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The stalled *Salmonella* situation in EU and assessment of current EU reduction targets

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European Food Safety Authority

Outline

- The stalled *Salmonella* situation in EU
- Assessment of current EU reduction targets
- Discussion/questions/proposals

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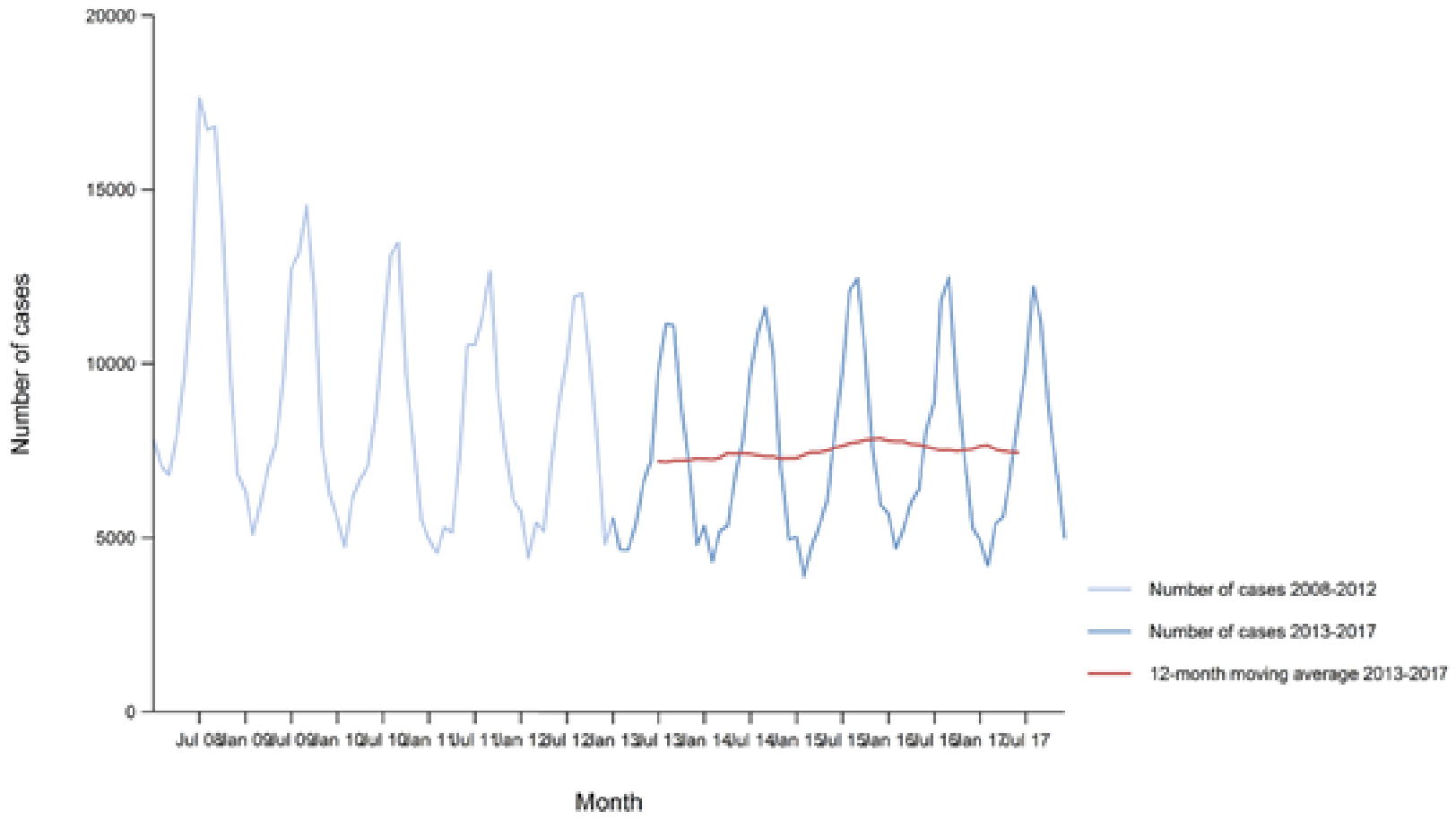
Salmonellosis in humans, EU, 2008-2017



There was significantly ($p < 0.05$) decreasing trend for salmonellosis in the EU/EEA in 2008–2017, however the trend did not show any significant increase or decrease over the last 5 years (2013–2017).

Salmonella PHC monitoring data : pig carcasses, by sampler, EU, 2017

For all MS except Bulgaria the occurrence of *Salmonella*-positive samples from official sampling was significantly higher than operator (self-monitoring) results

Table 14: Comparisons of proportions (%) of *Salmonella*-positive single samples from pig carcasses, by sampler, based on eight reporting Member States, EU, 2017

Country	Competent authorities (CA)					Food Business Operator (FBOp)					p-value[(a)]	Interpretation
	Sample weight	Tested	Positive	%	CI_{95}	Sample weight	Tested	Positive	%	CI_{95}		
						cm²	4,774	112	2.35	[1.94; 2.82]	***	CA > FBOp
						cm²	425	2	0.47	[0.06; 1.69]	NS	
							51	0	0	[0; 6.98] a	NS	
	tot	835	2	0.24	[0.03; 0.86]	tot	476	2	0.42	[0.05; 1.51]	NS	
Greece	400 cm²	64	1	1.56	[0.04; 8.4]	400 cm²	955	0	0	[0; 0.39] a	+	CA > FBOp
Italy	4 cm²	5,790	227	3.92	[3.44; 4.45]	4 cm²	14,186	221	1.56	[1.36; 1.78]	***	CA > FBOp
Netherlands	400 cm²	150	23	15.33	[9.98; 22.11]							
						100 cm²	5,308	413	7.78	[7.07; 8.53]		
	tot	150	23	15.33	[9.98; 22.11]	tot	5,308	413	7.78	[7.07; 8.53]	**	CA > FBOp
Poland	400 cm²	2,720	37	1.36	[0.96; 1.87]	400 cm²	3,128	0	0	[0; 0.12] a	***	CA > FBOp
Slovakia	400 cm²	2,299	22	0.96	[0.6; 1.45]	400 cm²	4,509	0	0	[0; 0.08] a	***	CA > FBOp
Spain	400 cm²	384	45	11.72	[8.68; 15.37]	400 cm²	2,746	176	6.41	[5.52; 7.39]	***	CA > FBOp
Total (MS)		**13,290**	**414**	**3.12**	**[2.82; 3.42]**		**36,082**	**924**	**2.56**	**[2.04; 2.73]**	***	**CA > FBOp**

(a): One-sided, 97.5% confidence interval; p- value interpretation: NS: not significant; + < 0.10; **< 0.01; ***< 0.001.

