CHARACTERISATION OF *SALMONELLA* GENETIC CLUSTERS IN IRELAND, 2017-2018

P. Garvey, L. O'Connor, P. McKeown: HSE- Health Protection Surveillance Centre (HPSC), Dublin
N. DeLappe, M. McGuire, J. King and M. Cormican National Salmonella, Shigella and Listeria Reference Laboratory, (NSSLRL) Galway

Background

- The National *Salmonella Shigella* and *Listeria* Reference Laboratory (NSSLRL) alerts Health Protection Surveillance Centre (HPSC) and Public Health Departments of new *Salmonella* genetic clusters, and when previously identified clusters increase in size.
- HPSC has developed a framework for evaluating clusters within its remit.

OBJECTIVES

- To describe identified WGS clusters by size, rate of evolution, and public health actions taken
- To review if amendments are required for interim framework

Materials and Methods

- Salmonellosis cases linked to clusters by whole genome sequencing (WGS) at NSSLRL cross-matched to events on CIDR
- Clusters characterised by size (large ≥4 cases), evolution rate (rapidly-evolving ≥2 cases per week), and correspondence with notified outbreaks on CIDR
- Statistical comparison by Chi square test.

Results

Overall summary

- Two thirds (487/725) sequenced *Salmonella* (2017-2018) apparently sporadic
- Isolates from 290 cases linked to 67 new & two clusters first identified in earlier years, with two cases which appeared sporadic being linked with internationally recognised clusters (71 clusters reviewed below)

Cluster characteristics (Figure 1 and Table 1)

- Median size=2 cases, range 2-36
- Fifteen (22%) were rapidly-evolving
- Outbreaks notified more often for large clusters (p=0.03) and rapidly-evolving clusters (p<0.001)
- Two large general outbreaks & 11 family outbreaks recognised epidemiologically as outbreaks before WGS
- WGS supported identification of two new travel-related outbreaks
- WGS supported linkage of four clusters and two apparently sporadic cases to international incidents
- Most remaining clusters too small or temporally diffuse to investigate further, three very slowly-evolving domestically-acquired clusters (7-11 cases each) continue to be monitored.

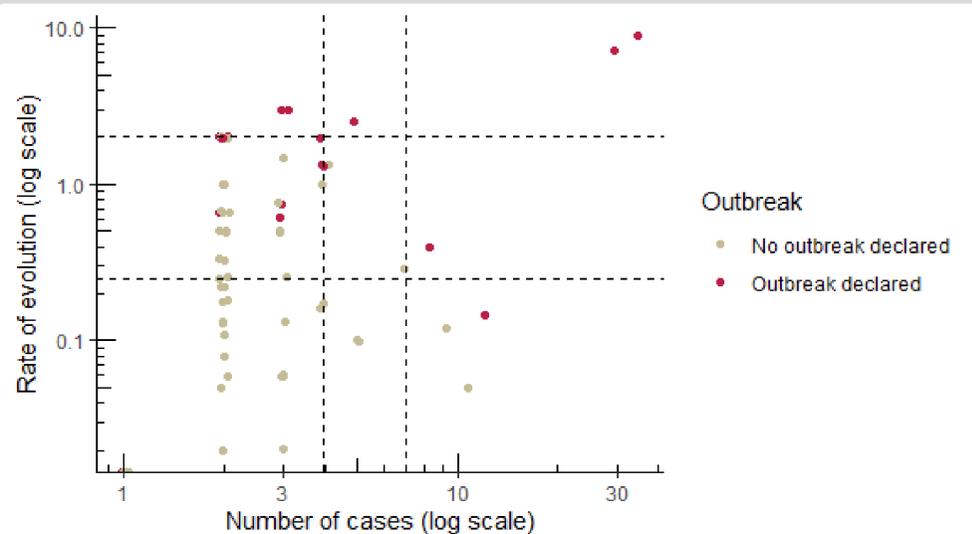Figure 1: Distribution of clusters by size and rate of evolution

Table 1: Number of clusters by size and rate of evolution (number outbreak investigations initiated)

	Rapidly evolving (2 or more per week)	Slowly evolving (0.25 to <2 cases per week)	Very slowly evolving (<0.25 cases per week)	NA	Total
>=7 cases	2 (2)	1 (1)	4 (1)		7 (4)
4-6 cases	2 (2)	4 (2)	4 (0)		10 (4)
<=3 cases	11 (8)	22 (4)	19 (0)		52 (12)
single case				2 (2)	2 (2)
Total	15 (12)	27 (7)	27 (1)	2 (2)	71 (22)

Rapidly evolving clusters with seven or more cases
HSE-East recognised *S.* Brandenburg outbreak associated with food from catering premises
- 35 confirmed cases–link between cases support by WGS
Ruth McDermott, et al 2017. Outbreak of Salmonellosis in North Dublin Epi-Insight Vol18: 6
http://ndsc.newsweaver.ie/epiinsight/19kuplbvzuf1qsl0rhv973?a=1&p=51918516&t=17517774

National travel-related S Typhimurium outbreak linked with pilgrimage site
- First recognised by HSE-North-East
- 18 confirmed cases -4 weeks - 6 HSE-areas—no source identified.
- Link between cases supported by WGS.
Petty-Saphon et al. 2019. OHEJP ASM 2019 Abstract
https://docs.wixstatic.com/ugd/c416fd_ab7cf6709f424a0ca26b4f1c3cd73b22.pdf

Slowly evolving clusters with seven or more cases
Outbreak declared for travel-related *S.* Newport cluster first identified by WGS
- 8 confirmed cases -5 months - same tourist destination -no specific common exposure identified.

Very slowly evolving clusters with seven or more cases
Multi-country outbreak with 17 *S.* Enteritidis (mostly travel-related) Irish cases
- WGS identified Irish cluster and linkage to wider EU outbreak.

Associated with Polish eggs
https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(19)30047-7/fulltext

Cluster of non-travel related *S.* Typhimurium cases being monitored
- 11 mostly over 4 year period –7 cases in 2015

Cluster of non travel-related S. Typhimurium being monitored
- 9 cases identified over 4 year period –6 in 2018

Cluster of non travel-related *S.* Newport
- 7 cases over two years. No common source identified..
N. DeLappe et al Usefulness of WGS Analysis in Distinguishing Between Two Concurrent Outbreaks of Salmonella Newport. Poster presented at International Symposium on Salmonella and Salmonellosis, Sept 2018

Selected other clusters involving more than one household
- Outbreak declared for travel-related cluster first identified by WGS -5 S monophasic Typhimurium cases -2 weeks -travel to the same tourist destination –specific common link not identified.
- Liaised with public health colleagues in Europe about three further small clusters (2-3 cases each) and about two apparently-sporadic travel-associated cases linked to international outbreaks.
European Centre for Disease Prevention and Control/European Food Safety Authority. Multi-country outbreak of Salmonella Agona possibly linked to ready-to-eat food – 26 July 2018. Stockholm and Parma: ECDC/EFSA; 2018.

Implications

- WGS showed majority Irish *Salmonella* cases apparently sporadic
- WGS supported link between cases in known outbreaks, identified new outbreaks, & linked cases to outbreaks identified elsewhere.
- Further linkages with cases in other jurisdictions might be possible when more countries commence WGS
- Comparison with WGS for non-clinical isolates may enable further hypotheses generation
- Based on these analyses, HPSC may consider introducing minimum thresholds for action (based on cluster size and/or evolution rate) in its *Salmonella* cluster evaluation framework