BELGIAN'S REFERENCE CENTER OF SALMONELLA & SHIGELLA : ORGANISATION AND COVERAGE

Pieter-Jan Ceyssens

Surveillance of human Salmonellosis in Belgium

SENTINEL SYSTEM

- 38 Sentinel labs who weekly report the number of isolated *Salmonella* spp.
- Basic metadata
- No AST/serotype/subtyping information

NATIONAL REFERENCE LAB

- Voluntary submission of human Salmonella isolates from 121 peripheral clinical microbiology labs
- Microbiological subtyping
- Monthly data uploads to Epistat (incl. metadata)

TOPIC OF TODAY
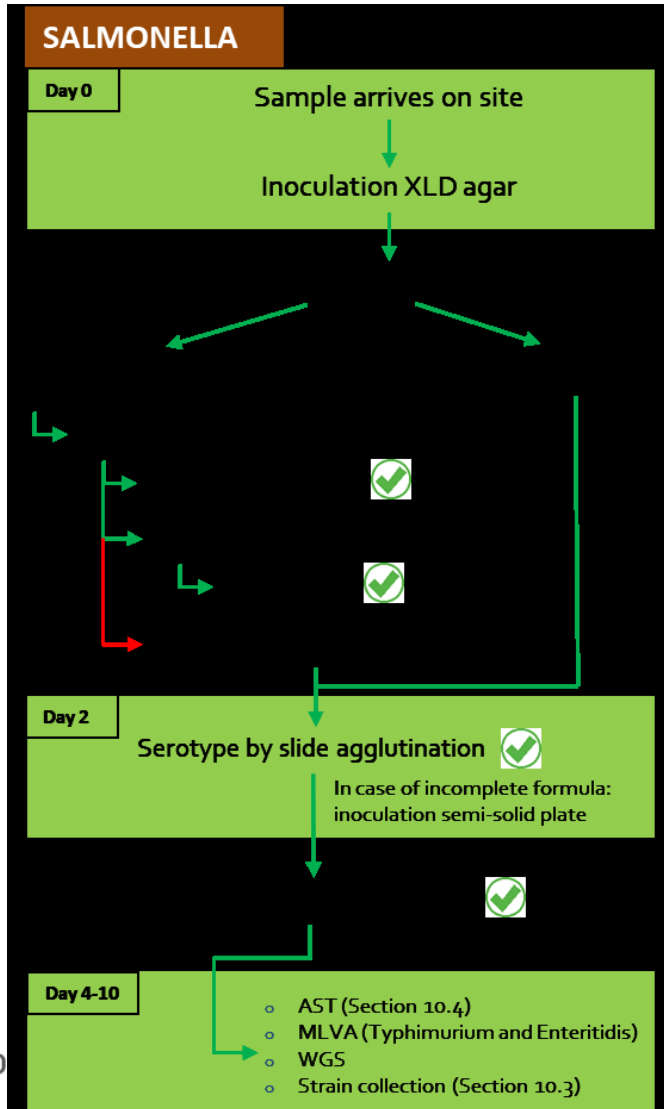
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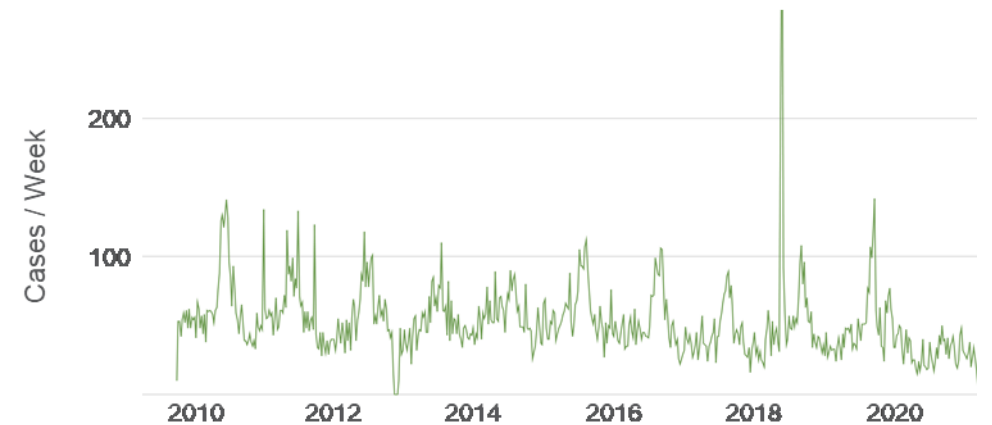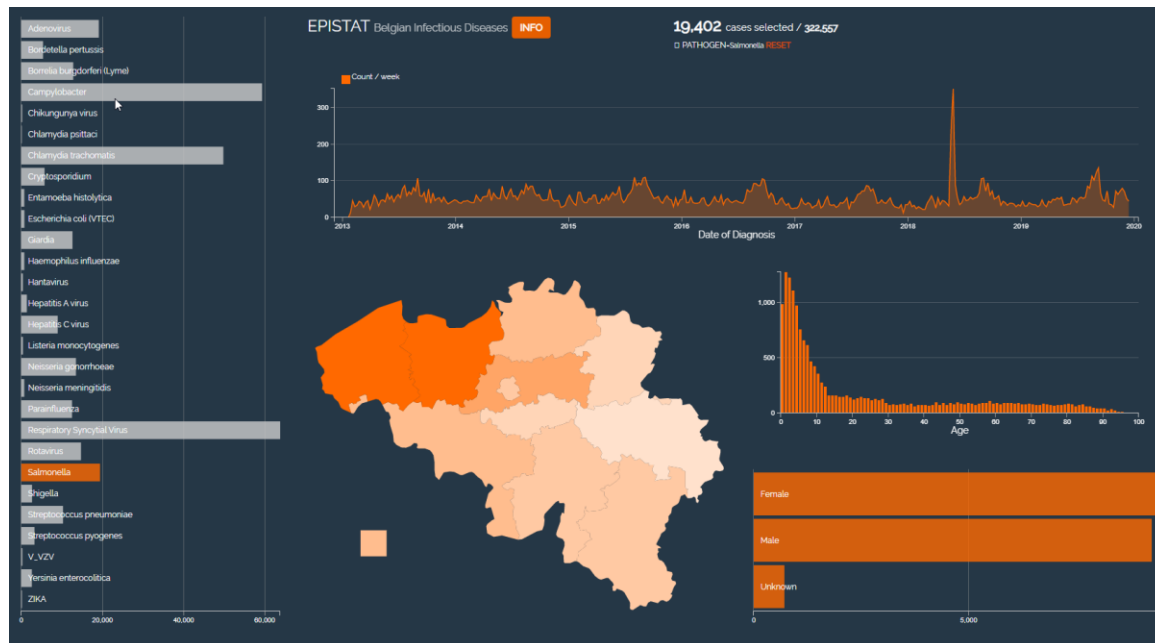
About being a Reference Center in Belgium