Results from Competent Authority more frequently positive compared to (Food Business) Operator samples

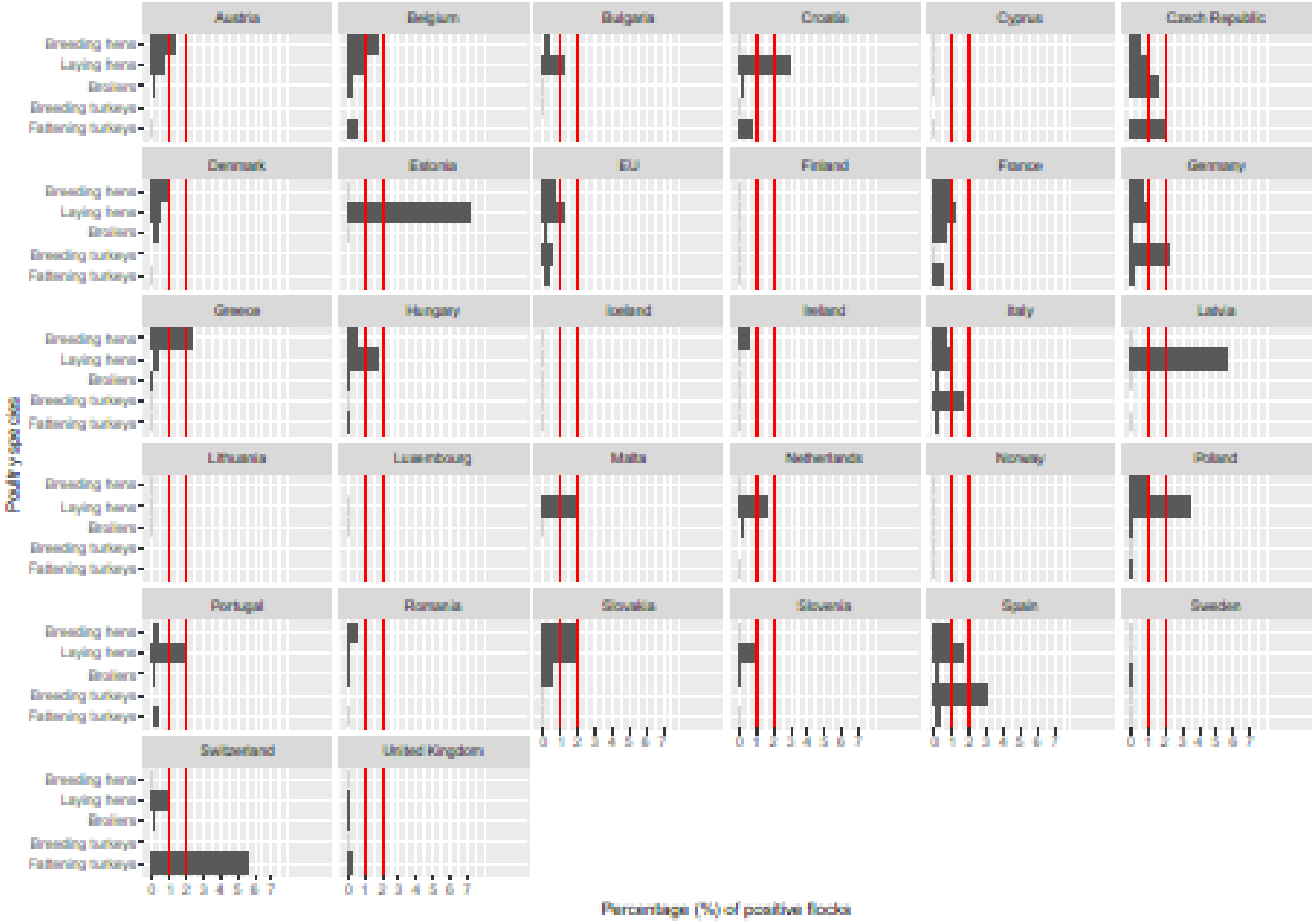
Salmonella: monitoring data from regulatory limits, EU, 2017

The data that serve the purpose of **trend watching** (sampling context: Surveillance, based on Regulation 2073/2005; sampling unit type: Single; sampling strategy: Objective sampling; and sampler: Official sampling) were **too scarce** and unrepresentative to describe the situation at EU level.

At the level of reporting MS;

- the highest proportions of *Salmonella*-positive samples were reported from **foods of meat origin intended to be cooked before consumption**; respectively 6.4% and 3.3% of 'minced meat and meat preparations from poultry' and of 'minced meat and meat preparations from other species than poultry'
- from samples of 'minced meat and meat preparations intended to be eaten raw' 1.1% were *Salmonella* positive,
- from 'fresh poultry meat' 0.1% of samples were positive to *Salmonella* target serovars,
- food products other than meat, 0.84% of samples of RTE precut fruits and vegetables were positive to *Salmonella*
- all the other tested food categories were negative to *Salmonella*

Prevalence of poultry flocks positive for target *Salmonella* serovars in EU MS, 2017



