# Review of testing and reporting practices of diagnostic laboratories for STEC in England

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## INTRODUCTION

Shiga toxin-producing *Escherichia coli* (STEC) are of significant public health concern due to their ability to cause severe disease and large outbreaks.[1,2]

Since 2013, increasing diagnostic laboratory use of *stx* PCR has improved detection of non-O157 STEC. However, how many laboratories use *stx* PCR and how results are reported locally are unknown.

## AIM

To gain greater understanding of diagnostic laboratory testing and reporting practices of STEC in England.

In order to:

- Ensure robust processes are in place and appropriate guidance is provided.
- Understand the biases of STEC surveillance and inform the true burden of STEC (O157 and non-O157) nationally.

## METHODS

### Review of SGSS *stx* PCR results

- All *E.coli* samples reported by diagnostic laboratories in England with a record of *stx* gene detection were extracted (01 January 2014 to 31 December 2022) from the Second Generation Surveillance System (SGSS).

  **Exclusion criteria:** Gastrointestinal Bacteria Reference Unit (GBRU) results, culture positive results.

- Test method description and toxin type fields were reviewed.

### Linked dataset

A data linkage of STEC specimens in SGSS and the Gastro Data Warehouse (GDW) was performed (**Figure 1**) to assess how many GDW STEC episodes were reported on SGSS and vice versa.

**STEC specimens:** All *E.coli* specimens with a O157 STEC culture positive or PCR *stx* positive result, confirmed by local diagnostic laboratories or GBRU, with a specimen date from 01January 2022 to 31 December 2022.

**Episodes:** Positive specimens from the same person within 90 days were considered one episode.

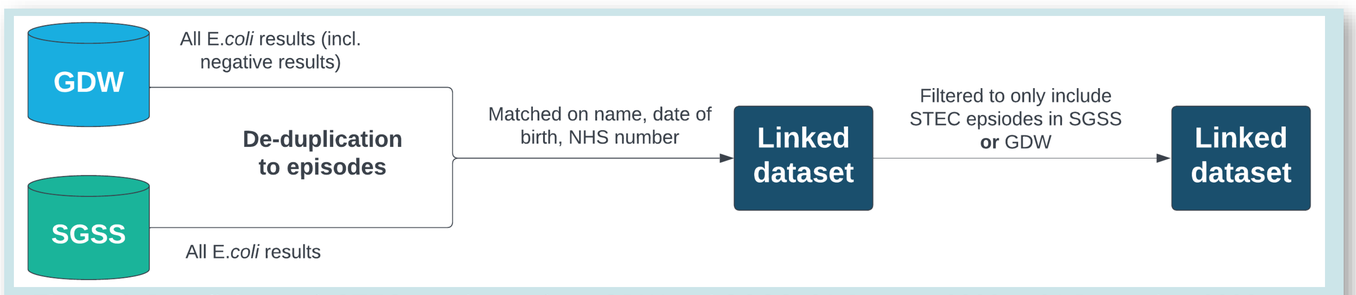


**Figure 1.** Data linkage of STEC specimens from GDW and SGSS, 01 January 2022 to 31 December 2022

## RESULTS

### Review of stx results in SGSS

- Between 2014 and 2022 159 local diagnostic laboratories reported an *E.coli* result on SGSS.
- 27 laboratories (17%) reported 7,317 culture negative records with *stx* gene detection.
- 5 different variations of reporting *stx* gene detection were used (**Table 1**).
- 5,204 records (71%) had a test method description of PCR (**Figure 2**). Other test method descriptions included culture (1,613, 22%), other technique (181, 2%) and unknown (242, 3%).
- 17 laboratories reported a *stx* result with a test method of PCR. Nearly three quarters of *stx* results (3,710, 71%) were reported by laboratories in the South East.

| Toxin Type Field | Number of records | % |
|---|---|---|
| VT+ | 3,523 | 48 |
| SHIGA-LIKE TOXIN PRODUCING | 2,469 | 34 |
| VT1/VT2/VT1+2 | 925 | 13 |
| TOXIN DETECTED | 371 | 5 |
| STX1/2 (SHIGA TOXIN 1 AND SHIGA TOXIN 2) | 29 | 0 |
| Total | 7,317 | 100 |

**Table 1**. Review of SGSS toxin type field for records with stx gene detection reported by diagnostic laboratories, 2014 to 2022

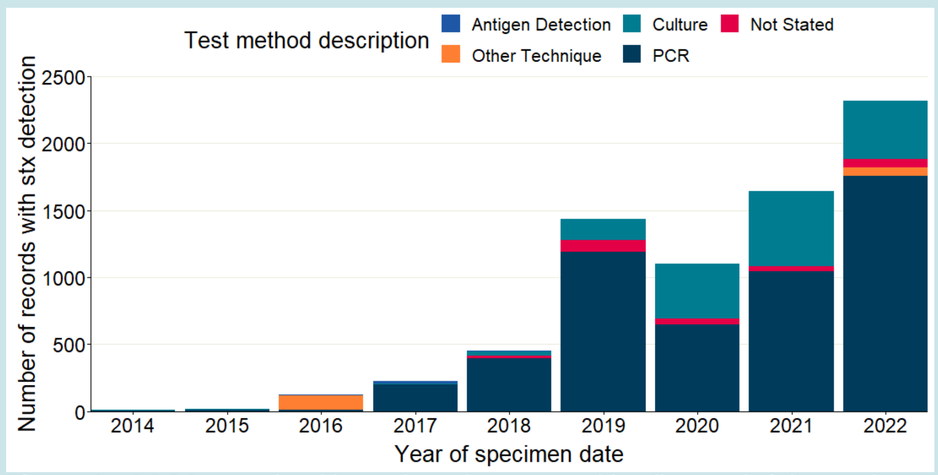


**Figure 2.**, SGSS records with *stx* detection reported by diagnostic laboratories , by test method, 2014 to 2022

### Linked dataset

In 2022 there were 2,827 STEC episodes on GDW, of which 2,250 (80%) had a linked STEC episode in SGSS (**Figure 3).**

