COVID-19 Robot surveillance weekly report 14/09/2021

Report and analysis by: HPSC COVID-19 Robot team

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Project summary

Background

HSE-HPSC developed a COVID-19 surveillance robot to align COVID-19 data across HSE information systems on behalf of regional HSE-Public Health departments (DPHs). The DPHs use CIDR to process laboratory or clinical notifications, apply case definitions and input enhanced surveillance information from contact-tracing centres. On average, it takes 26 minutes per case.

Aim

The robot was rapidly developed to navigate the national infectious disease reporting system (CIDR), replicate human behaviour and automate three manual sub-processes (SP) to deliver timely data for epidemiological reporting by the Health Protection Surveillance Centre (HPSC) to the National Public Health Emergency Team (NPHET);

1. **SP1**
   Laboratory records: process COVID-19 laboratory notifications on CIDR by either linking to a current patient on the system or by creating a new patient.
2. **SP2**
   Infectious disease notifications: create a COVID-19 notification on CIDR, termed a 'CIDR event', by applying current case definitions.
3. **SP3**
   Contact-tracing surveillance data: update the COVID-19 notification with data collected by the contact tracing centres via the Covid Care Tracker (CTC) i.e. information on symptoms, pre-existing clinical conditions and exposures of interest requiring immediate public health investigation to contain/limit the spread of COVID-19 (travel, mass gatherings etc.).

Results

1. **Successful integration:**
   The robot aligned COVID-19 surveillance data across HSE information systems.
2. **Successful time-saving result:**
   The robot operates quicker than a human, 3.3 minutes per case compared to 26 minutes. Therefore, based on a case-load of 100 daily cases, the robot saves 38 hours per day (400 cases, saves 151 hours).
3. **The ability to operate outside of core hours:**
   The robot currently operates for 22 hours per day to maximise its benefit. This reduces overtime and out of hours work by the regional scientists, resulting in overtime cost-savings for the HSE.
4. **Successful degree of automation:**
   The robot processed greater than 80% of cases just like a human. The remaining 20% are flagged by the robot for human processing as per the agreed robot business rules. The Public Health teams review and investigate these cases on a daily basis (Appendix 1).
5. **Sustainable change in surveillance system:**
   SP1 and SP2 can both be extended to other infectious diseases being notified on CIDR, proving a worthwhile investment in national infectious disease surveillance. The SP3 process is specific to COVID-19 as the collection of enhanced surveillance by contact tracing centres, is a pandemic response and a departure from normal CIDR business process for collecting disease-specific information.

Report on key performance indicators for COVID-19 data processing

1. COVID-19 robot activity

Transactions account for records the robot has processed; laboratory records (SP1), infectious disease notifications (SP2) enhanced surveillance data collected via the contact tracing centres' positive patient assessments (SP3), whole genome sequencing (SP4) and vaccination data (SP5) (activity displayed in graph below).