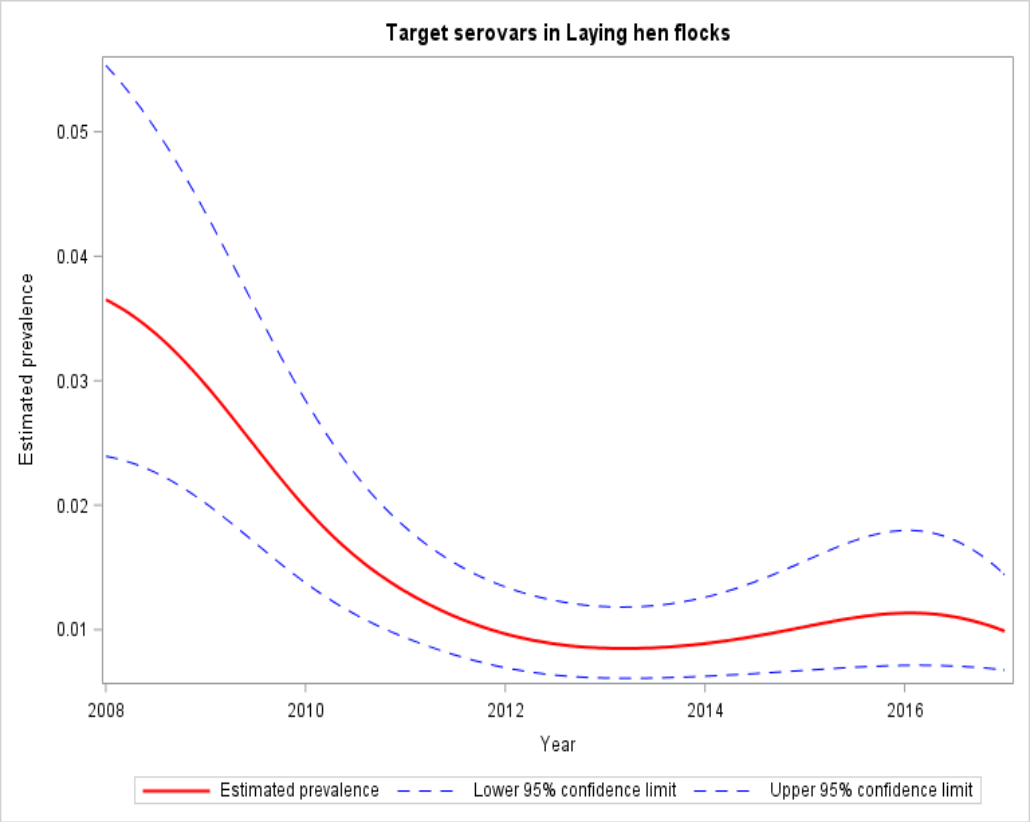
Results *Salmonella* NCPs, 2017

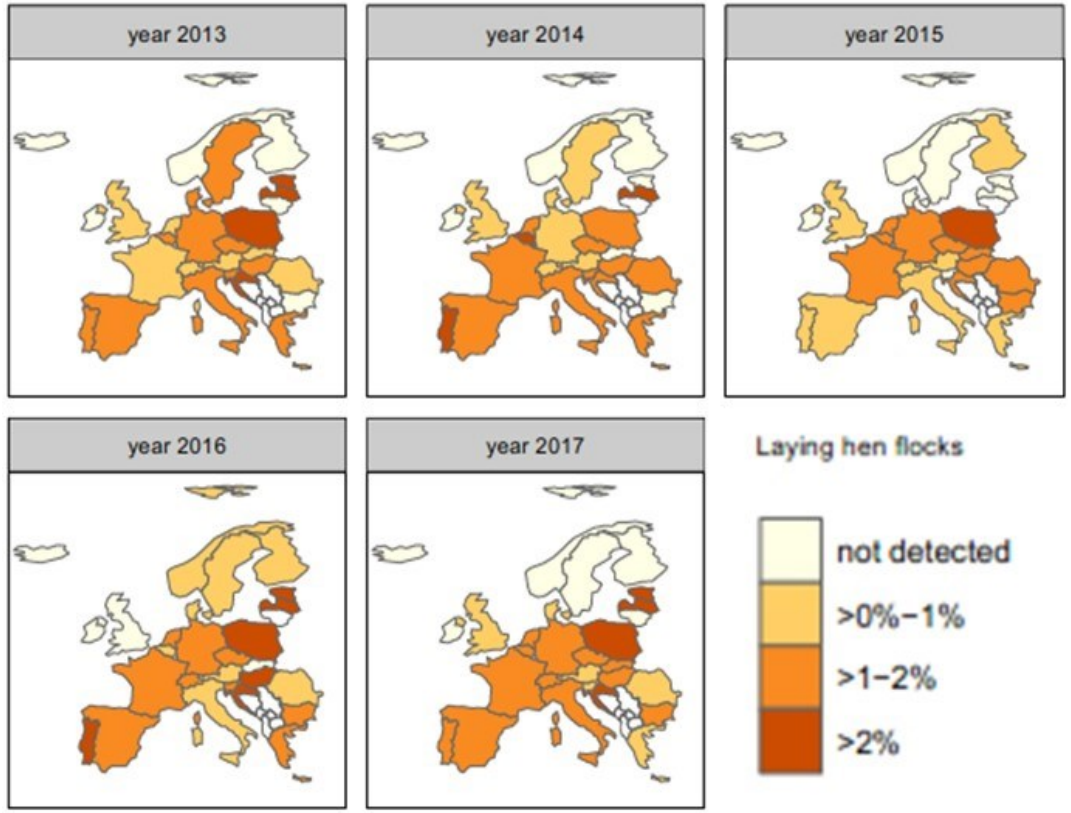
At primary production level, in the context of the NCP, the EU-level flock **prevalence of target *Salmonella* serovars** in breeding hens, laying hens, broilers and fattening turkeys decreased or remained unchanged compared with 2016, whereas in breeding turkeys it slightly increased due to *S*. Typhimurium. This last finding seems to be related to the situation in few MS.

The analyses of the time trends, since the implementation of the NCP from 2007 to 2010, showed an overall decreasing **prevalence of flocks positive to target *Salmonella* serovars** in all poultry species, except for breeding turkeys, where a stationary trend with minor fluctuations was observed.
Moreover, there was an increasing **prevalence of *Salmonella*-positive flocks** for all poultry categories.

Generally;
Still in the context of NCP (broilers, breeding and fattening turkeys) the **prevalence of target *Salmonella*-positive flocks based on official control samples taken by the CA was generally higher** than that resulting from sampling by FBOp. These differences were more evident for some MS.

Prevalence of target *Salmonella* serovars in laying hens, EU, 2008-2017





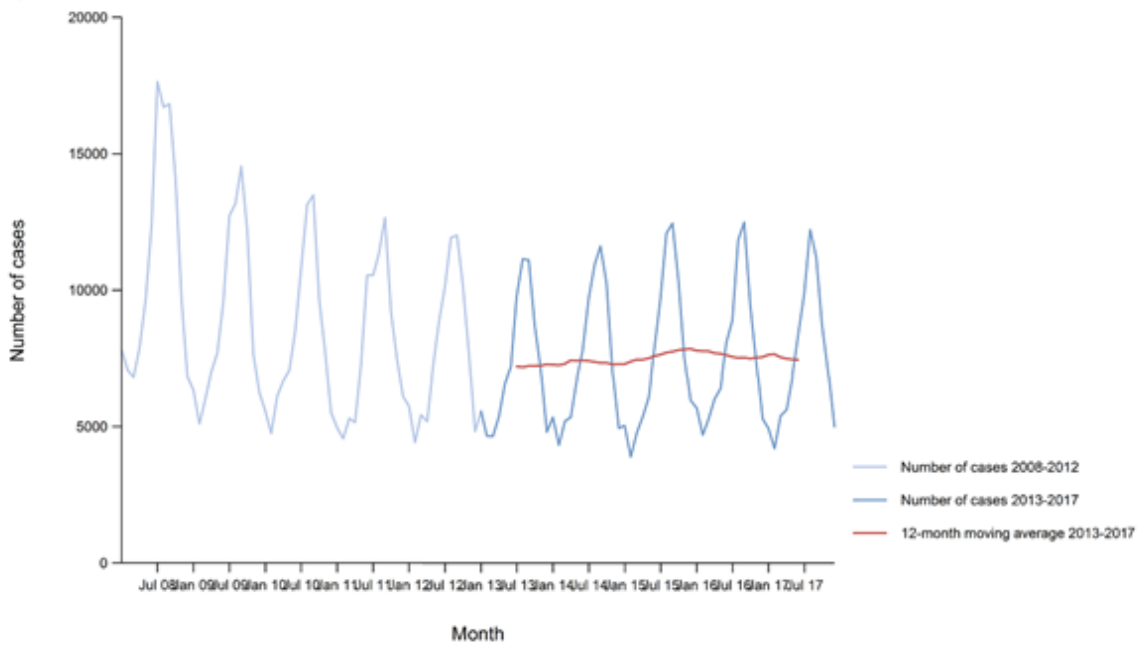
Distribution of reported cases of human salmonellosis, EU, 2017