- Belgium has 41 National Reference Labs, 5 year mandates

- Official tasks of NRC Salmonella & Shigella :
  - Confirmation of diagnosis
  - Technical support to peripheral labs (sampling/transport/test results communication)
  - Tracking, developing and implementation of new diagnostic tests and typing methods
  - ISO accreditation
  - Contribute to scientific/epidemiological research
  - Publish annual report
  - Technical advice to government

- Sample number : 3,000 (Salmonella) / 400 (Shigella) per year

- Total budget:
  - 100,000€ for sample analysis / year – OVERHEAD
  - 45,000€ for personnel / year - OVERHEAD

1 lab technician + €27 per sample

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Looking for a workable solution

- Embed in group with permanent scientists
    - Wesley Mattheus
    - An Van den Bossche
    - Pieter-Jan Ceyssens

- Expand reference activities & create transversal platforms
    - NRC Listeria
    - NRC Neisseria
    - NRC Yersinia
    - NRC Mycobacteria

- Serotyping of veterinary samples
- Research grants
- Optimizing lab flow

SALMONELLA

Day 0
- Sample arrives on site
- Inoculation XLD agar

Day 2
- Serotype by slide agglutination
  - In case of incomplete formula: inoculation semi-solid plate

Day 4-10
- AST (Section 10.4)
- MLVA (Typhimurium and Enteritidis)
- WGS
- Strain collection (Section 10.3)

<u>A multiplex oligonucleotide ligation-PCR method for the genoserotyping of common Salmonella using a liquid bead suspension assay</u>