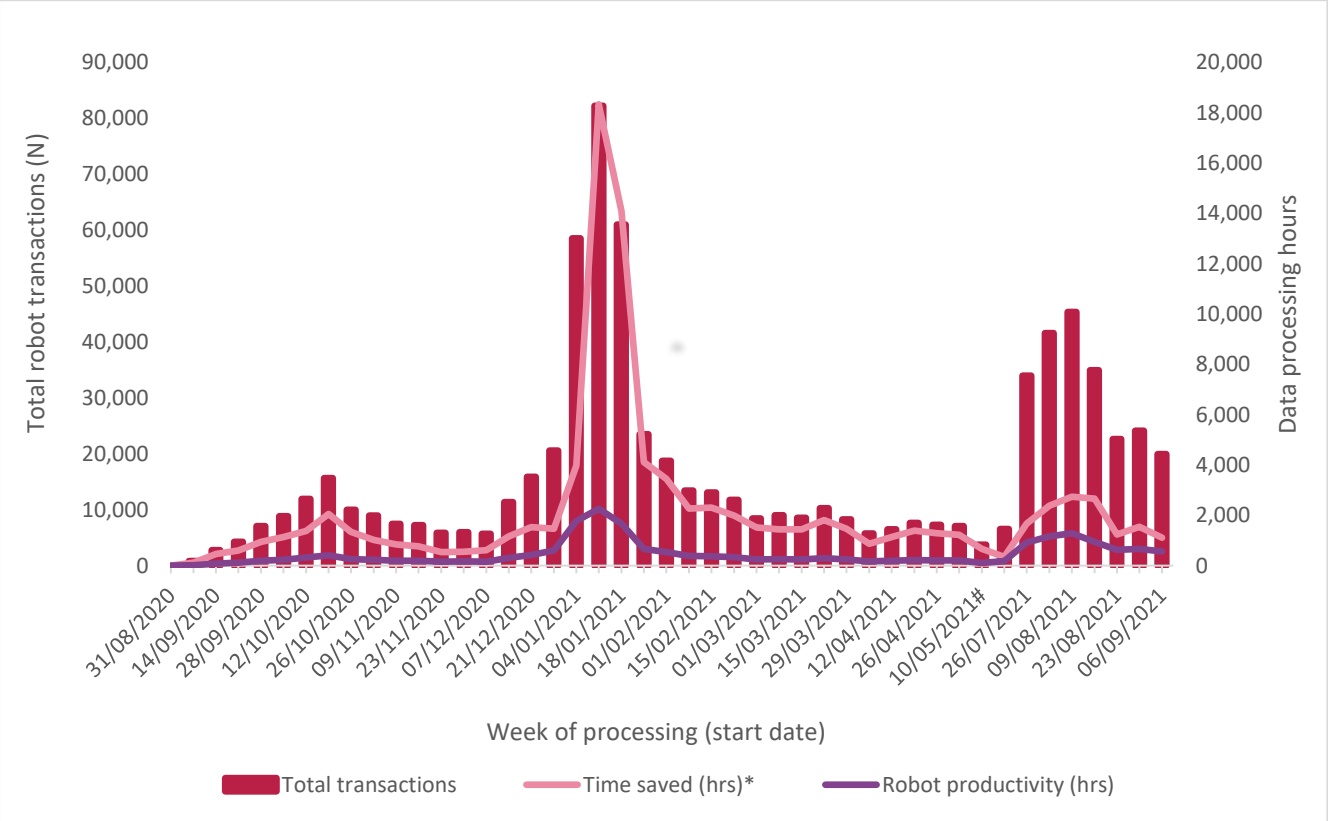


Figure 1: Weekly robot activity of COVID-19 data processing; total transactions, robot productivity (hrs) and time saved (hrs) for public health teams

*Time saved (hrs): Calculated by comparing the average robot processing time compared to human processing time of successful transactions. Average human processing time calculated during robot development, average robot processing time continuously updated.
10/05/2021#: Week of the cyberattack. Data unavailable from 14/05/2021 – 19/07/2021 inclusive. SP3 paused 14/05/2021 – present.
Data source: HSE RPA CoE weekly output files up to 12 September 2021

2. Timeliness of COVID-19 data processing: Laboratory / CIDR

This graph displays the data by time comparing when the laboratory authorised the test result, to when the infectious disease notification/event was created on CIDR.

