Building a novel address enrichment approach to monitor COVID-19 cases in prisons in England throughout the pandemic, evaluated against published data

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SUMMARY

- We built address matching methods to detect COVID-19 cases in prisons in England
- We compared COVID-19 cases in prisons to estimates published by the Ministry of Justice
- The total number of COVID-19 cases in prisons is close but does not fully align between the UK Health Security Agency and the Ministry of Justice

INTRODUCTION

Prisons are known for being high-risk environments where infectious diseases transmit rapidly, and outbreak management is considerably difficult (1).

National surveillance systems often lack information required to inform policy decision and monitor infectious diseases in prisons (2). Obtaining high quality data through routine surveillance systems has also been proven to be difficult due to inaccuracies in recording information and difficulties linking information to medical records.

Both the prison environment and the vulnerability of prisoners are known to be additional risk factors for SARS-CoV-2 infection, (3, 4, 5) which broadens health inequalities among this population.

In an attempt to obtain near real-time information on COVID-19 cases among prisoners, the UK Health Security Agency (UKHSA) built highly sensitive address matching methods to determine the location of residence of all COVID-19 positive episodes.

The is to describe the methods we built to enhance address property information and compare our findings with data manually submitted to the Ministry of Justice and that have been published as official statistics for COVID-19 cases in prisons in England from 2020 to 2023.

METHODS

All individuals testing for COVID-19 are asked for their residential address. Address information was provided via the Second Generation Surveillance System (SGSS) and positive episodes (positive test results ≥90 days apart) are provided in the COVID-19 episode line list, in accordance with statutory legislation.

Address information is cleaned, and geospatial address matching is used to obtain the Unique Property Reference Number (UPRN) and Basic Land Property Unit (BLPU) class information.

Cases from community testing have an application programming interface (API) to generate a UPRN, which is linked to the Ordnance Survey Addressbase Premium via stored procedure to obtain remaining address information.

BLPU classes are used to determine which cases reside in a prison and a line list of cases residing in prisons is generated for national surveillance and for the Health Equity and Inclusion Division.

We compared the COVID-19 prison cases detected through our enhancement methods to those published by the Ministry of Justice (6). Furthermore, a subset of prison data was used to compare prison data directly.

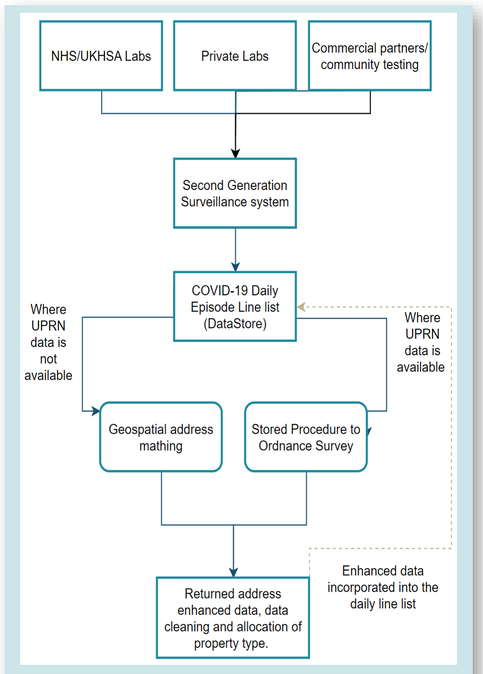

Figure 1. Data flow diagram for COVID-19 case address enrichment

RESULTS

From 30 January 2020 to 05 June 2023 a total of 20,831,984 COVID-19 cases were reported. A total of 786,077 (3.8%) cases were unable to be address enriched and a total of 35,693 (0.17%) individuals were recorded to have had COVID-19 in prison. The trends in prison cases aligned with the trends observed in residential settings and care homes (Figure 2).

From 02 February 2020 to 23 February 2023, 35,618 episodes (33,594 first infections) were seen in among prisoners. This was 28.1% fewer cases than published reports by the Ministry of Justice (49,510) during the same period.

When comparing prison level data for two of the 19 prison regions, there were 3.1% fewer cases reported by UKHSA compared to the Ministry of Justice (Table 1, Figures 3, 4).

Figure 2. Crude trends in prison cases compared to residential properties and care homes throughout the COVID-19 Pandemic in England.