- 80% of human isolates
- Cost declines with increasing samples numbers

- MLVA : 6€ per sample

Antibiotic Susceptibility Testing

Sérovar	Fréquence d'échantillonage (par semaine)				
	Semaines				
	1-24	25-29	30-41	42-47	48-53
S. Typhimurium	5	8	10	8	5
S. Enteritidis	3	5	5	5	3
S. Brandenburg	(tout)				
S. Derby	(tout)				
S. Virchow	(tout)				
S. Hadar	(tout)				
S. Dublin	(tout)				
S. Newport	(tout)				
S. Infantis	(tout)				
S. Kentucky	(tout)				
S. Heidelberg	(tout)				
S. Panama	(tout)				
S. Agona	(tout)				
S. Stanley	(tout)				
S. Livingstone	(tout)				
S. Corvalis	(tout)				
Isolates from abroad	(tout)				
S. Typhi	(tout)				
S. Paratyphi A, B et C	(tout)				
S. Chester	(tout)				
Invasive isolates	(tout)				

- Approx. 1,000 tests per year

- Certain serotypes are not monitored (e.g. Braenderup)

- **EU help needed in defining priorities !**

optimal?

Coverage of surveillance system

PLOS ONE

RESEARCH ARTICLE

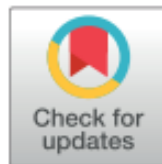## Coverage of the national surveillance system for human *Salmonella* infections, Belgium, 2016-2020

Nina Van Goethem[1,2]*, An Van Den Bossche[3], Pieter-Jan Ceyssens[3], Adrien Lajot[1], Wim Coucke[4], Kris Vernelen[4], Nancy H. C. Roosens[5], Sigrid C. J. De Keersmaecker[5], Dieter Van Cauteren[1‡], Wesley Mattheus[3‡]

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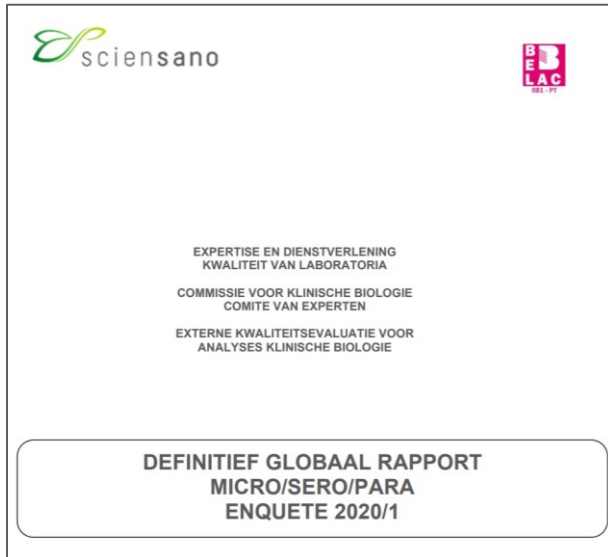
‡ These authors contributed equally to this work (Joint Senior Authors).
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Coverage of surveillance system

Which proportion of all isolates from diagnosed cases with a laboratory confirmation are sent to the NRC ?

Data on **no. reimbursed stool cultures**

- calculate the Salmonella positivity rate
- estimate the total number of cases in Belgium in 2019

Capture – recapture[1]