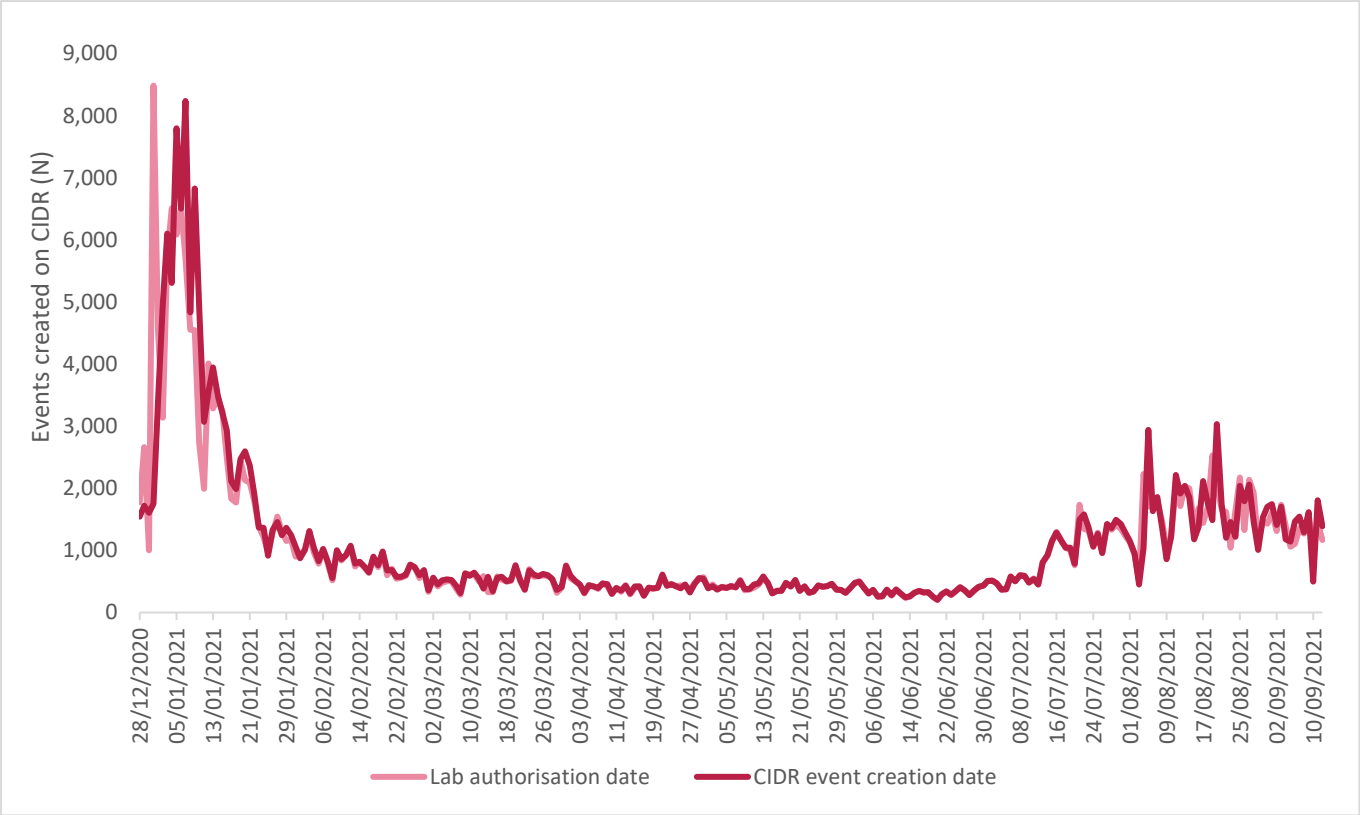


Figure 2: Timeliness of daily COVID-19 data processing; laboratory authorisation date compared to CIDR event creation date

Data source: CIDR report extracted 14 September 2021 at 09:30

3. Resources for COVID-19 data processing: human/ robot (SP2)

This graph displays the daily case data by whether the infectious disease notification/ CIDR event was created by a human working in a regional Public Health department or by the national COVID-19 robot, and the percentage of notifications/ events created by the robot in total (SP2).