Table 19. Distribution of reported confirmed cases of human salmonellosis in the EU/EEA, 2015–2017, by the 20 most frequent serovars in 2017

Serovar	2017			2016			2015		
	Cases	MS	%	Cases	MS	%	Cases	MS	%
Enteritidis	38,780	27	49.1	33,325	25	48.5	32,341	25	44.4
Typhimurium	10,593	27	13.4	9,789	25	13.4	12,035	25	16.5
Monophasic Typhimurium 1.4. [5].12:i:-	6,324	16	8.0	5,697	15	8.4	5,786	15	7.9
Infantis	1,805	28	2.3	1,658	25	2.4	1,655	25	2.3

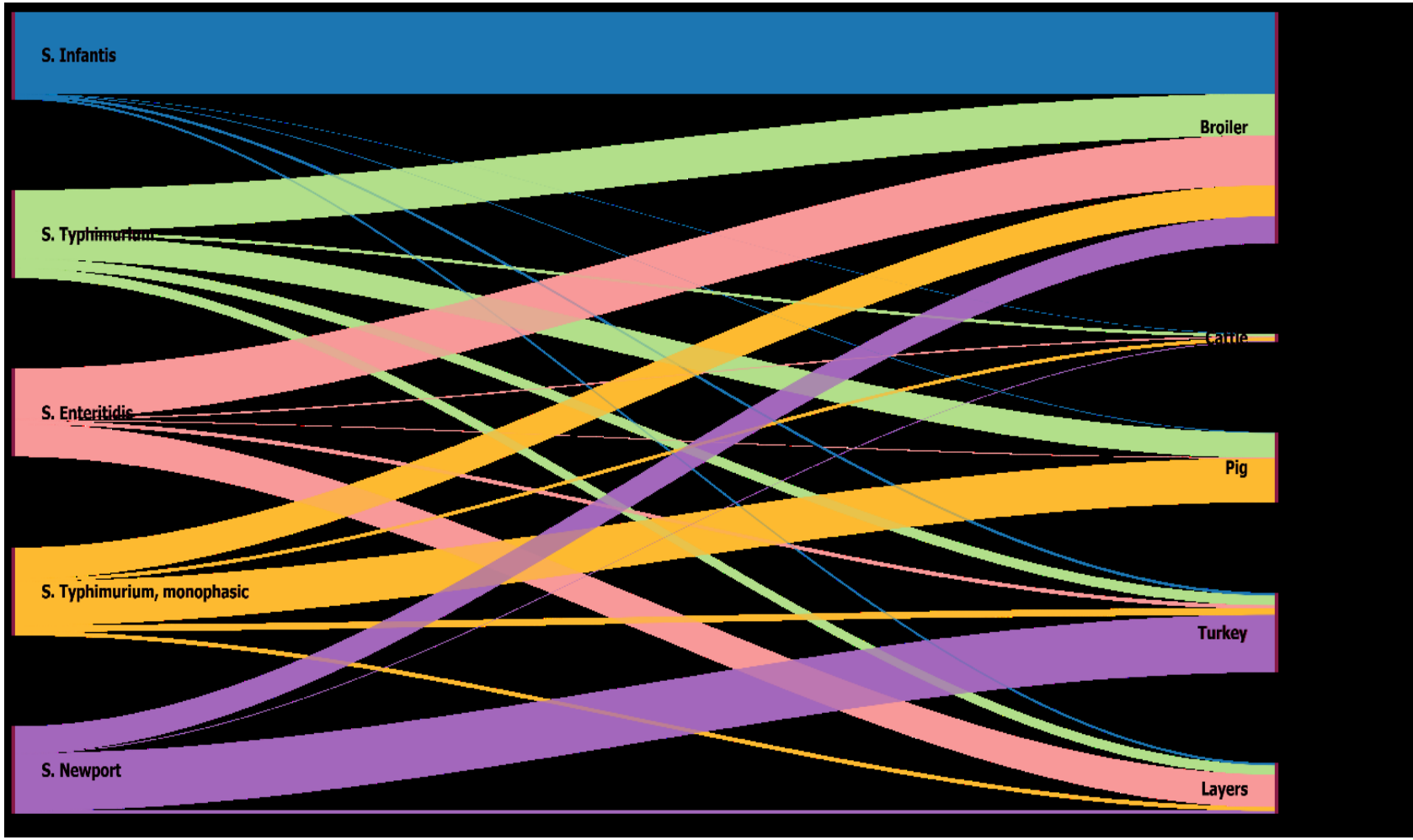
Table 20. Distribution of reported cases of human salmonellosis acquired in the EU, 2015–2017, by the five most frequent serovars in 2017

Serovar	2017			2016			2015		
	Cases	MS	%	Cases	MS	%	Cases	MS	%
Enteritidis	32,251	25	61.2	26,781	23	57.1	25,788	22	54.7
Typhimurium	6,807	25	12.9	6,725	23	14.3	7,971	22	16.9
Monophasic Typhimurium 1.4. [5].12:i:-	2,098	16	4.0	2,088	16	4.5	2,303	14	4.9
Infantis	1,164	22	2.2	1,099	21	2.3	1,137	21	2.4