= Comparing two independent data sources (NRC/Sentinel) that provide surveillance information on the same disease
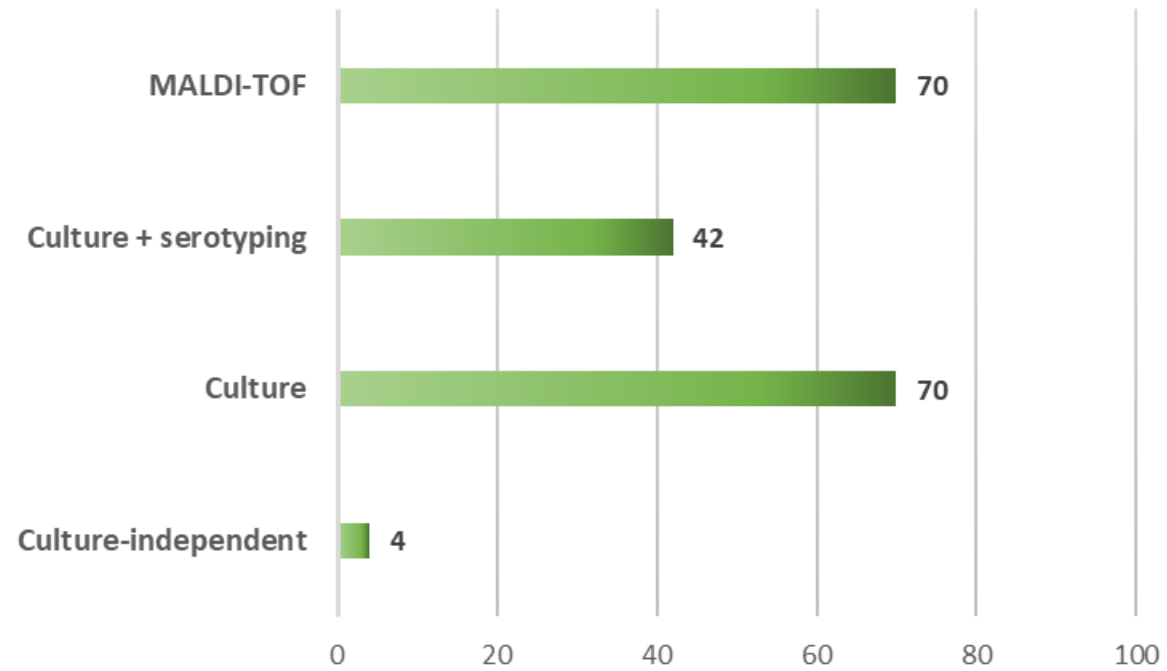
- estimate extent of incomplete ascertainment
- Identify true and missed cases
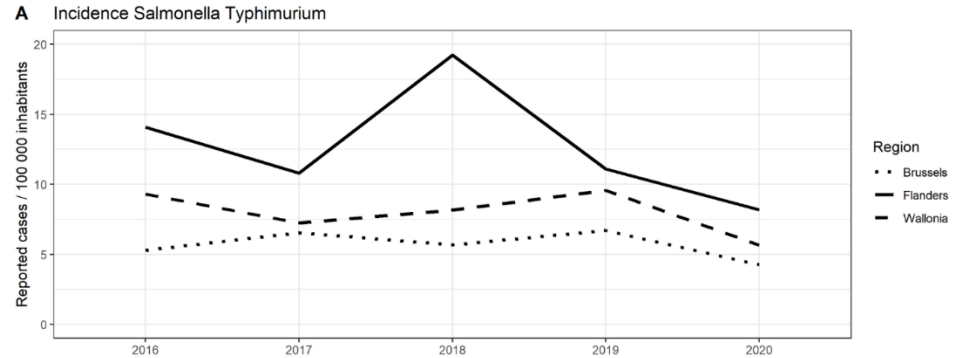
Mandatory Quality control for all 121 labs
=> Questionnaire:
- How many Salmonella samples in 2019 ?
- Which culture-independent diagnostics ?

[1]Hook EB, Regal RR. Capture-recapture methods in epidemiology: methods and limitations. Epidemiol Rev. 1995;17: 243–264.

Diagnosis of Salmonella in Clinical Labs (2019 data)

MALDI-TOF	70
Culture + serotyping	42
Culture	70
Culture-independent	4

0   20   40   60   80   100

Salmonella epidemiology

A Incidence Salmonella Typhimurium
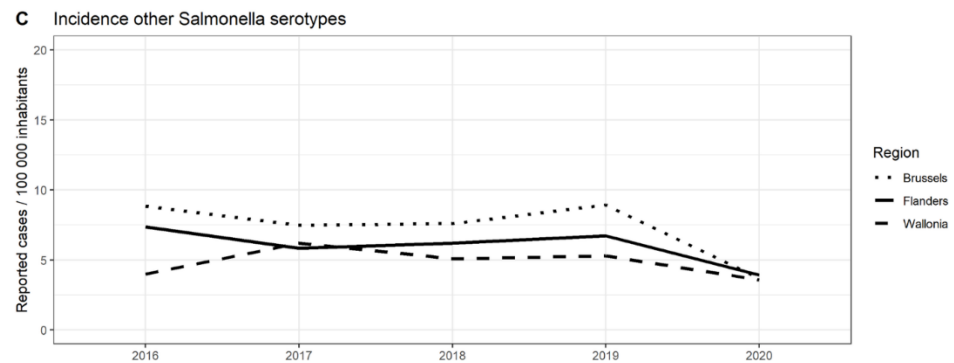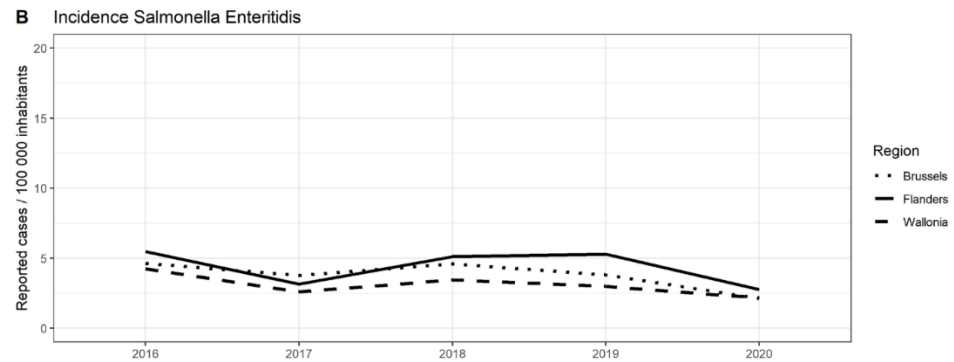
B Incidence Salmonella Enteritidis