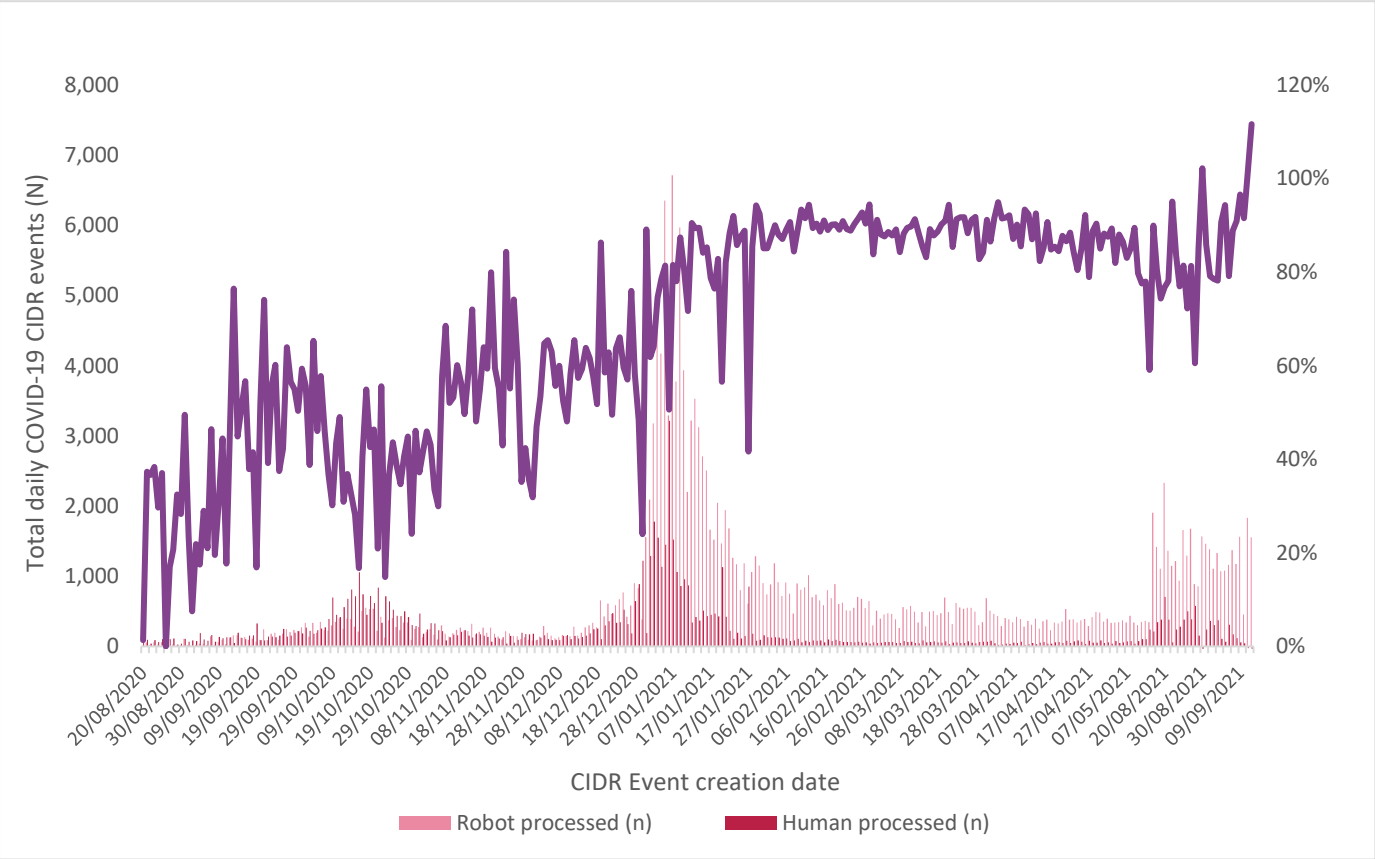


Figure 3: COVID-19 data processing; CIDR event creation processing by robot compared to human and proportion of total events created by the robot

Data source: CIDR report extracted 14 September 2021 at 09:30
Data source: HSE RPA CoE weekly output files up to 12 September 2021

Data between 14/05/21 and 17/08/21 are excluded due to the cyberattack.

4. Robot SP1: COVID-19 laboratory records

COVID-19 laboratory records are processed on CIDR by either linking the record to an existing patient on the CIDR system or by creating a new patient (activity displayed in graph below). Exceptions are records that are flagged for human investigation by public health based on the nationally agreed business rules for the COVID-19 robot. Exceptions are flagged mainly due to data quality or case definitions and are applied to strengthen the quality of COVID-19 data on CIDR.

