Indirect age- and sex-standardisation of COVID-19-related mortality rates for the prison population of England and Wales

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Affiliations

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Summary

This paper estimates a standardised mortality ratio (SMR) for death due to COVID-19 among people in prisons in England and Wales between 1 March 2020 and 26 February 2021. Over this period, prisons in England and Wales reported 121 deaths related to COVID-19. The SMR is 3.33 (95% C.I. 2.77–3.98), meaning there were 3.33 times more deaths among people in prisons than expected given the age and sex of the population.

Introduction

This paper accompanies a Spotlight article in Lancet Respiratory Medicine outlining the case for early vaccination of people in prisons and prison staff (REFERENCE). The UK, like many countries, has had higher rates of COVID-19 infection amongst people in prisons than the general population throughout the pandemic. There were over 10,000 confirmed positive COVID-19 cases amongst people in prisons up to end January 2021.¹

Relative numbers of cases should be treated with caution due to potentially different case ascertainment.

We therefore used indirect standardisation² to compare the COVID-19 mortality rate among people in prisons with that in the general population, accounting for the age and sex structure of people in prisons.
Data sources

**General population estimates.** We used the most recent ONS general populations (June 2019) for England and Wales, published on NomisWeb.³

**COVID-19 deaths in the general population.** We used Office for National Statistics data for occurrences of deaths (i.e. the actual date of death) involving COVID-19 (deaths where COVID-19 is mentioned on the death certificate).⁴

**Prison population size.** We used the prison population (all types of custody) published in Offender Management Statistics Quarterly.⁵

**COVID-19 deaths in people in prisons.** We used the Her Majesty’s Prison and Probation Service (HMPPS) COVID-19 Summary tables (data to 31 January 2021, with data for February collated from weekly HMPPS reports)¹. We used the number COVID-19-related deaths, defined as deaths within 28 days of a positive test or where COVID-19 was confirmed post-mortem, and/or where it was assessed as a contributory factor. Although COVID-19 was not necessarily the main cause of death in all of these cases, the general population ONS data similarly includes individuals where COVID-19 was mentioned on the death certificate but was not necessarily the main cause of death.

Data analysis

We estimated the proportion of the general population who died each month in each age- and sex-group, then applied these proportions to the prison population to estimate the number of expected deaths each month.

The oldest age group in prison population data is ‘70+'. We therefore did the following sensitivity analyses of the expected (general population) mortality rate in this group:

- Base scenario: mortality rate for 70-79 year-olds in the general population
- Low scenario: mortality rates for 70-74 year-olds in the general population.
- High scenario: mortality rates for all 70+ year-olds in the general population.

These rates affect the denominator in the SMR so a low ‘expected' mortality rate translates to a higher SMR.

We estimated the number of ‘expected' deaths ('E') among people in prisons, had they experienced the same mortality rates as people of the same age and sex in the general population of England and Wales.
We then compared this with the observed number of deaths among people in prisons (‘O’), determined their ratio (Standardised Mortality Ratio = O/E), and calculated exact Poisson 95% confidence intervals using R version 4.0.3.

Results

There were 121 deaths amongst people in prisons related to COVID-19 from March 2020 to February 2021. Given the age and sex structure of this population, we expected 36.3 deaths over this period; this gave an SMR of 3.33 (95% C.I. 2.77–3.98).

The sensitivity analyses showed that these findings are sensitive to different assumptions about the distribution in age of the 2% of people in prisons population who are aged 70 and over. The SMRs were 2.42 (95% C.I. 2.01–2.90) when we applied reference mortality rates for the whole general population aged 70+, and 3.71 (95% C.I. 3.08-4.43) when we applied reference mortality rates for 70-74 year-olds.
Table 1: Number of deaths related to COVID-19 in the general population of England and Wales

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<th>2020</th>
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Table 2: Deaths related to COVID-19 per million in the general population of England and Wales

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<td>25-29</td>
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<td>30-39</td>
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<td>40-49</td>
<td>3,720,131</td>
<td>23</td>
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<td>50-59</td>
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<td>74</td>
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<td>60-69</td>
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<td>70-74</td>
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<td>565</td>
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<tr>
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<tr>
<td>Female</td>
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Page 4
### Table 3: Number of people in prisons in England and Wales

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### Table 4: Expected number of deaths (×1000) related to COVID-19 among people in prisons in England and Wales, based on mortality rates in the general population

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<td>80</td>
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Table 5: Summary of observed and expected deaths related to COVID-19 among people in prisons in England and Wales

<table>
<thead>
<tr>
<th></th>
<th>Observed deaths</th>
<th>Expected deaths (base)</th>
<th>Expected deaths (low)</th>
<th>Expected deaths (high)</th>
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<td>3.7</td>
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<tr>
<td>May</td>
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<td>2.5</td>
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<td>7.9</td>
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<td>Feb</td>
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<td>5.5</td>
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<td>32.6</td>
<td>49.9</td>
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<td>SMR (95% C.I.)</td>
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<td>3.33 (2.77-3.98)</td>
<td>3.71 (3.08-4.43)</td>
<td>2.42 (2.01-2.90)</td>
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Figure 1: Observed and expected deaths related to COVID-19 among people in prisons in England and Wales

![Figure 1](image-url)
References