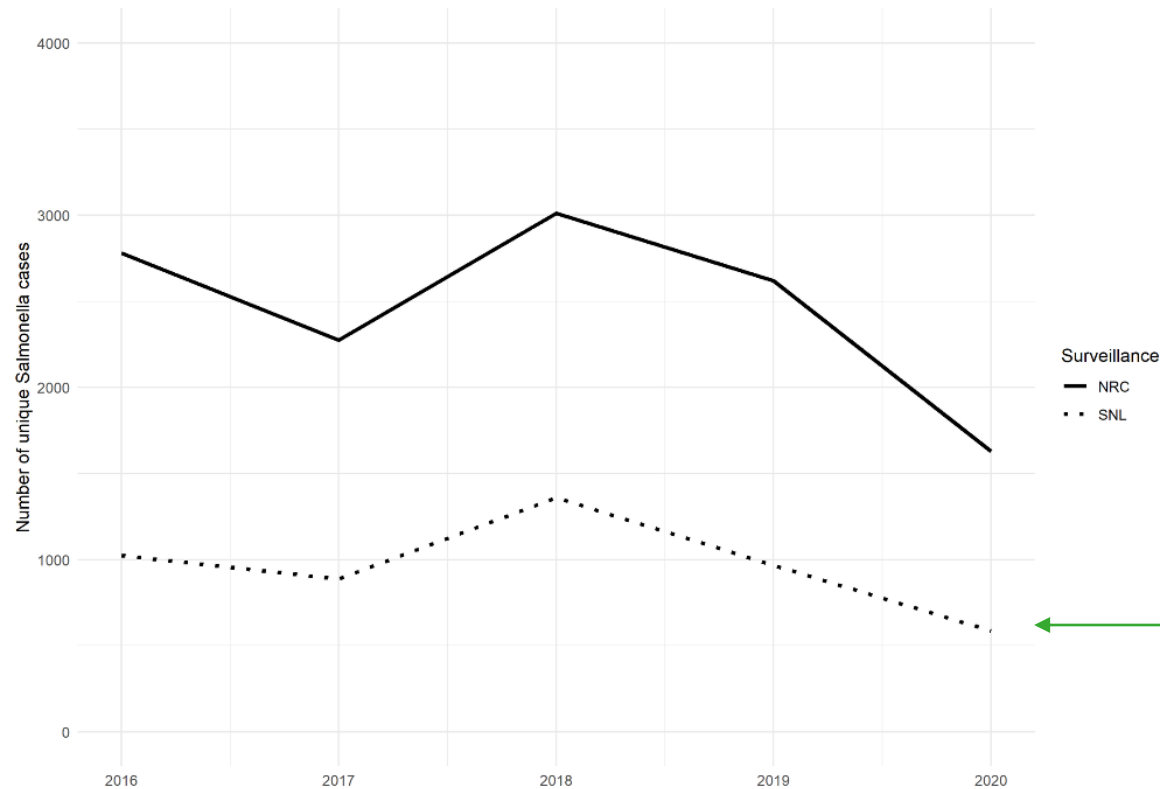C Incidence other Salmonella serotypes

Number of *Salmonella* cases per 100 000 inhabitants reported by the National Reference Center (NRC) per region, Belgium, 2016–2020.