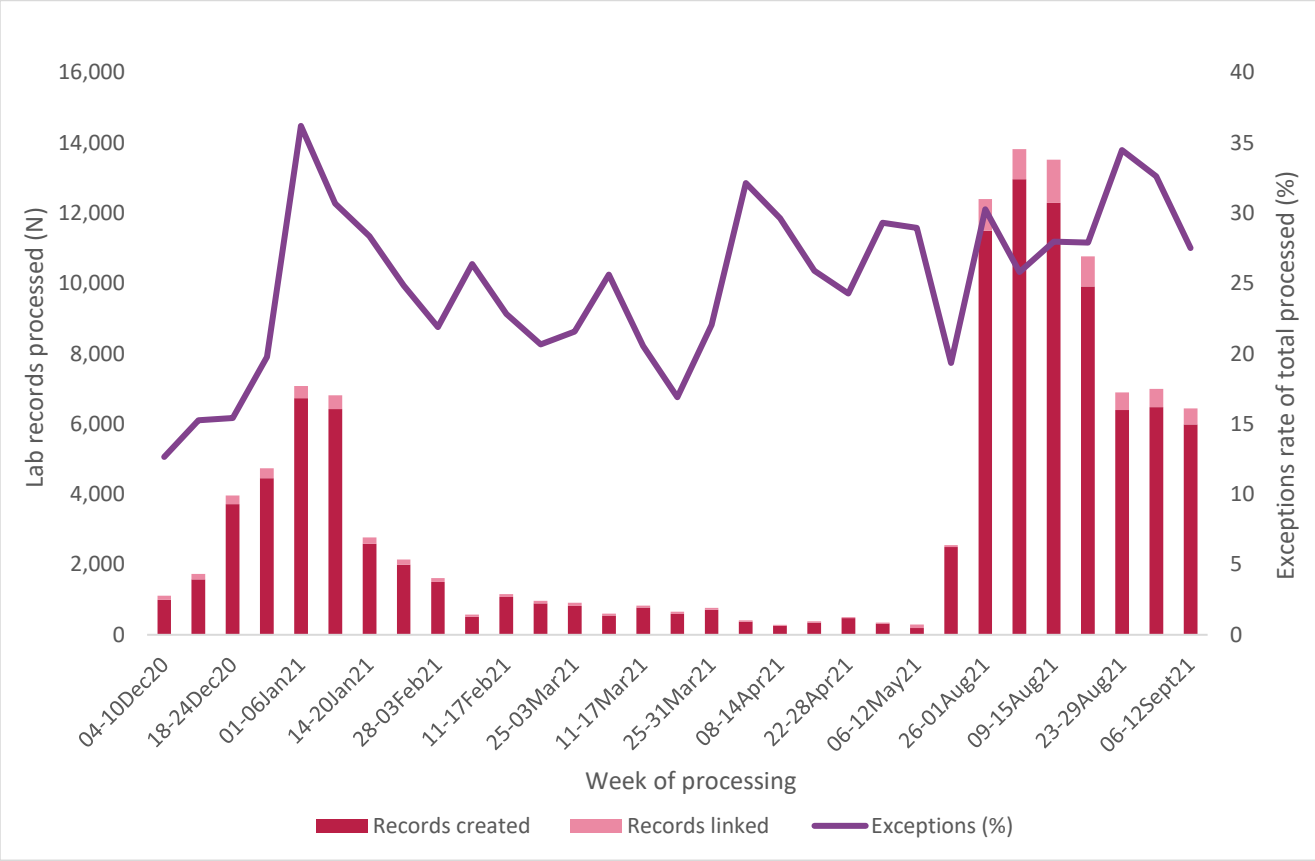


Figure 4: COVID-19 robot data processing SP1; Laboratory records by week and proportion of exceptions for public health investigation

Data source: HSE RPA CoE weekly output files up to 12 September 2021

5. Robot SP2: COVID-19 CIDR event creation

COVID-19 infectious disease notifications are created on CIDR by applying current case definitions and are termed a 'CIDR event' (activity displayed in graph below). Exceptions are records that are flagged for human investigation by public health based on the nationally agreed business rules for the COVID-19 robot. Exceptions are flagged mainly due to data quality or case definitions and are applied to strengthen the quality of COVID-19 data on CIDR.