Table 1: Total number of cases in specific prisons from the Ministry of Justice and UKHSA

Dataset		Case counts
Ministry of Justice	Total	12,222
	Total with positive episodes	3,917
	Total positives with reinfections occurring in <90 days.	3,730
UK Health Security Agency	Total positive episodes	3,616

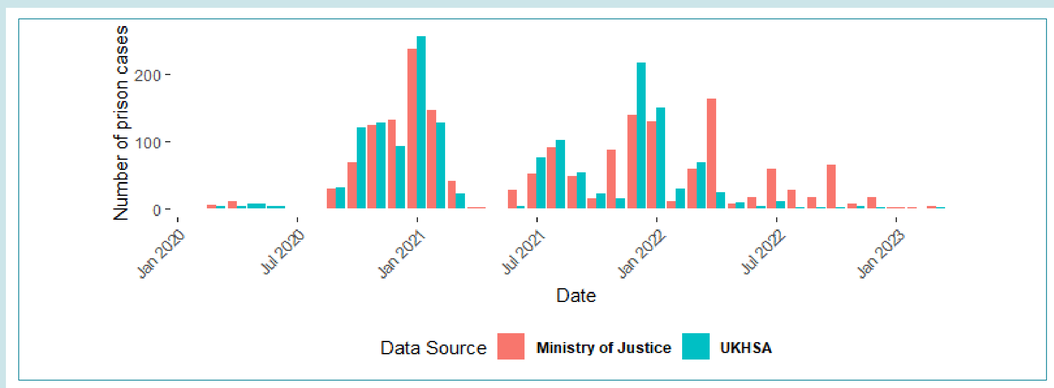

Figure 3. Trends in prison cases presented in 2/19 prison regions by data source

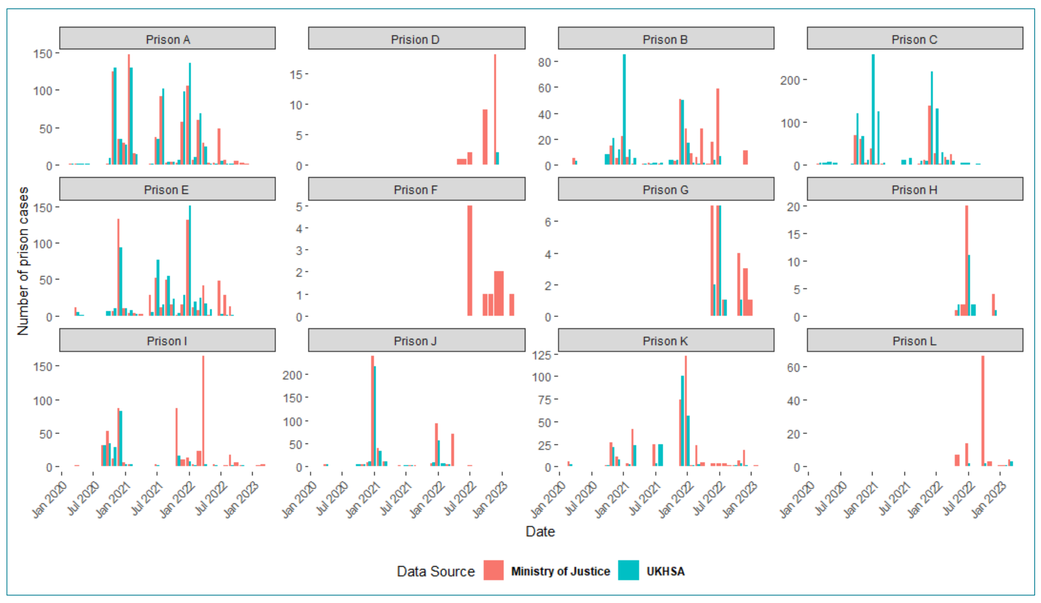

Figure 4. Trends at the prison level for 12 prisons by the two data sources

DISCUSSION

The built methods allow UKHSA to report on COVID-19 cases within 24 hours of receipt of test information which can be used rapidly for public health action.

Our results show that overall, the total number of COVID-19 cases in prisons is close to but does not fully align between the UKHSA and the Ministry of Justice. There is also variation in these discrepancies at the prison level.

When evaluating overall estimates, the Ministry of Justice has reported more COVID-19 cases in prisoners. This may be because:

- The Ministry of Justice line list is not purely used for health reporting which therefore may explain some differences
- UKHSA relies on address information to be correctly provided at the point of test or in prisoners medical records
- Reporting fatigue / waning anxiety levels of COVID-19 may have resulted in fewer tests reported in both surveillance systems

CONCLUSIONS

- The methods built by UKHSA supersedes solely using address and post code information to detect prison cases
- These methods reduce the burden and the risk of manual error through excel forms and can be linked to other health datasets such as hospitalisation data
- The UKHSA methods rely on accurate minimum level of information, Discrepancies between prisons are most likely due to the quality of data recorded and available for prisoners.
- Further work could be done to look at individual record data to further evaluate why specific cases are not being missed (i.e., due to poor address quality)
- Development of a central case registry would avoid issues around inconsistent data between multiple data sources
- More inter-agency collaboration could help improve methods, so the information is useful for public health action both at the national-level and within prisons
- These methods are currently being considered for monitoring other infectious diseases in prisons, and incorporating UPRN information into SGSS

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