- Outbreak in 2018
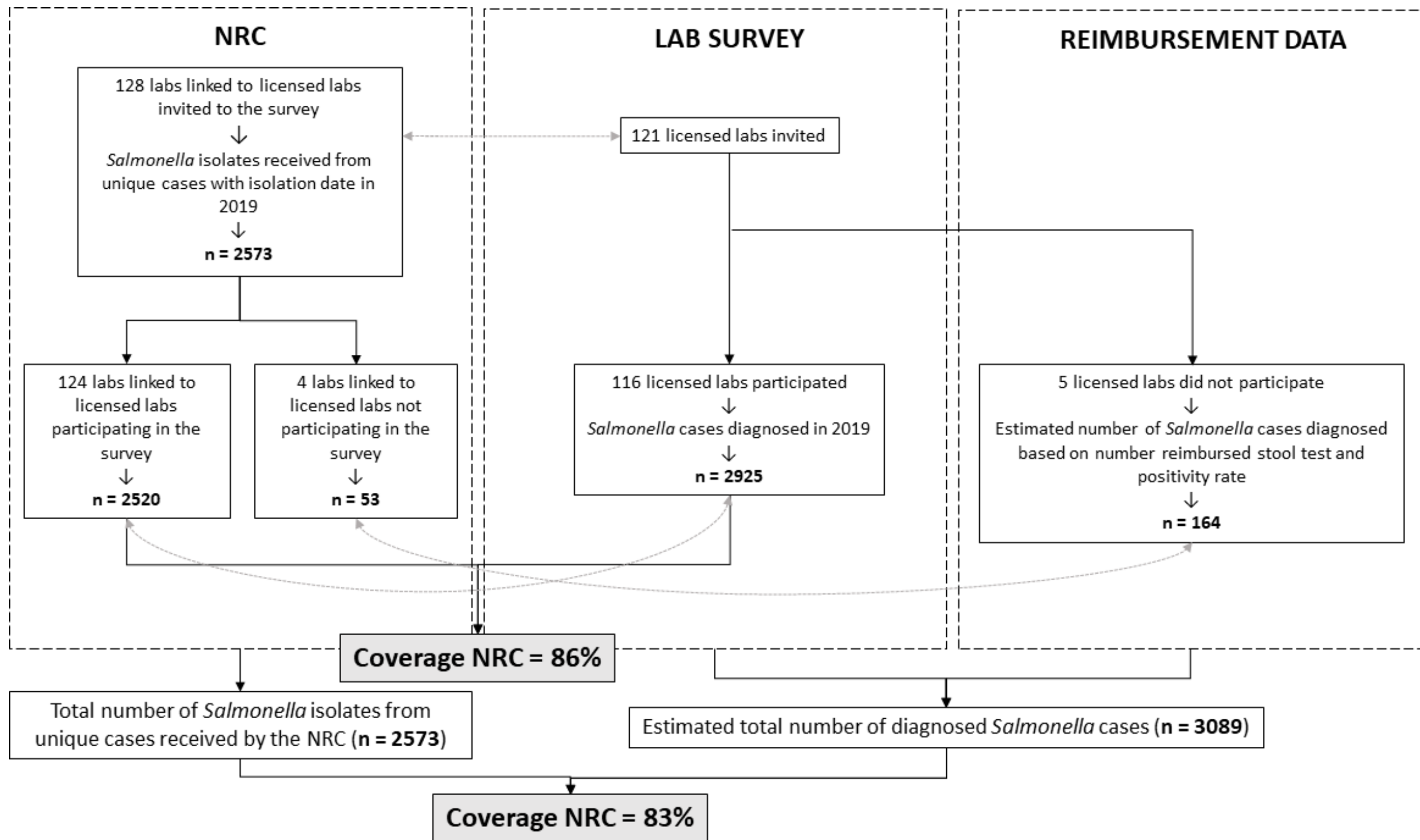- Stable (except Covid decline)

NRC vs SNL

The annual trends observed between both surveillance systems are similar.