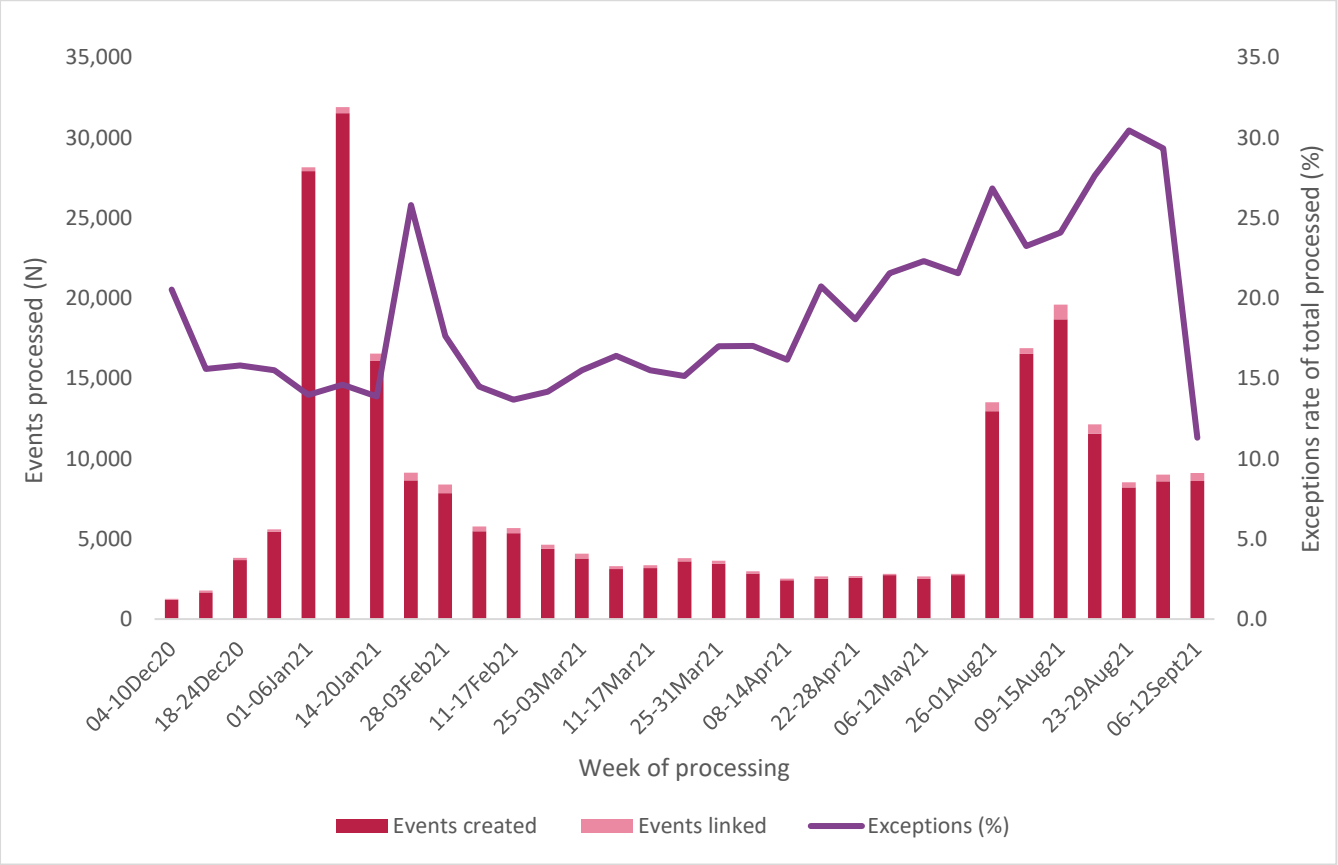


Figure 6: COVID-19 robot data processing SP2; CIDR event creation by week and proportion of exceptions for public health investigation

Data source: HSE RPA CoE weekly output files up to 12 September 2021

8. Robot SP4: COVID-19 whole genome sequencing

Whole genome sequencing data from COVID-19 laboratory records are robotically processed to update a CIDR event. SP4 is currently in the live trial stage since late August; 57 records have been processed with 10.5% exceptions. Exceptions are records that are flagged for human investigation by public health based on the nationally agreed business rules for the COVID-19 robot. Exceptions are flagged mainly due to data quality or case definitions and are applied to strengthen the quality of COVID-19 data on CIDR.