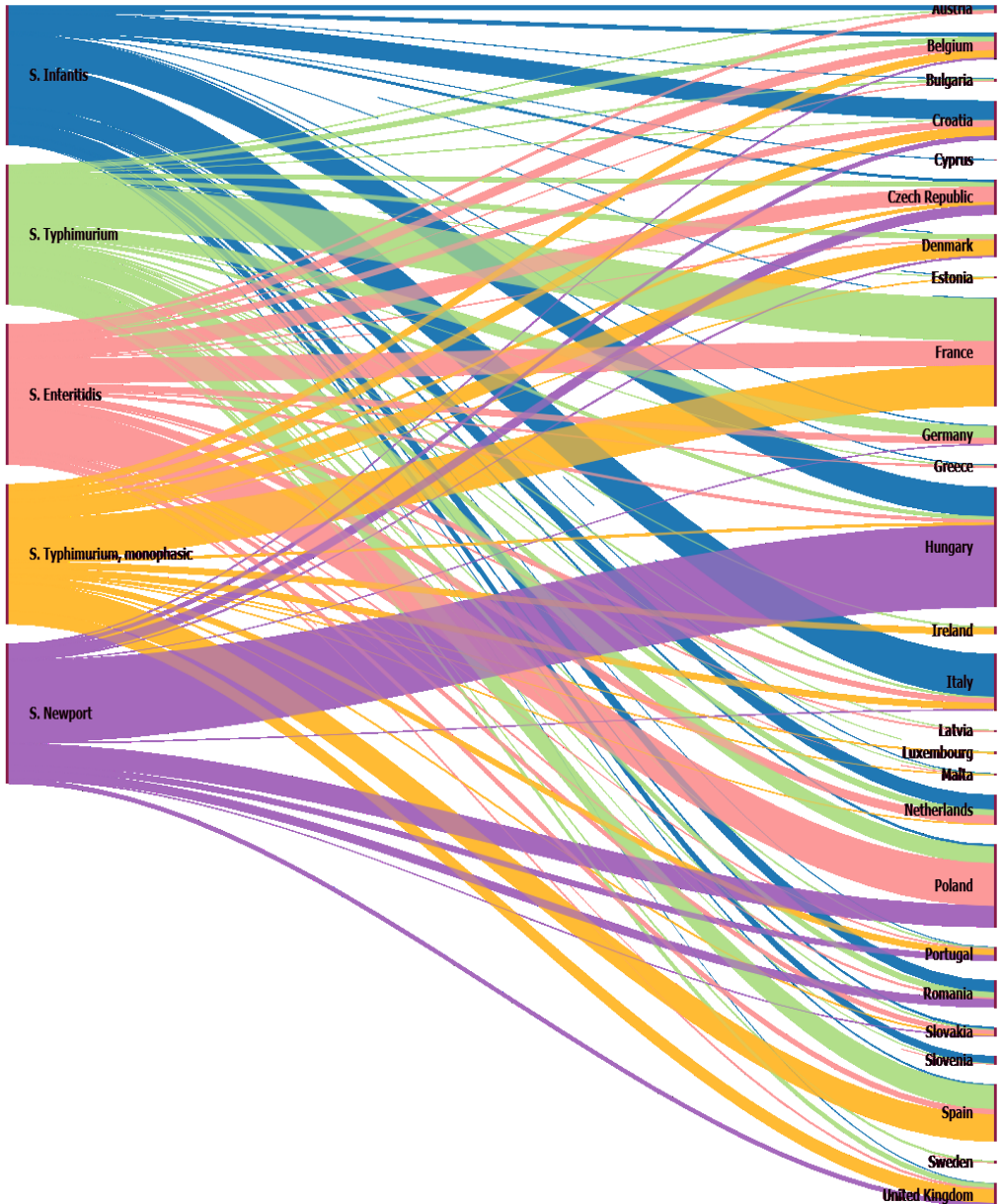
Distribution of Top-5 human serovars, 2017, by source

Sankey diagram of the distribution of the five most commonly reported EU domestic human *Salmonella* serovars, among animal and food isolates (layers, broiler, cattle, pig and turkey), by source, MS, 2017



Distribution of Top-5 human serovars, 2017, by MS

Sankey diagram of the distribution of the EU top-five *Salmonella* serovars in human salmonellosis acquired in the EU, by reporting Member States, EU, 2017