- 779 (35%) were O157, 1,276 were non-O157 (57%) and 195 (9%) were culture negative, PCR positive.
- Of the O157 episodes, 634 (81%) had a local result and a GBRU result on SGSS.

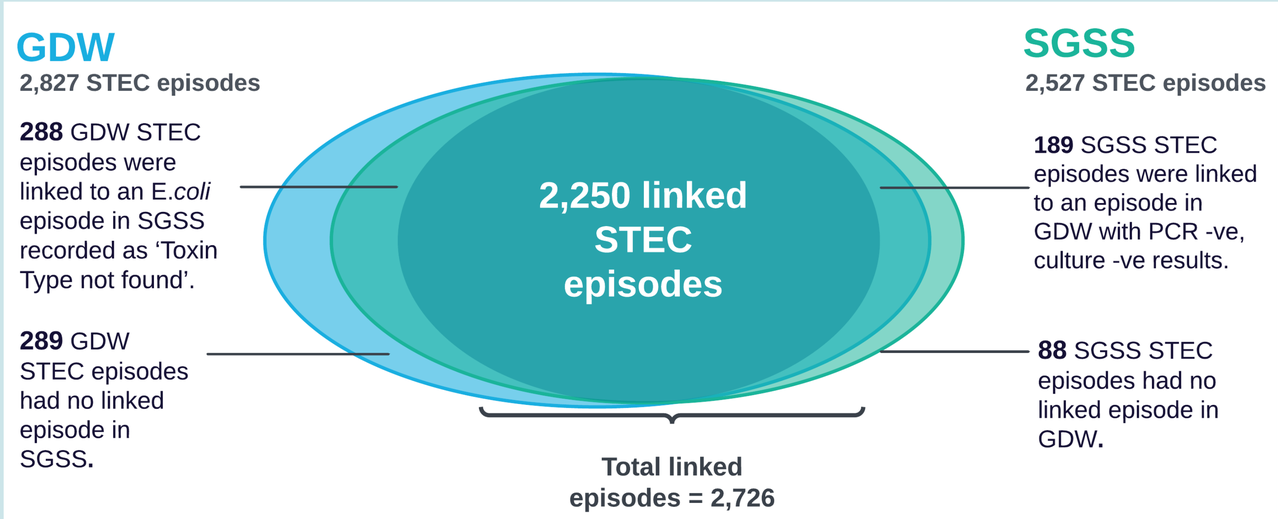


**Figure 3.** Data linkage results of STEC episodes in GDW and SGSS, 2022

SGSS

**289** GDW STEC episodes were not reported on SGSS:

- Samples referred from 55 different diagnostic laboratories
- Evenly distributed throughout the year
- Majority (215, 74%) were culture negative, PCR positive.
- Only 8 O157 not reported on SGSS.

GDW

**88** SGSS STEC episodes had a local PCR positive sample not referred to the reference laboratory.

- Samples from 22 diagnostic laboratories.
- Majority (71, 81%) were culture negative, PCR positive. Of these, 60 (85%) had a test method description of PCR.

## DISCUSSION

There is a lot of variation in how diagnostic laboratories report STEC data in SGSS in England.

Not all laboratories report *stx* results in SGSS with a test method description of PCR. Therefore, this field cannot be used as a reliable method to determine laboratory use of PCR for *stx* detection.

Not all laboratories report local preliminary O157 STEC results in addition to confirmatory GBRU results.

Some laboratories perform PCR locally but do not refer the samples to GBRU. Without data linkage to GDW it is currently not possible to capture these results for STEC surveillance.

Due to the lack of a common identifier across SGSS and GDW, linkage is not straightforward. Errors are likely to occur because of mismatched personal information across the two datasets.

## RECOMMENDATIONS

- Including the MOLIS ID in SGSS data would allow for quick and accurate reconciliation between GDW and SGSS, facilitating regular audit.
- Guidance for diagnostic laboratories on how to report STEC results would ensure consistency in the reporting of *stx* data and enable SGSS to be used to determine the testing methodology used by each laboratory.
- Ensuring the reporting of local O157 STEC results in SGSS prior to GBRU confirmation would allow SGSS data to be used to detect early warning signals of exceedances.

## REFERENCES

1. Byrne, L., Jenkins, C., Launders, N., Elso, R. and Adak, G., 2015. The epidemiology, microbiology and clinical impact of Shiga toxin-producing *Escherichia coli* in England, 2009–2012. Epidemiology and Infection, 143(16), pp.3475-3487.
2. Vishram, B. Jenkins, C. Greig, D. et al., 2021. The emerging importance of Shiga toxin-producing *Escherichia coli* other than Serogroup O157 in England. Journal of Medical Microbiology, 70(7).