9. Robot SP5: COVID-19 case vaccination data

Vaccination uptake data are robotically processed to update a CIDR event (activity displayed in graph below). SP5 is currently live since August; 3,371 records have been processed with 1.9% exceptions. Exceptions are records that are flagged for human investigation by public health based on the nationally agreed business rules for the COVID-19 robot. Exceptions are flagged mainly due to data quality or case definitions and are applied to strengthen the quality of COVID-19 data on CIDR.

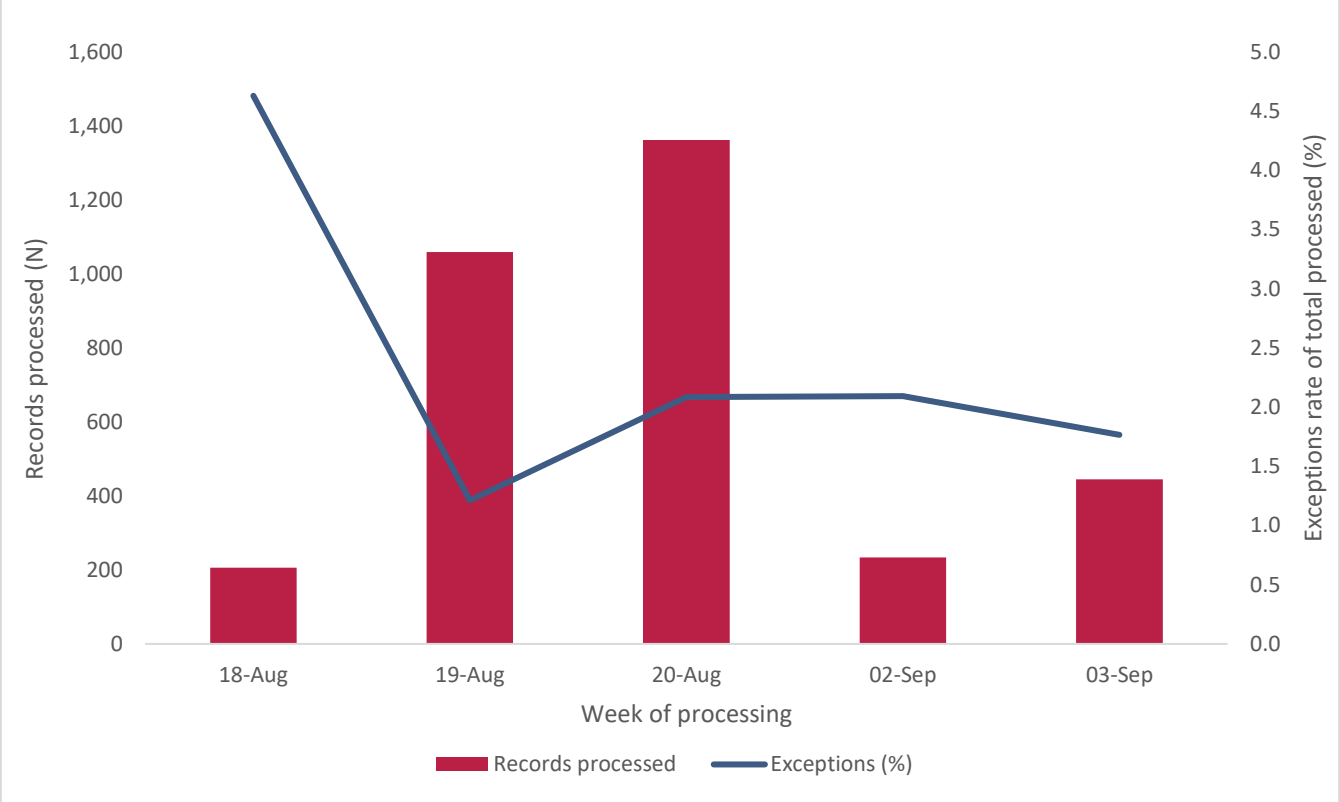
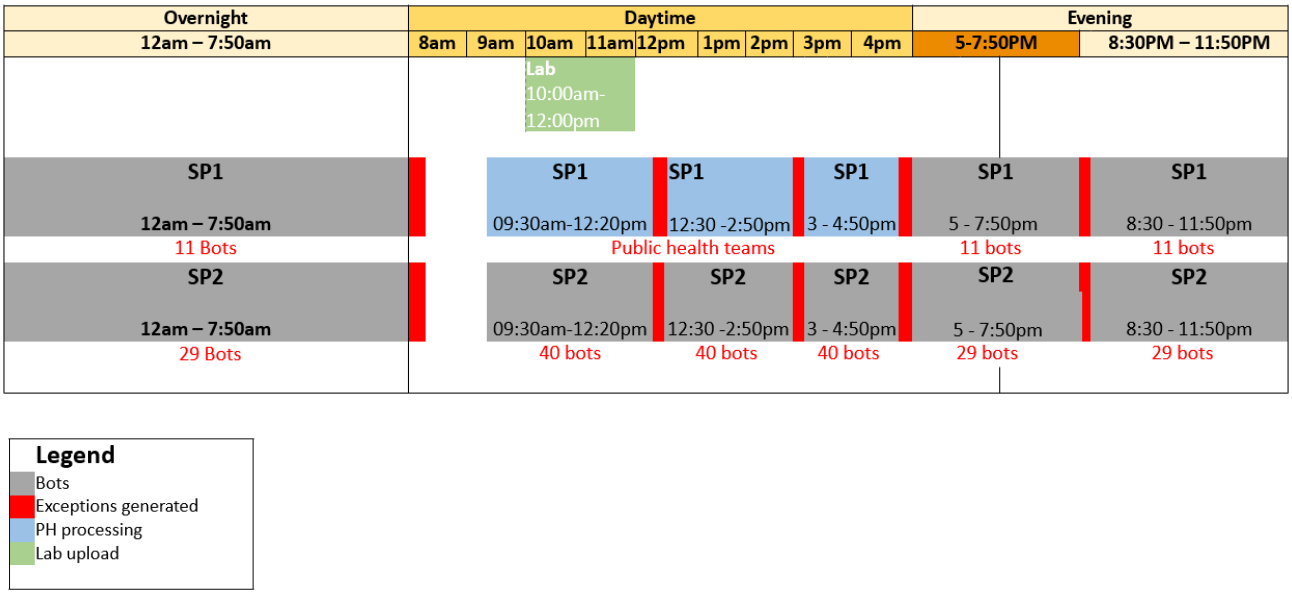


Figure 8: COVID-19 robot data processing SP5; Vaccination data, exceptions by week

Data source: HSE RPA CoE weekly output files up to 12 September 2021

Appendix 1: COVID-19 data processing activity schedule (lab/ public health/robot)

1. Robot operational schedule



2. Surveillance data processing actions/ responsibilities/ dependencies

Public Health teams daytime activity:

- Process SP1 and SP2 Exceptions from the queues, cleared by end of day.
- Manually process CIDR Queue 1 (SP1)

CIDR team activity - Adjust CIDR queue sizes.

- Daytime (9am -6pm): Q1 limit is 200, Q2 is 250.
- Evening/overnight: Q1 limit is 700, Q2 is 500.

Appendix 2: Acknowledgements

The national COVID-19 Robot project was led by the HSE-HPSC on behalf of the scientists in the HSE-Departments of Public Health, in partnership with and supported by HSE-Departments of Public Health, HSE-RPA Centre of Excellence, national diagnostic laboratories and the HSE-Office of the Chief Information Officer

Appendix 3: HPSC COVID-19 robot contact information

Robot support helpdesk: robotsupport@hpsc.ie

Appendix 3: Further information

Further information is outlined on the HPSC website.