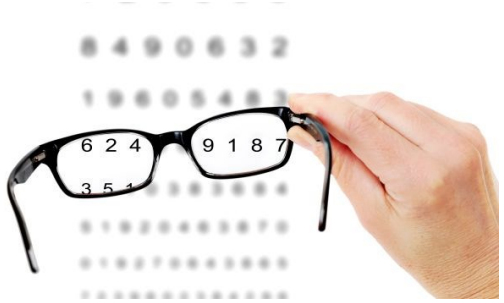


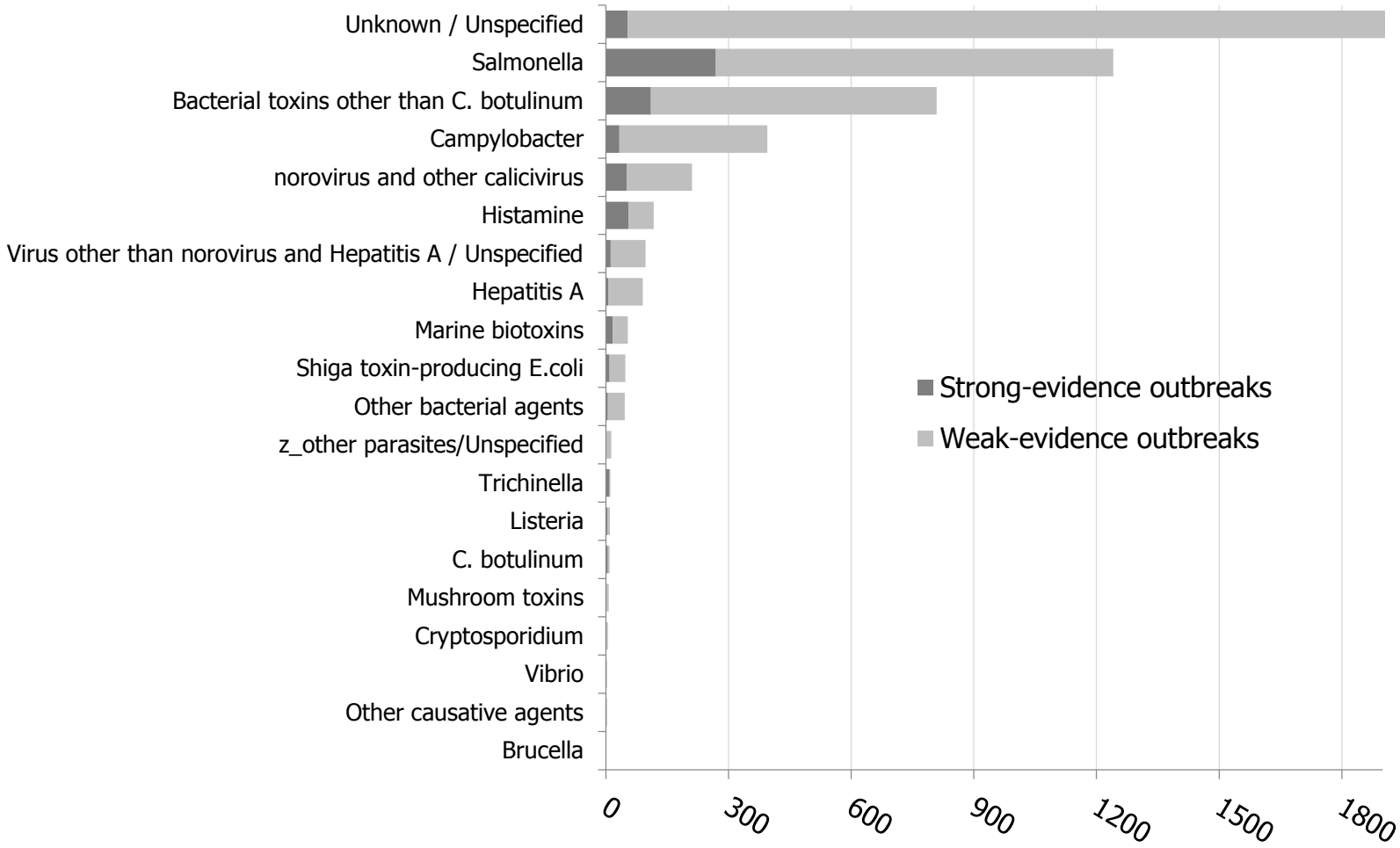
FBO surveillance data, EU, 2017

- **643 strong-evidence**
- **4,436 weak-evidence**

= number of FBO during 2017 (in total 5,079)

~ average: 100 FBO per week

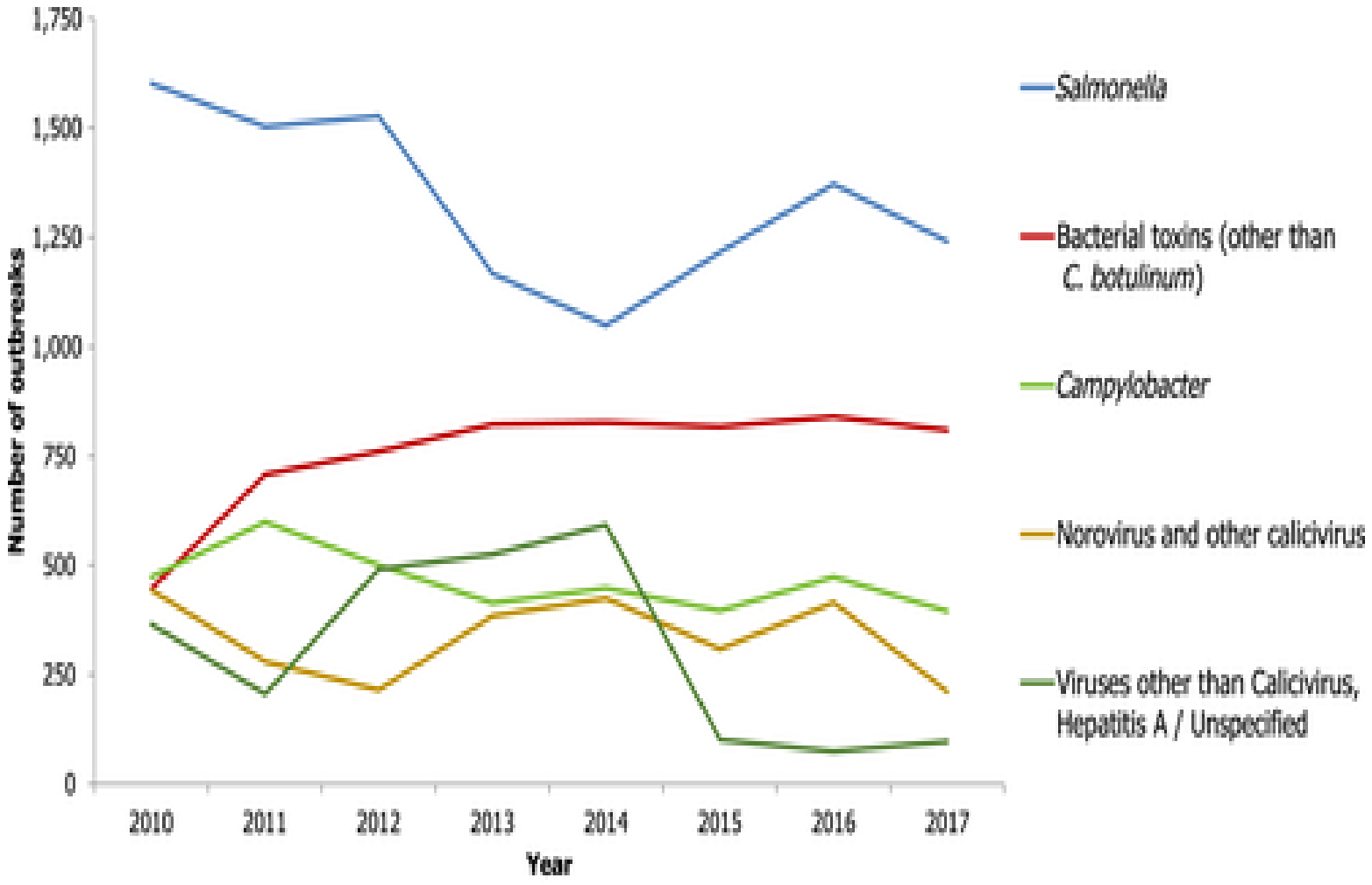




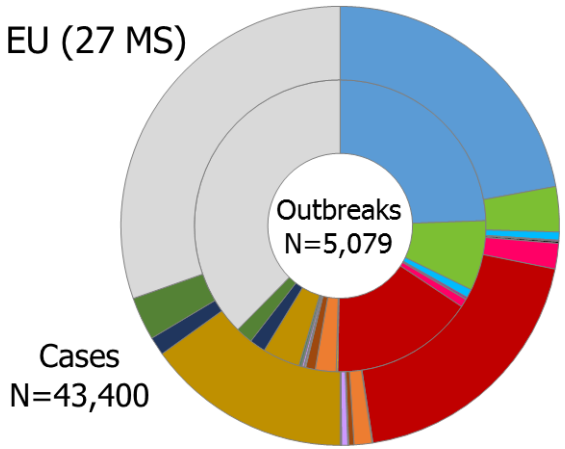
43,400 involved cases, 4,541 hospitalisations and 33 deaths (reported by MS)

FBO surveillance data by causative agent, EU, 2010 - 2017

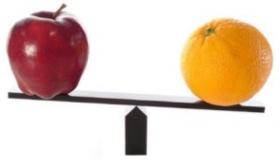
Number of food-borne outbreaks reported in the EU Member States from 2010 to 2017, by causative agent

