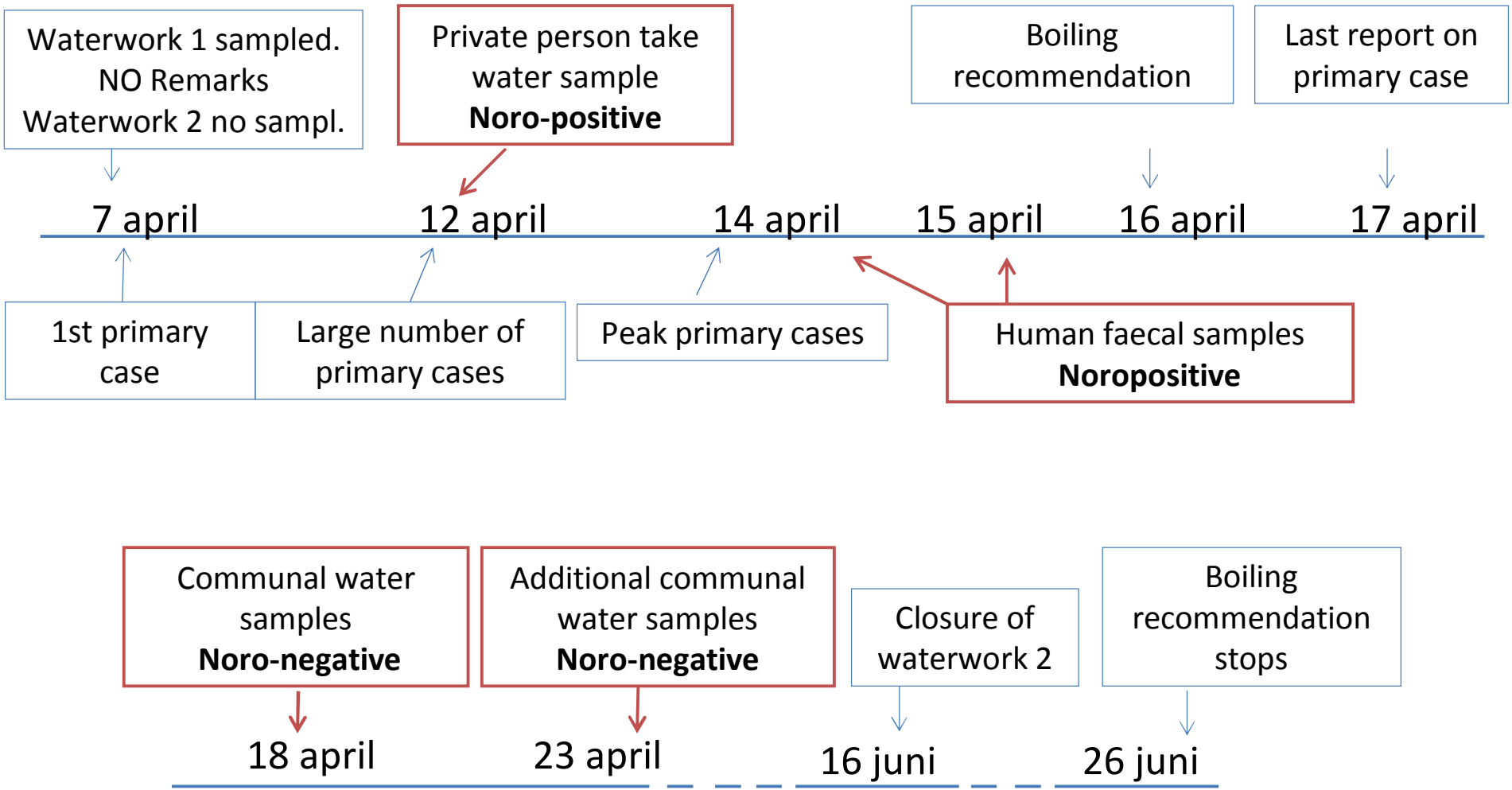
Unknown cause: 102 outbreaks

Source: Yvonne Andersson, Dep of Epidemiology, SMI

RECENT CAMPYLOBACTER OUTBREAKS

Water	Area	Type	Pathogen	Risk population	No of affected persons	Contamination
Drinking Water 2000						
	C	DW	Campylobacter			
	C	DW	Campylobacter +norovirus		22	Overflow from soil infiltration
Additional water 2000						
	O	SURFACE WATER	Campylobacter (3 pos)	98	42	Affected from forest area
	W	SPRING WATER	Campylobacter		5	Leakage/intrusion from a fox burrow (din)
Drinking Water 2003						
	X	DW	Campylobacter	22000	3300 (Epi based)	

Highlights Evertsberg outbreak



Evertsberg - Conclusion

- Norovirus was the cause of the outbreak with water as the vehicle.
- The contamination took place at the Evertsberg water source (well water), and/or in the water pipe network due to repair.
- The melting of snow was an involved factor amplified by the water pressure fall that occurred in distribution on April 10.
- The isolation of norovirus in the water was THE key to support the results of the epidemiological investigation and led to the closure of the water source believed to be responsible.

Earlier Norovirus outbreaks - examples

- Lilla Edet, 2008
  - Communal water, > 2000 cases
  - Norovirus not detected in water. High level of **phages** in distribution network - surrogate
- Horse farm, 2007
  - Well water, approx 30 cases
  - **Norovirus positive** samples during several months. Well closed. High wastewater contamination.
- Bathing water (reserve DW source), 2004
  - Delsjön and Aspen, approx 400 cases
  - **Noropositive** in saved control sample. Not present in later water samples.

Ongoing outbreak under investigation

- EHEC
  - Outbreak in Norrköping
    - Reporting from local authorities ongoing
  - Positive samples from a groundwater source.
    - Surface water intrusion in well, existing UV treatment unsufficient
    - Highly impacted by surface water based on regular parameters

Earlier Outbreak of EHEC in Sweden due to irrigation from surface water

Run-off from agricultural land where grazing cattle were infected with EHEC (a zoonoses, i.e. transmission animal-human)

Transport from manure to river water

Irrigation of lettuce (no requiremenmts for analysis of the water)

The lettuce was consumed by a large number of individuals – resulted in 100 cases (approx. 10 hospitilised)

At SMI: samples from patients (typing of isolates), water samples

Case study Göteborg

- 250 000 people (1/2 Göteborg town)
- Surface water – Göta Älv with prestorage in Delsjöarna
- Treatment: chemical coagulation, rapid filtration combined with GAC and chlorination
- Distribution network: 880 km
- Frequent variations in raw water quality; Intake closed 1/3 of the time
- Mainly microbial contaminations
- Source water contamination from wastewater outlets and impact from agricultural land after heavy rains.

Deviation in treatment

	Frequency/year	Duration
Failure in particle reduction (coagulation/sedimentation/filtration)		
Failure in dosing or pH	1.5	0.6 h
Filtration failure after filter back-flushing	15	5 h
Failure chlorination	0.5	0.4 h

Deviation in distribution

	Frequency/year	Duration
Local cross-connection (affecting approx 25 pers)	0.4	3 days
Contamination of reservoar (affecting approx 2500 pers)	0.7	14 days
Contamination of periferial part of distribution network (affect approx 25 pers)	0.3	30 days

Conclusions

- We can learn so much from an open athmosphere of disease surveillance
- Positive water samples – the KEY to acceptance and understanding
- Variability and events are the risk driving factors
- Small water sources should recieve regained attention
- Vulnerability is not just based on treatment performance – more attention is needed to failure frequency and the distribution network
- Predictive risk assessment, combined with a vigerous epidemiological surveillance goes hand in hand