Lower because of less labs reporting

Capture – recapture (2016-2020), Chapman method

SNL	NRC		
	Identified	Not identified	Total
Identified		679	4548
Not identified	7148		*8402*
Total	11017	*1933*	

NRC: National Reference Center; SNL: Sentinel Network of Laboratories. In italics: numbers estimated by capture-recapture using Chapman's formula [15].
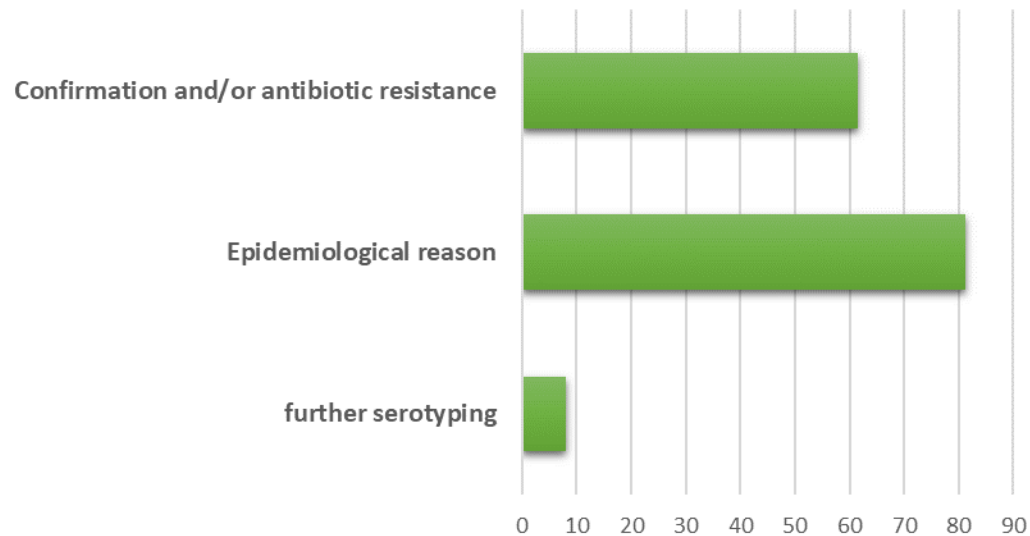

Stable in Covid times !

Coverage NRC : 85% (95% CI: 84–86%)
Coverage SNL : 35% (95% CI: 34–36%)

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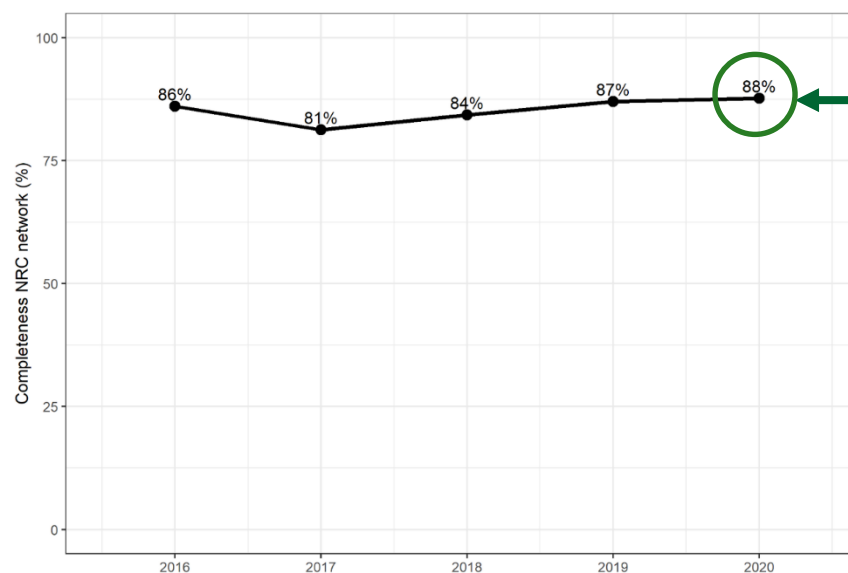
Reasons for high coverage (1)

- Higher than reported for France (48%) and The Netherlands (64%)[1]

- Why? Labs are motivated !

- Continuity : NRC Salmonella has been in place for >30 y

- Combined with other NRCs for Gastrointestinal Diseases (some of which are mandatory) – clear for the labs

- Transport tubes, package material and pre-paid sending material is provided to the labs – all that within the €27 per sample!

[1] European Centre for Disease Prevention and Control. The European Union One Health 2019 Zoonoses Report. 2021 Feb.
Available: https://www.ecdc.europa.eu/en/publications-data/european-union-one-health-2019-zoonoses-report

Struggles

- **We can't sequence everything**

- **Far from early detection system, as food isolates are routinely not sequenced as well**

- Reduce number of analyses – seems possible given the high coverage

- Prioritize serotypes ?

EU help needed in defining priorities !

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