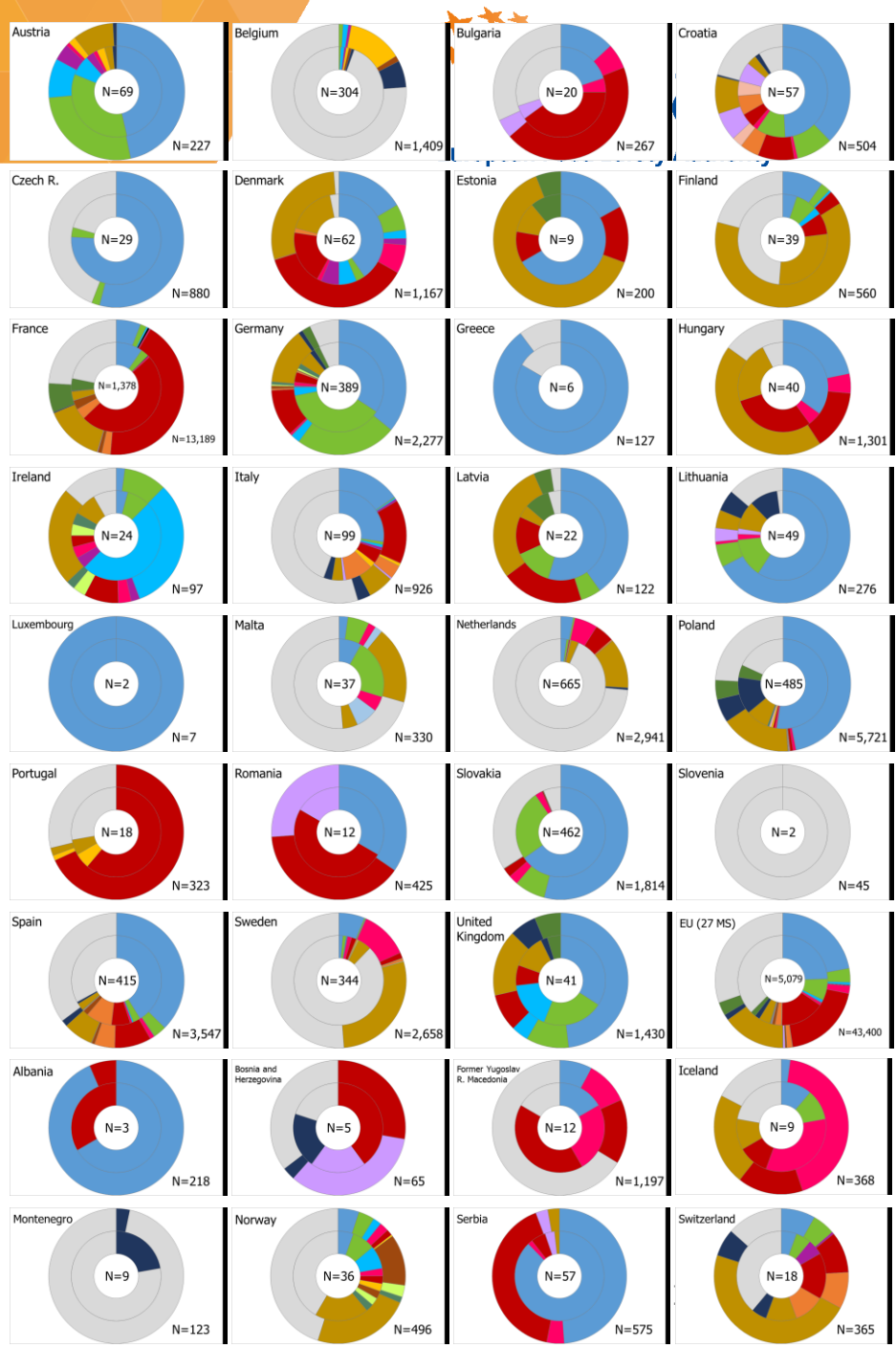


FBO surveillance data, EU, 2017



- Salmonella
- Campylobacter
- STEC
- Listeria
- Vibrio
- Brucella
- other bacterial agents
- Bacterial toxins other than C. botulinum
- C. botulinum
- Histamine
- Marine biotoxins
- Mushroom toxins
- other causative agents
- Trichinella
- Cryptosporidium
- other parasites
- norovirus and other calicivirus
- Hepatitis A
- other viruses
- Unknown / unspecified





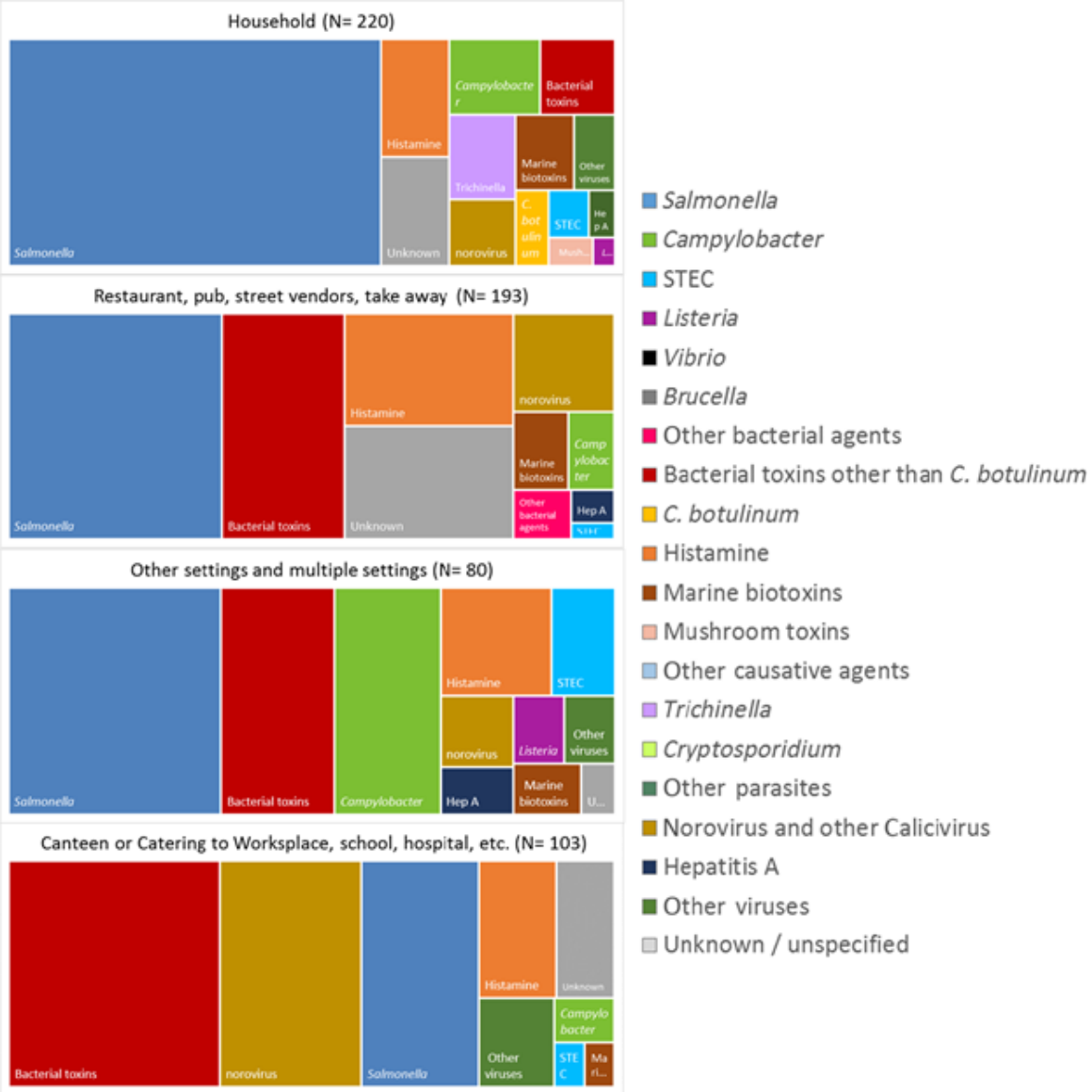
FBO surveillance data, EU, 2017

What were the locations ('settings') where the food was consumed?

About one in three strong-evidence FBO happened at **home ('Household') (34.2%)**, followed by **'Restaurants, pubs, street vendors and take away' (30.0%)**, 'Canteen or catering to workplace, school, hospital' (16.0%) and 'Other settings' (such as farms, fairs and festivals, other) (12.4%).

What were the causative agents of strong-evidence FBO reported in those different settings?

They are shown in the figure to the right: in the home setting the diversity of agents was largest, and *Salmonella* was more frequently reported compared to other settings.



Summary: *Salmonella* FBOs, EU, 2017

Salmonella was the most frequently reported causative agent in the EU (1,241 foodborne outbreaks and no waterborne outbreaks; 24.4% of total outbreaks, 25 MS).

Outbreaks of salmonellosis had the **highest impact** in terms of human cases (9,600, 22.1% of all outbreak cases), hospitalisations (2,227, 49.0% of all hospitalisations) and deaths (11, 33.3% of all deaths).

***S.* Enteritidis** was by far the most frequently reported *Salmonella* serovar and totalled 61.1% (N=758, 23 MS) of *Salmonella* FBO, corresponding to 14.9% - **about one in seven - of all reported FBO at the EU level**. Two MS (Poland and Slovakia) accounted together for the 63.3% of all outbreaks caused by this serovar, in the EU.

Outline

- *The stalled Salmonella situation in EU*
- Assessment of current EU reduction targets
- *Discussion/questions/proposals*

Zoonotic diseases: progress has stalled

Background and Terms of references

The annual number of reported confirmed human salmonellosis cases in the EU increased after 2014.

This triggered an investigation of potential *Salmonella* control options in poultry flocks and their public health impact by

(a) changing the target serotypes in breeding hens (Enteritidis, Typhimurium, Infantis, Virchow and Hadar) while maintaining the current Union target (1%) (~ ToR 1) and

(b) reducing the target for laying hens for *S*. Enteritidis and *S*. Typhimurium from 2 to 1% (~ ToR 2).

Approach ToR 1

- To **update the literature review** in the previous BIOHAZ SO on the impact of setting a new target for the reduction of the *Salmonella* prevalence in breeding hen flocks of *G. gallus* (EFSA, 2009), supplemented by **descriptive analysis** of serovar distributions on breeding, laying and broiler flocks based on data from 2014 to 2016.
- The connection with the **impact on human health was achieved through a descriptive analysis** of serovar distributions and through ToR 2, which provided an indication of the relative contribution of the laying hen and broiler reservoirs to human salmonellosis cases, taking underestimation into account.

Answer ToR 1

Scenario 5 serotypes

- **Serovar 1, 2 and 3:** justification for retaining ***S.* Enteritidis, *S.* Typhimurium** (incl. monophasic variants) and ***S.* Infantis** in the target
- Apart from these, the predominant serovars in humans are subject to change on an annual basis => a new top 5 could become out of date quite rapidly, as has occurred for ***S.* Virchow** and ***S. Hadar***
- **Serovar 4**: ***S.* Kentucky** as it has spread among broiler populations in several EU MS recently, and because of antimicrobial resistance
- **Serovar 5**: several options
  - ***S.* Heidelberg** on a precautionary basis to prevent dissemination of epidemic strains
  - ***S.* Thompson** based on its occurrence in breeding flocks and dissemination in a small number of MS, plus enhanced virulence of some strains
  - a **variable fifth serovar** in MS-specific national prevalence targets in breeding flocks

Answer ToR 1

Scenario all serotypes

- A target that incorporates all serovars is **expected to be more effective** than one for selected serovars as the most relevant serovars in breeding flocks vary between MS and over time. It would be more effective in reducing the dissemination of all serovars, incl. newly emerging strains with 'epidemic potential' and the re-emergence of previously specified target serovars

Note: It was not possible to assess the impact of proposed changes of target serovars on laying hen or broiler populations, or on human salmonellosis cases

Approach ToR 2 and answer

Approach

- Use the '*Salmonella* source attribution model (SAM)', based on the microbial subtyping attribution approach using various animal/food sources of *Salmonella*: layers, broilers, turkeys and pigs
- Similar to the previous scientific opinions of the BIOHAZ Panel (EFSA BIOHAZ Panel, 2011a, 2012)
- Most recent 2016 data, when available, was used (28 serovars)

Answer

- If a 1% target for the current target serovars in laying hen flocks would be met in the 23 EU MSs included in the SAM
  - the number of **layer-associated human salmonellosis** true cases is estimated to be reduced by 254,400 CrI_{95}[98,540; 602,700] compared to 2016 (= reduction by 53.38% CrI_{95}[39.11; 65.69]
  - the **overall human salmonellosis estimated true cases** (4.08 million CrI95[2.22; 7.39]) would be reduced by 6.2%
  - *(11.7% was attributed to laying hens; 41.5% to pigs, 24.9% to broilers and 7.5% to turkeys)*

More info

- The Scientific Report "The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2017" is at : http://www.efsa.europa.eu/en/efsajournal/pub/5500

- The Scientific Opinion "*Salmonella* control in poultry flocks and its public health impact" has been published at https://efsa.onlinelibrary.wiley.com/doi/full/10.2903/j.efsa.2019.5596

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Zoonotic diseases: progress has stalled

Outline

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